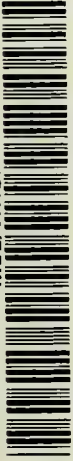




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REPORTS

OF

EXPLORATIONS AND SURVEYS,

TO

ASCERTAIN THE MOST PRACTICABLE AND ECONOMICAL ROUTE FOR A RAILROAD

FROM THE

MISSISSIPPI RIVER TO THE PACIFIC OCEAN.

MADE UNDER THE DIRECTION OF THE SECRETARY OF WAR, IN

1853-6,

ACCORDING TO ACTS OF CONGRESS OF MARCH 3, 1853, MAY 31, 1854, AND AUGUST 5, 1854.

VOLUME X.

WASHINGTON:
BEVERLEY TUCKER, PRINTER.
1859.

IN SENATE—FEBRUARY 24, 1855.

Resolved, That there be printed, for the use of the Senate, ten thousand copies of the several reports of surveys for a railroad to the Pacific, made under the direction of the Secretary of War; and also of the report of F. W. Lander, civil engineer, of a survey of a railroad route from Puget's Sound, by Fort Hall and the Great Salt lake, to the Mississippi river; and the report of John C. Frémont, of a route for a railroad from the headwaters of the Arkansas river into the State of California; together with the maps and plates accompanying said reports necessary to illustrate the same; and that five hundred copies be printed for the use of the Secretary of War, and fifty copies for each of the commanding officers engaged in said service.

Attest :

ASBURY DICKINS, *Secretary*.

THIRTY-SECOND CONGRESS, SECOND SESSION—CHAPTER 98.

SECT. 10. *And be it further enacted*, That the Secretary of War be, and he is hereby, authorized, under the direction of the President of the United States, to employ such portion of the Corps of Topographical Engineers, and such other persons as he may deem necessary, to make such explorations and surveys as he may deem advisable, to ascertain the most practicable and economical route for a railroad from the Mississippi river to the Pacific ocean; and that the sum of one hundred and fifty thousand dollars, or so much thereof as may be necessary, be, and the same is hereby, appropriated, out of any money in the treasury not otherwise appropriated, to defray the expense of such explorations and surveys.

Approved March 3, 1853.

THIRTY-THIRD CONGRESS, FIRST SESSION—CHAPTER 60.

Appropriation: For deficiencies for the railroad surveys between the Mississippi river and the Pacific ocean, forty thousand dollars.

Approved May 31, 1854.

THIRTY-THIRD CONGRESS, FIRST SESSION—CHAPTER 267.

Appropriation: For continuing the explorations and surveys to ascertain the best route for a railway to the Pacific, and for completing the reports of surveys already made, the sum of one hundred and fifty thousand dollars.

Approved August 5, 1854.



CONTENTS OF VOLUME X.

PARTS III, IV.—GENERAL REPORT UPON THE ZOOLOGY OF THE SEVERAL PACIFIC RAILROAD ROUTES.

ZOOLOGICAL PORTION OF THE REPORTS, BY LIEUTENANT E. G. BECKWITH, THIRD ARTILLERY, UPON THE ROUTE NEAR THE THIRTY-EIGHTH AND THIRTY-NINTH PARALLELS, SURVEYED BY CAPTAIN J. W. GUNNISON, AND UPON THE ROUTE NEAR THE FORTY-FIRST PARALLEL, SURVEYED BY HIMSELF.

Nos. 2-5 OF PART VI OF THE REPORT, BY LIEUTENANT A. W. WHIPPLE, CORPS OF TOPOGRAPHICAL ENGINEERS, UPON THE ROUTE NEAR THE THIRTY-FIFTH PARALLEL.

ZOOLOGICAL PORTION OF THE REPORT, BY LIEUTENANT J. G. PARKE, CORPS OF TOPOGRAPHICAL ENGINEERS, UPON THE ROUTE NEAR THE THIRTY-SECOND PARALLEL, FROM THE RIO GRANDE TO THE PIMAS VILLAGES. 1853-'4.

PART IV OF THE REPORT, BY LIEUTENANT R. S. WILLIAMSON, CORPS OF TOPOGRAPHICAL ENGINEERS, UPON ROUTES IN CALIFORNIA TO CONNECT WITH ROUTES NEAR THE THIRTY-FIFTH AND THIRTY-SECOND PARALLELS.

No. 4 OF PART IV OF THE REPORT, BY LIEUTENANT HENRY L. ABBOT, CORPS OF TOPOGRAPHICAL ENGINEERS, UPON THE ROUTES IN OREGON AND CALIFORNIA, EXPLORED BY PARTIES UNDER THE COMMAND OF LIEUTENANT R. S. WILLIAMSON, CORPS OF TOPOGRAPHICAL ENGINEERS, IN 1855.

EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.
WAR DEPARTMENT.

GENERAL REPORT

UPON

THE ZOOLOGY

OF THE

SEVERAL PACIFIC RAILROAD ROUTES.

WASHINGTON, D. C.
1857.

PART III.



EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.
WAR DEPARTMENT.

R E P T I L E S :

BY SPENCER F. BAIRD,

ASSISTANT SECRETARY OF THE SMITHSONIAN INSTITUTION.

WASHINGTON, D. C.
1859.

WAR DEPARTMENT,

Office of Explorations and Surveys, February 14, 1859.

The General Natural History Reports having been extended so much beyond the limits originally contemplated, the War Department has considered it advisable to omit the publication of the Report on Reptiles. The plates to accompany this report having been prepared and printed, they, with a brief explanation of the figures composing them, are herewith given.

A. A. HUMPHREYS,
Captain Topographical Engineers, in charge.

EXPLANATION OF THE PLATES.

As the general report on the reptiles of western North America, observed by the different exploring parties, has been excluded from the series for want of room, all that can be given here is an explanation of the plates prepared for this report. These represent the details of external form in different species of North American serpents. All the outlines from the same specimen have a common number, to which is added a system of lettering common to all, and indicating the several details, as follows :

u, the upper surface of the head.

l, the lower surface of the head.

s, the side of the head, (usually the left.)

f, the head from before.

a, the anal region, showing the peculiar scutellation.

sc, the scales on the side of the body, showing several oblique rows, with the upper portion of the abdominal scales. Each figure illustrates usually the median dorsal row and those between it and the abdominal plates on the left side. The entire number of dorsal rows of scales will therefore be twice the number represented, less one. The figure is generally taken at about the posterior end of the anterior third of the length of body, including head and tail.

In some cases a different series of letters has been adopted ; these are explained in their place.

The figures have, as far as possible, been taken from the type specimens of the species, especially those described in the catalogue of serpents in the museum of the Smithsonian Institution, (1853,) to which the page column refers.

| Plate. | Fig. | Name. | Page. | Locality. | Details given. |
|--------|---------|--|-------|----------------------------|-------------------|
| XXIV | 1 | <i>Crotalus durissus</i> , L. p. | 1 | Carlisle, Pennsylvania | All. |
| | 2 | ..do.. <i>adamanteus</i> , Beauv. | 3 | Pensacola, Florida | All. |
| | 3 | ..do.. <i>atrox</i> , B. & G. | 5 | Indianola, Texas | u. l. s. f. |
| | 4 | ..do.. <i>confluentus</i> , Say | 8 | Red River | All. |
| | 5 | ..do.. <i>molossus</i> , B. & G. | 10 | Sonora | u. l. s. f. sc. |
| | 6 | ..do.. <i>oregonus</i> , Holb. | 145 | Oregon? | u. sc. |
| | 7 | <i>Crotalophorus miliaris</i> , Holb. | 11 | Charleston, South Carolina | All. |
| | 8 | ..do.. <i>consors</i> , B. & G. | 12 | Indianola, Texas | u. sc. |
| XXV | 9 | <i>Crotalophorus tergeminus</i> , Holb. | 14 | Racine, Wisconsin | All. |
| | 10 | ..do.. <i>edwardsii</i> , B. & G. | 15 | Rio Grande, Texas | All. |
| | 11 | ..do.. <i>kirtlandii</i> , Holb. | 16 | Ohio | All. |
| | 11 bis. | ..do.. ..do.. (young) | 16 | Ohio | s. |
| | 12 | <i>Ancistrodon contortrix</i> , B. & G. | 17 | Near San Antonio, Texas | All. |
| | 13 | <i>Toxicophis piscivorus</i> , B. & G. | 19 | Red River, Louisiana | All. |
| | 14 | ..do.. <i>pugnax</i> , B. & G. | 20 | Indianola | All. |
| | 15 | <i>Elaps fulvius</i> , Cuv. | 21 | Charleston, South Carolina | All. |
| | 16 | ..do.. <i>tener</i> , B. & G. | 22 | San Felipe, Texas | All. |
| | 17 | ..do.. <i>tristis</i> , B. & G. | 23 | Kemper county, Mississippi | All. |
| XXVI | 18 | <i>Dipsas septentrionalis</i> , Kennicott ¹ | | Brownsville, Texas | All. |
| | 19 | <i>Eutaenia saurita</i> , B. & G. | 24 | Carlisle, Pennsylvania | All. |
| | 20 | ..do.. <i>faireyi</i> , B. & G. | 25 | Red River, Louisiana | All. |
| | 21 | ..do.. <i>proxima</i> ?, B. & G. | 25 | Indianola, Texas | All. |
| | 22 | ..do.. <i>ornata</i> , B. & G. ² | 28 | San Antonio to El Paso | All. |
| | 23 | ..do.. <i>sirtalis</i> , B. & G. | 30 | Westport, New York | All. |
| | 24 | ..do.. <i>ordinata</i> , B. & G. | 32 | Riceboro', Georgia | All. |
| | 25 | ..do.. <i>radix</i> , B. & G. | 34 | Racine, Wisconsin | All. |
| | 26 | ..do.. <i>marciana</i> , B. & G. | 36 | Red river | u. l. s. f. sc. |
| | 1 | <i>Nerodia transversa</i> , B. & G. | 148 | Red river | All. |
| XXVII | 2 | <i>Eutaenia dorsalis</i> , B. & G. | 31 | Texas | All. |
| | 3 | ..do.. <i>ordinoides</i> , B. & G. | 33 | California | All. ³ |
| | 27 | <i>Nerodia sipedon</i> , B. & G. | 38 | Carlisle, Pennsylvania | All. |
| | 28 | ..do.. <i>erythrogaster</i> , B. & G. | 40 | Red river, Louisiana | u. l. s. f. sc. |
| | 29 | ..do.. <i>taxispilota</i> , B. & G. | 43 | Liberty county, Georgia | All. |
| | 30 | ..do.. <i>holbrookii</i> , B. & G. | 43 | Red river, Louisiana | All. |
| | 31 | ..do.. <i>niger</i> , B. & G. | 147 | Massachusetts | All. |
| | 32 | <i>Regina leberis</i> , B. & G. | 45 | Carlisle, Pennsylvania | All. |
| | 33 | ..do.. <i>rigida</i> , B. & G. | 46 | Pennsylvania | All. |
| | 34 | ..do.. <i>grahamii</i> , B. & G. | 47 | Texas | All. |
| XXVIII | 35 | ..do.. <i>clarkii</i> , B. & G. | 48 | Indianola | u. l. s. f. sc. |
| | 36 | ..do.. <i>kirtlandii</i> , Kenn. ⁴ | | Illinois | All. |
| | 37 | <i>Ninia diademata</i> , B. & G. | 49 | Orizaba, Mexico | s. u. |
| | 38 | <i>Heterodon platyrhinos</i> , Latr. | 51 | Carlisle, Pennsylvania | All. |
| | 39 | ..do.. <i>cognatus</i> , B. & G. | 54 | Indianola | All. |
| | 40 | ..do.. <i>niger</i> , Troost | 55 | Carlisle, Pennsylvania | All, nasal pl. |
| | 41 | ..do.. <i>atmodes</i> , B. & G. | 57 | Charleston, South Carolina | All, n. p. |
| | 42 | ..do.. <i>simus</i> , Holb. | 59 | ..do.. ..do.. | All. |
| | 42 bis. | ..do.. <i>simus</i> , (second spec.) | 59 | ..do.. ..do.. | u. |
| | 43 | ..do.. <i>nasicus</i> , B. & G. | 61 | Eagle Pass, Texas | All, n. p. |

¹ U. S. Boundary Report, II, 1859; Reptiles, p. 16.

² U. S. Boundary Report, II, 1859; Reptiles, 16: *Eutaenia parietalis*, Catal. Serpents, 28.

³ a, head from above; b, do. from side; c, do. from below; d, anal region; e, side scales.

⁴ KENNICOTT, Pr. A. N. Sc. VIII, April, 1856, 95.

| Plate. | Figure. | Name. | Page. | Locality. | Details given. | |
|--------|------------------|---|-------------------------------------|--|----------------------------|-------------|
| XXXIX | 44 | <i>Pityophis melanoleucus</i> , Holb. | 65 | Carolina | u. l. s. f. sc. | |
| | 45 | do. <i>sayi</i> B & G | 151 | Fort Snelling | All. | |
| | 46 | do. <i>bellona</i> , B. & G. | 66 | Rio Grande | All. | |
| | 47 | do. <i>mc clellanii</i> , B. & G. | 68 | Red river | All. | |
| | 48 | do. <i>annectens</i> , B. & G. | 72 | San Diego, California | All. | |
| | 49 | <i>Scotophis alleghaniensis</i> , B. & G. | 73 | Carlisle, Pennsylvania | u. l. s. f. sc. | |
| | 50 | do. <i>lindheimeri</i> , B. & G. | 74 | New Braunfels, Texas | All. | |
| | 51 | do. <i>vulpinus</i> , B. & G. | 75 | Racine, Wisconsin | All. | |
| | XXX | 52 | do. <i>confinis</i> , B. & G. | 76 | Anderson, South Carolina | u. s. |
| | | 53 | do. <i>laetus</i> , B. & G. | 77 | Red river, Arkansas | All. |
| | | 54 | do. <i>guttatus</i> , B. & G. | 78 | Kemper county, Mississippi | All. |
| 55 | | do. <i>4-vittatus</i> , B. & G. | 80 | Florida | u. l. s. f. sc. | |
| 56 | | do. <i>emoryi</i> , B. & G. | 157 | Howard Springs, Texas | All. | |
| 57 | | <i>Ophibolus boylii</i> , B. & G. | 82 | Eldorado county, California | u. l. s. f. sc. | |
| 58 | | do. <i>splendidus</i> , B. & G. | 83 | Sonora | All. | |
| 59 | | do. <i>sayi</i> , B. & G. | 84 | Red river, Arkansas | u. l. s. f. sc. | |
| 60 | | do. <i>rhombomaculatus</i> , B. & G. | 86 | Georgia | All. | |
| 61 | | do. <i>ezimus</i> , B. & G. | 87 | Warren, Massachusetts | All. | |
| XXXI | | 62 | do. <i>clericus</i> , B. & G. | 88 | Clark county, Virginia | All. |
| | 63 | do. <i>doliatus</i> , B. & G. | 89 | Kemper county, Virginia | All. | |
| | 64 | do. <i>gentilis</i> , B. & G. | 90 | Red river, Arkansas | All. | |
| | 65 | do. <i>getulus</i> , B. & G. | 85 | Charleston, South Carolina | All. | |
| | 66 | <i>Georgia obsoleta</i> , B. & G. | 158 | Brownsville, Texas | All. | |
| | 67 | <i>Bascanion constrictor</i> , B. & G. | 93 | Carlisle | All. | |
| | 68 | do. <i>fremontii</i> , B. & G. | 95 | California | All. | |
| | 69 | do. <i>foxii</i> , B. & G. | 96 | Michigan; both sides of head drawn to show difference in labials | All. | |
| | 70 | do. <i>flaviventris</i> , B. & G. | 96 | Texas? | All. | |
| | 71 | <i>Masticophis flagelliformis</i> , B. & G., (old) | 98 | Pensacola, Florida | All. | |
| | XXXII | 72 | do. <i>flagelliformis</i> , (young) | 149 | Georgia | u. l. s. f. |
| 73 | | do. <i>flavigularis</i> , B. & G., (young) | 99 | Indianola, Texas | u. l. s. f. | |
| 74 | | do. <i>mormon</i> , B. & G. | 101 | Salt Lake | All. | |
| 75 | | do. <i>ornatus</i> , B. & G. | 102 | San Antonio to El Paso | All. | |
| 76 | | do. <i>taeniatus</i> , B. & G. | 103 | California | All. | |
| 77 | | do. <i>schottii</i> , B. & G. | 160 | Eagle Pass | All. | |
| 78 | | <i>Salvadora grahamiae</i> , B. & G. | 104 | Sonora | u. l. s. f. sc. | |
| 79 | | <i>Leptophis aestivus</i> , Bell | 106 | Anderson, South Carolina | u. l. s. f. sc. | |
| 80 | | do. <i>majalis</i> , B. & G. | 107 | Indianola | u. s. | |
| 81 | | <i>Chlorosoma vernalis</i> , B. & G. | 108 | Westport, New York, 2 diam. | s. a. | |
| 1 | | ? <i>Diadophis docilis</i> , B. & G. | 114 | Tucson, 2 diam. * | All. | |
| 2 | <i>Diadophis</i> | | Santa Magdalena, 2 diam. * | All. | | |
| 3 | <i>Wenona</i> | | Oregon * | All. | | |
| XXXIII | 82 | <i>Diadophis punctatus</i> , B. & G. | 112 | Carlisle, Pennsylvania | u. s. | |
| | 83 | do. <i>amabilis</i> , B. & G. | 113 | San Jose, California | All. | |
| | 84 | do. <i>docilis</i> , B. & G. | 114 | San Pedro, Comanche Spring | All. | |
| | 85 | do. <i>pulchellus</i> , B. & G. | 115 | Eldorado county, California | All. | |
| | 86 | do. <i>regalis</i> , B. & G. | 116 | Sonora, Mexico | All. | |
| | 87 | <i>Taeniophis imperialis</i> , B. & G. ¹ | | Brownsville, Texas | All. | |
| | 88 | <i>Sonora semi-annulata</i> , B. & G. | 117 | Sonora | s. u. | |
| | 89 | <i>Rhinostoma coccinea</i> , Holb. | 118 | Riceboro', Georgia | All. | |
| | 90 | <i>Rhinocheilus leontii</i> , B. & G. | 120 | California | u. l. s. f. sc. | |

* References as in plate XXVI, figure 1.—3.

¹ *Taeniophis imperialis*, B. & G., Mexican Boundary Report, II. 1859; Reptiles, 23.

| Plate. | Fig. | Name. | Page. | Locality. | Details given. |
|-----------|------|---|-------|---|-----------------------------|
| XXXIII .. | 91 | <i>Haldea striatula</i> , B. & G..... | 122 | Richmond, Virginia, 2 diam..... | u. l. s. f. sc. |
| | 92 | <i>Farancia abacura</i> , B. & G..... | 123 | Red river, Louisiana..... | u. l. s. f. sc. |
| | 93 | <i>Abastor erythrogrammus</i> , Gray..... | 125 | Southern States..... | u. l. s. f. sc. |
| | 94 | <i>Virginia valeria</i> , B. & G..... | 127 | Maryland, 2 diam..... | u. l. s. f. sc. |
| | 95 | <i>Celuta amoena</i> , B. & G..... | 129 | Carlisle, 2 diam..... | u. l. s. f. sc. |
| | 96 | <i>Tantilla coronata</i> , B. & G..... | 131 | Kemper county, Mississippi, 2 diam..... | u. s. |
| | 97 | <i>Oseola elapsoides</i> , B. & G..... | 133 | Charleston, South Carolina, 2 diam..... | u. s. |
| | 98 | <i>Storeria dekayi</i> , B. & G..... | 135 | Framingham, Massachusetts, 2 diam..... | u. s. |
| | 99 | ..do.. <i>occipito-maculata</i> , B. & G..... | 137 | Madrid, New York, 2 diam..... | u. s. |
| | 100 | <i>Rena dulcis</i> , B. & G..... | 142 | San Pedro, Can. Sp., Tex., 3 diam..... | u. l. s. |
| XXXIV .. | 1 | <i>Georgia couperi</i> , B. & G..... | 92 | Georgia..... | a. b. c. d. e. ¹ |
| | 2 | <i>Nerodia rhombifer</i> , B. & G..... | 147 | Arkansas..... | As in fig. 1. |
| | 3 | ..do.. <i>woodhousii</i> , B. & G..... | 42 | Texas..... | As in fig. 1. |
| | 4 | ..do.. <i>fusciata</i> , B. & G..... | 39 | South ?..... | As in fig. 1. ² |
| | 5 | <i>Eutaenia radix</i> , B. & G..... | 34 | Wisconsin ?..... | As in fig. 1. |
| | 6 | ? <i>Microps lineatus</i> , Hall ³ | | Fort Chadbourne, Texas..... | As in fig. 1. |
| | 7 | ?..... | | | |
| XXXV ... | 1 | <i>Crotalus tigris</i> , Kennicott ⁴ | | | As in fig. 1. |
| | 2 | <i>Crotalus</i> | | Colorado Bottom..... | As in fig. 1. |
| | 3 | <i>Crotalus</i> | | Sierra Verde, California..... | As in fig. 1. |
| | 4 | <i>Crotalus cerastes</i> , Hallow. ⁵ | | | As in fig. 1. |
| | 5 | ..do..... | | Sierra Verde, California..... | As in fig. 1. |
| | 6 | <i>Lamprosoma occipitale</i> , Hall ⁶ | | Colorado Desert..... | As in fig. 1. |
| | 7 | <i>Lamprosoma' occipitale</i> , Hall ⁷ | | California..... | As in fig. 1. |
| | 8 | <i>Toluca lineata</i> , Kenn ⁸ | | Valley of Mexico..... | As in fig. 1. |
| XXXVI... | 1 | <i>Crotalus lucifer</i> , B. & G..... | 6 | Oregon..... | As in fig. 1. |
| | 2 | <i>Eutaenia leptocephala</i> , B. & G..... | 29 | Oregon..... | As in fig. 1. |
| | 3 | ..do.. <i>pickeringii</i> , B. & G..... | 27 | Oregon..... | As in fig. 1. |
| | 4 | <i>Pityophis catenifer</i> , B. & G..... | 69 | California..... | As in fig. 1. |
| | 5 | ..do.. <i>wilkesii</i> , B. & G..... | 71 | Oregon..... | As in fig. 1. |
| | 6 | <i>Bascanion velustus</i> , B. & G..... | 97 | Oregon..... | As in fig. 1. |
| | 7 | <i>Contia mitis</i> , B. &..... | 110 | Oregon, 2 diam..... | As in fig. 1. |
| | 8 | <i>Lodia tenuis</i> , B. & G..... | 116 | Oregon, 2 diam..... | As in fig. 1. |

¹ All, except head from front.

² Add f. dorsal scales; g, side view of ditto, showing a peculiar serration of the carination.

³ HALLOWELL, Pr. A. N. Sc. VIII, 1856, 240.

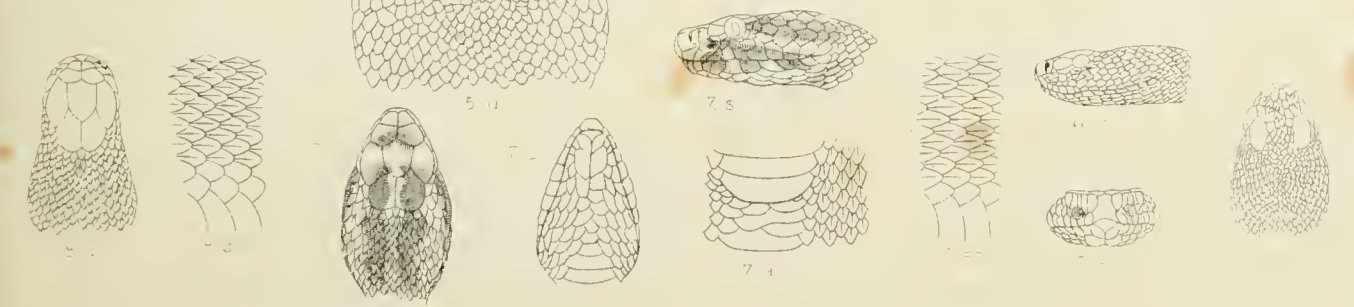
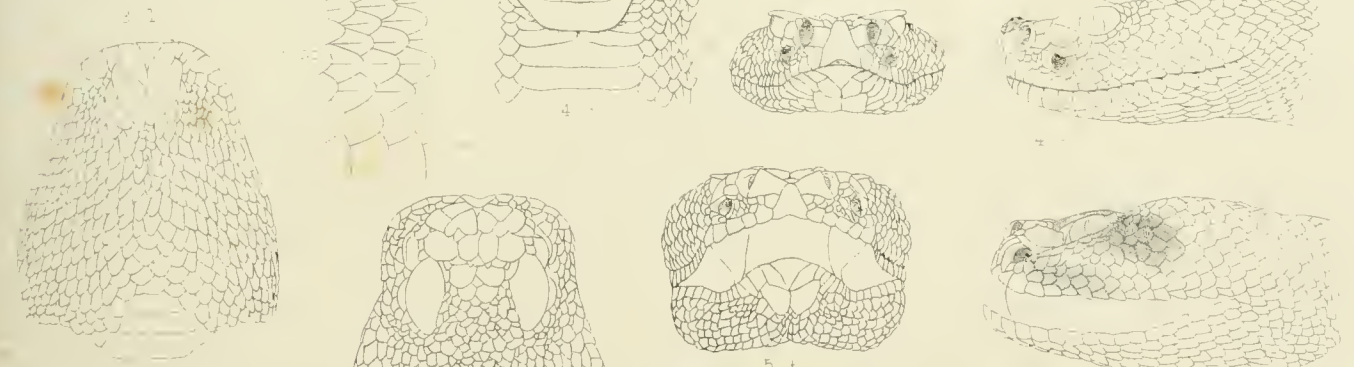
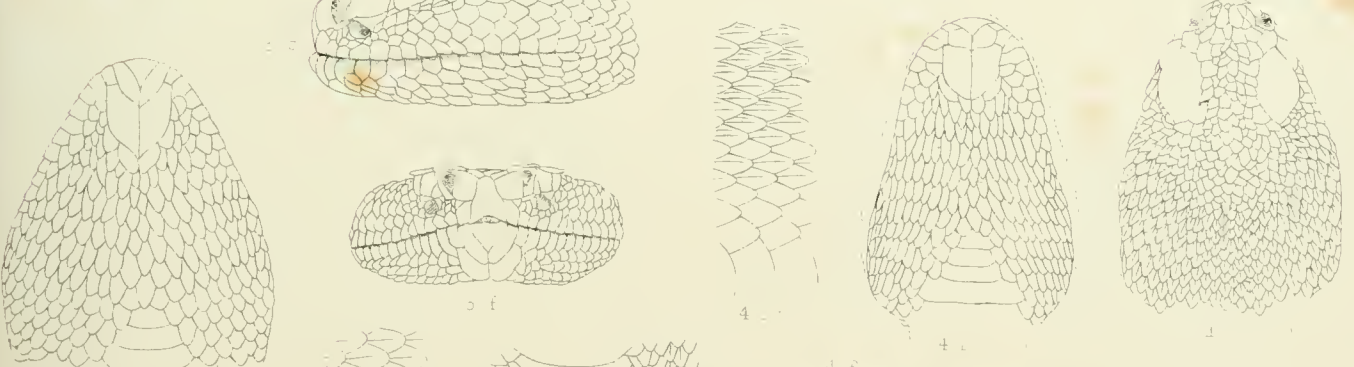
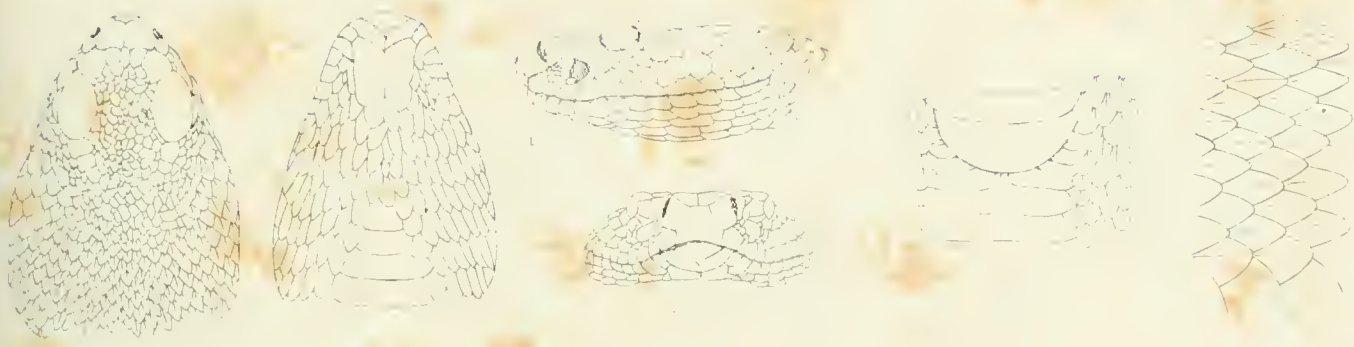
⁴ Mex. Bound. Rep. II, 1839; Reptiles, 14.

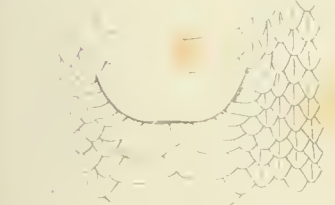
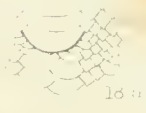
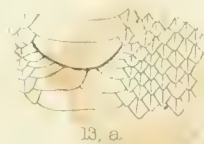
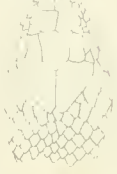
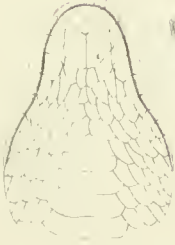
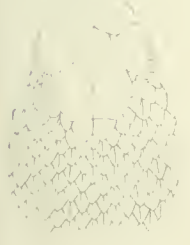
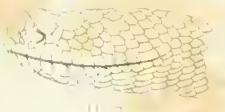
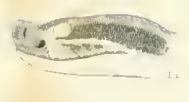
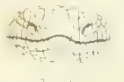
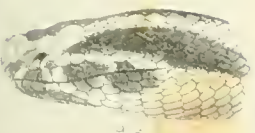
⁵ HALLOWELL, Pr. A. N. Sc. VII, June, 1854, 95.

⁶ U. S. Mex. Bound. II, 1859; Reptiles, 21.

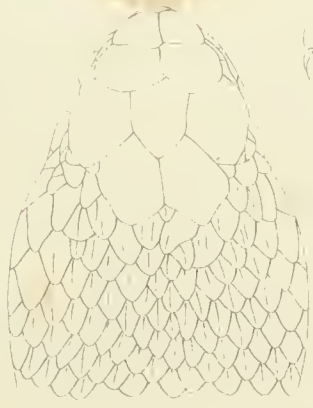
⁷ HALLOWELL, Pr. A. N. Sc. *ut supra*.

⁸ KENNICOTT, *ut supra*, 23.





14, a



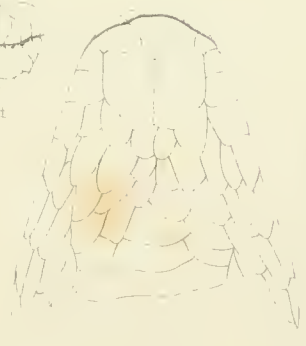
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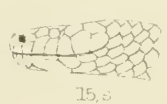
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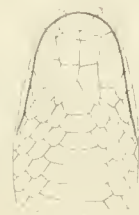
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16, a









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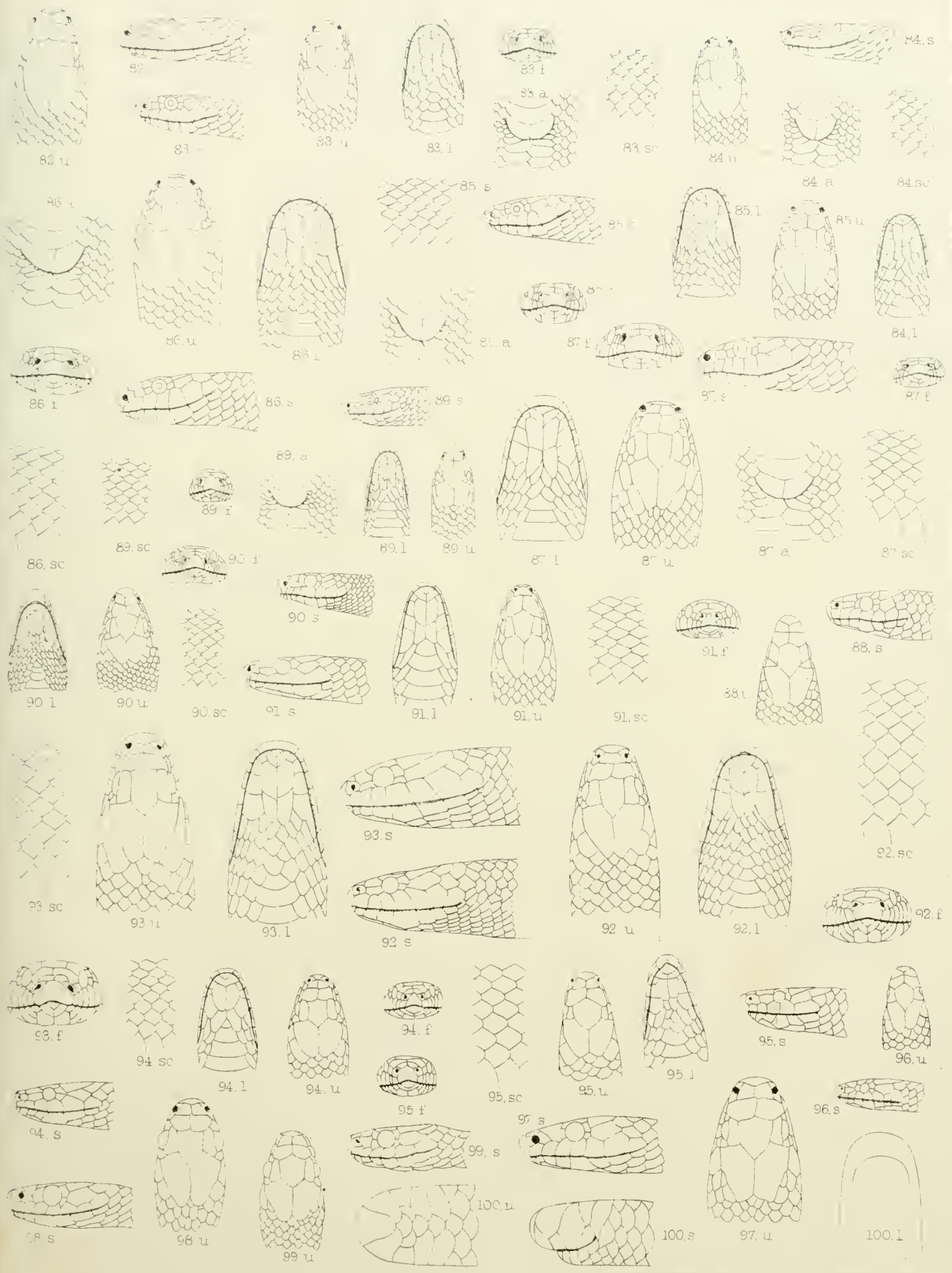
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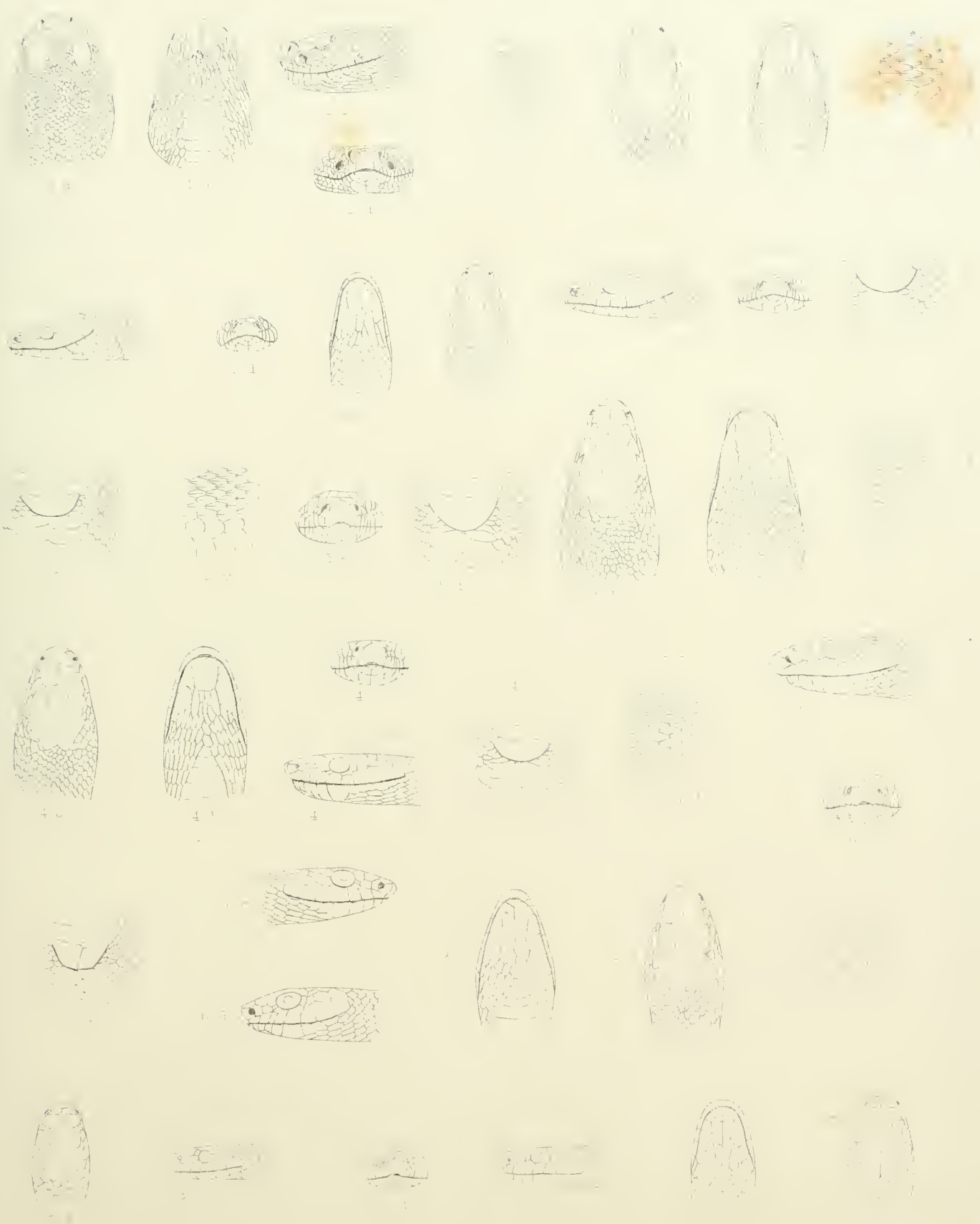
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P A R T I V.

a 1 *

EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.

WAR DEPARTMENT.

FISHES:

BY CHARLES GIRARD, M. D.

WASHINGTON, D. C.

1858.

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INTRODUCTORY REMARKS.

THE fishes of western North America are as yet too little known, and the amount of new materials for further investigations too great, also, to warrant anything like an attempt on the present occasion to establish a natural series. After treating of the various groups in a series of monographs, as already begun by us,* we shall be better prepared to do justice to that part of our subject.

We have spoken at some length upon two groups—the Cataphracti, or mailed cheeks, and the Embiotocoids, or viviparous family, both of them having numerous representatives along the Pacific coast. They constitute the most predominant feature of the ichthyic fauna of that region of the North American continent, together with the Trachinids and the Heterolepids, which seem to bring into closer relationships the Percoids and the Cottoids, properly so called. The true Percoids, themselves, appear isolated west of the Rocky Mountain range.

The Sphyraenid family is represented by one species of the genus *Sphyraena*.

The Sciaenoids, so far as observed, are few in numbers, and remind us of the Atlantic types.

Not a single species of Sparoid has as yet come to our knowledge from the coast of Oregon and California.

As to the Atherinoid family, we find in California a rather large species designated by the settlers under the name of “smelt,” probably on account of its delicacy, and which is, truly speaking, an ally of the “silver-side” or “silver-fish” of our Atlantic coast, and “pesce del Rey” and “pescadilla del Rey” of Central and South America. The “silver-fish” being of a diminutive size, even when fully grown, its esculent qualities have remained unnoticed by either fishermen or gastronomers. The “pesce del Rey” tells its own story.

The scarcity of Scomberoids is a curious feature in the fauna of our western coast: a Mackerel, (*Scomber*), a Bonito (*Pelamys*), and two *Caranx*, constitute so far the entire known list. But we venture to say that further researches will bring to light many more of them.

The only species of Chetodonts we are acquainted with from the western coast was obtained in the southern part of the State of California.

The Blennioids appear to be more numerous than the preceding ones, new generic types having been found (*Neoclinus*, *Xiphidion*, *Apodichthys*, *Cebidichthys*, and *Anarrichthys*) along with species of known genera (*Blennius*, *Gunnellus*, *Lumpenus*).

The Gobioids, properly so called, are comparatively scarce, two species of the genus *Gobius* constituting the entire known list.

The Cyclopterids, or *Discoboli*, are represented by two species also, one of which is a *Lepadogaster*, the other a *Cyclogaster*.

The Batrachoid or toad-fish family has given one species to the fauna, and which we have erected into a new genus.

The Labroids, properly so called, are anything but numerous, if the Embiotocoids are considered as a separate family. We think, however, that many more will be found hereafter, especially along the southern coast of California.

* See “Smithsonian Contributions to Knowledge,” vol. III, 1852.

The Pomacentrid family, or marine labroids, with pectinated scales, has given us one species, which we have placed in the genus *Glyphisodon*, not having the means of determining it more accurately.

The Chromids, or fresh water labroids, with pectinated scales, have not yet been met with along the Pacific range of North America. We have evidences of their presence in the basin of the Rio Grande del Norte (Rio Bravo), one species of which being figured and described in the "Report on the United States and Mexican Boundary Survey."

The Scomberesocids, on the other hand, are represented, so far, by a species of the genus *Belone*.

The Gadoid family has given us a cod, a whiting, and a cusk; the latter we have not examined.

The Pleuronectids, or flat-fishes, are tolerably well represented, though we observe as yet no turbot (*Rhombus*), properly so called. The halibut (*Hippoglossus*) is spoken of as occurring along the coast, but we have not examined it as yet.

The Ophidioid family is represented by two known genera, *Ophidion* and *Ammodytes*, whilst the true eels have not yet been heard of.

The Salmonids are rather abundant, especially in species of the Linnean genus *Salmo*, to which may be added a white-fish (*Coregonus*) and two smelts, properly so called (*Osmerus* and *Thaleichthys*).

No Characinids are known north of the valley of the Rio Grande del Norte, (Rio Bravo), where one species was collected by the United States and Mexican Boundary Commission, and in whose report it is figured and described.

The Scopelids have furnished us, so far, with one species of the genus *Saurus* along the Pacific coast.

The fresh waters teem with Cyprinoids and Percoids, the former east and west of the Rocky Mountains, the latter only eastwardly, in the shape of sun-fishes (*Pomotis*) and bass (*Ambloplites* and *Centrarchus*), a single species of the bass having been met with in California.

Of the Cyprinodont family we have mentioned but one species, an inhabitant of the fresh waters of California. Those collected in the interior of the continent we propose to investigate at some future time.

The Etheostomoids are likewise left aside for the present.

A few pickerels or Esocids have been observed in the Hydrographic basin of the Arkansas.

A few catfishes (*Pimelodus*) were procured at the initial point of the exploration of the 35th and the 47th parallels; none having been found west of the Rocky Mountains.

Of the herring family, we meet with two herrings (*Clupea* and *Meletta*), and several anchovies (*Engraulis*), but as yet no shads (*Alosa*) have been seen in the collections made.

The Plectognaths have furnished a *Balistes* and a balloon-fish.

The Lophobranchs are represented by a few pipe-fishes and a sea-horse.

The Ganoids of the western coast consist of sturgeons, of which peculiar forms are met with in the fresh waters of the interior of the continent, where we find also a few mud-fishes, and have obtained some gar-pikes.

The cartilaginous fishes, so far as observed, are anything but numerous; a few sharks, skates, and lampreys constitute the list we are for the present acquainted with. Amongst sharks and skates there are curious genera: *Cestracion*, *Triakis*; *Rhinobatis*, *Uraptera*, and *Rhinoptera*, whilst amongst lampreys we meet the ordinary genera, *Petromyzon* and *Ammocoetes*.

The elephant-fish (*Chimaera*) was also observed as far as Puget's Sound.

INTRODUCTORY REMARKS.

THE fishes of North America are as yet too little known, and the amount of new materials for further investigations too great, also, to warrant anything like an attempt on the present occasion to establish a natural series. After the various groups have been treated of in a series of monographs, as already begun by us,* we shall be better prepared to do justice to that part of our subject.

We have spoken at some length upon two groups—the cataphracti, or mailed cheeks, and the embiotocoids, or viviparous family, both of them having numerous representatives along the Pacific coast. They constitute the most predominant feature of the ichthyic fauna of that region of the North American continent, together with the trachinids and the heterolepids, which seem to bring into closer relationships the percoids and the cottoids, properly so called. The true percoids themselves appear isolated west of the Rocky Mountain range.

The family of *Sphyraenidae* is represented by one species of *Sphyraena*.

The scianoids, so far as observed, are few in numbers, and remind us of the Atlantic types; whilst other families present several new genera.

Not a single species of sparoid has as yet come to our knowledge.

The scarcity of scomberoids is a curious feature in the fauna of our western coast. But we venture to say that further researches will bring to light many more of them.

As to the atherinoid family, we find in California a rather large species designated under the name of “smelt” by the settlers, probably on account of its delicacy, and which is, truly speaking, an ally of the “silver-side” or “silver-fish” of our Atlantic coast, and “pesce del rey” and “pescadilla del rey” of Central and South America. The “silver-fish” being of a diminutive size, even when fully grown, its esculent qualities have remained unnoticed by either fishermen or gastronomers. The “pesce del rey” tells its own story; an allied species has been described and figured in vol. II of Lieutenant Gilliss’ “Report.”

The blennioids appear to be more numerous than the preceding ones, new generic types having been found (*Xiphidion*, *Apodichthys*, *Cebidichthys*, and *Anarrichthys*) along with species of known genera (*Blennius*, *Gunnellus*.)

The gobioids, properly so called, are comparatively scarce, two species of the genus *Gobius* constituting the entire known list.

The cyclopterids, or *Discoboli*, are represented by two species also, one of which is a *Lepadogaster*, the other a *Liparis*.

The labroids, properly so called, are anything but numerous, if the embiotocoids are considered as a separate family. We think, however, that many more will be found hereafter.

The pomacentrid family, or marine labroids, with pectinated scales, numbers one species,

* See “Smithsonian Contributions to Knowledge,” vol. III, 1852.

which we have placed in the genus *Glyphisodon*, not having the means of determining it more accurately.

The chromids, or fresh water labroids, with pectinated scales, have not yet been met with along the Pacific range of North America. We have evidences of their presence in the basin of the Rio Grande del Norte or Rio Bravo, figured and described in Major Emory's "Report on the United States and Mexico Boundary Survey."

The scomberesocids, on the other hand, are represented, so far, by a species of the genus *Belone*.

The gadoid family has given us a cod and a whiting.

The pleuronectids, or flat fishes, are tolerably well represented, though we observe as yet neither turbot (*Rhombus*) nor halibuts (*Hippoglossus*).

The ophidioid family is represented by two known genera, *Ophidium* and *Ammodytes*, whilst the true eels have not yet been heard of.

The salmonids are rather abundant, especially in species of the Linnean genus *Salmo*, to which may be added a white fish (*Coregonus*), and two smelts, properly so called (*Osmerus* and *Argentina*).

No characini are known north of the valley of the Rio Grande del Norte (Rio Bravo), where one species was collected by the United States and Mexico Boundary Commission, and in whose report it will be figured and described.

The scopelini have furnished us, so far, with one species of the genus *Saurus* or *Laurida* along the Pacific coast.

The fresh waters teem with cyprinoids and percoids, the former east and west of the Rocky mountains, the latter only eastwardly, in the shape of sun-fishes (*Pomotis*) and bass, (*Centrar-chus*), a single species of the bass having been met with in California.

Of the cyprinodont family we have mentioned but one species, an inhabitant of the fresh waters of California. Those collected in the interior of the continent we propose to investigate at some future time.

The etheostomoids are likewise left aside for the present.

Neither pikes, nor pickerels, or esocids have been observed west of the Mississippi valley.

A few catfishes (*Pimelodus*) were procured at the initial point of the exploration of the 35th and the 47th parallels, none having been found west of the Rocky mountains.

Of the herring family, we meet with a true herring (*Meletta*), and two anchovies (*Engraulis*), but as yet no shads (*Alosa*) have been seen in the collections made.

The lophobranchs are represented by a few pipe fishes.

So much for the *osseous* fishes. The *cartilaginous*, so far as observed, are anything but numerous; a few sturgeons, sharks, skates, and lampreys constitute the list we are for the present acquainted with. Amongst sharks and skates there are curious genera: *Cestracion*, *Triakis*, *Rhinobatis*, and *Rhinoptera*, whilst amongst lampreys we meet the ordinary genus *Petromyzon*.

ORDER.

ACANTHOPTERI.

This order embraces a large number of fishes having either one, two, or three dorsal fins. In the case of one dorsal fin being present, its anterior portion is always composed of inarticulated and undivided spiny rays, whilst the remaining portion consist of soft, articulated, and often divided or bifurcated ones. When two dorsals exist, the anterior is spinous, and the posterior soft. The ventral fins are mostly near the pectorals, being situated beneath or anteriorly to the base of these latter fins, and whenever fully developed, they are composed of an external, inarticulated, spiny ray, and rarely more than six articulated and branched ones, the latter being generally five in number, and occasionally less. The swimming bladder is without air duct to the throat. The inferior pharyngeals exist throughout as independent bones.

Family PERCIDÆ, Bonap.

The percid or perch family has always been looked upon as typifying best the order of acanthopterians at the head of the osseous fishes.

It comprehends numerous tribes and genera both from the marine and fresh waters, all characterized by a body more or less elongated, in most cases protected by pectinated scales, generally rough to the touch, occasionally, however, appearing rather smooth, owing to the deciduous nature of their prickles or pectinations.

Regarding the fins, we observe that the dorsal is always well developed, sometimes single, at others subdivided into two distinct fins. The anterior portion, or anterior fin, just as the occurrence may be, being spinous—that is, composed of osseous and rigid rays—resembling more common bones than ordinary rays. The anal exhibits a variable number of spiny rays at its anterior margin, and which, in a few instances, are entirely wanting. The caudal fin is either truncated posteriorly or more or less emarginated. The ventrals are inserted posteriorly to the base of the pectorals, and composed of an external stoutish spine, and five soft and dichotomised rays.

Generally speaking, the preopercle and opercle exhibit various spinous or serrated edges, while in a few only they are perfectly smooth and entire. The jaws, the front of the vomer, and often the palatine bones also, are furnished with teeth of various kinds: velvet-like, card-like, or of the canine type; the canines occurring occasionally intermingled with the former two kinds.

The yellow perch, so common in the fresh waters of the eastern States, has not been brought to notice beyond the main bed of the Mississippi basin, and hence was not met with by any of the parties whose collections we investigate in the present report.

Most of the percoids are fishes which appear upon our tables, some as delicacies, others as ordinary staples. The less esteemed are the sunfish or pond perch, owing, mayhap, somewhat to their diminutive size.

DIOPLITES, Rafin.

GEN. CHAR.—Body elongated, sub-fusiform in profile, compressed. Head well developed. Preopercle smooth and entire. Mouth large; lower jaw longest. Velvet-like teeth on the jaws, front of vomer, and palatine bones. Tongue smooth. Cheeks and opercular apparatus scaly. Branchial apertures continuous under the throat. Two dorsal fins contiguous upon their base. Three small anal spines. Insertion of ventrals on a line immediately behind the base of pectorals. Caudal fin posteriorly sub-crescentic. Scales well developed and posteriorly ciliated.

SYN.—*Dioplites*, RAFIN. Ichth. Ohiens 1820, 35.

Grystes, CUV. & VAL. Hist. Nat. P. iss. III, 1829, 54.

The fishes of this genus are not uncommon in the localities where they occur. They resemble, in general appearance, the common or yellow perch, though often reaching a much larger size. They are esteemed as an article of food, and known under the general appellation of "trouts" or "bass." Exclusively of fresh water habits, they are met with in ponds and rivers, associated with various kinds of suckers, chubs, daces, minnows, &c., upon which they feed.

They are remarkable in the percoid family for their general smooth appearance, having neither spines nor serratures upon the opercular apparatus. The scales themselves are but slightly pectinated, and the few pectinations are quite deciduous or falling off with the epidermis. Their teeth are all uniform and velvet-like, and exist upon the palatine bones as well as upon the vomer, premaxillaries (upper jaw), and dentaries (lower jaw). The mouth is generally large, with its gape slightly oblique upwards, and the lower jaw protruding beyond the upper. The tongue is generally smooth anteriorly, but an elongated and narrow patch of velvet-like teeth is occasionally observed upon the middle line at the base of that organ.

A feature peculiarly characteristic of this genus, when associated with its other natural characters, consists in the separation of the spinous portion of the dorsal from the soft portion, by a wide gap, so that we have in reality two fins, contiguous upon their base only. This feature appears to constitute the chief difference between *Dioplites* and *Calliurus*, not taking into account the general aspect of the body, which has a subordinate value.

The species enumerated below appears to be very common in Texas, and even south of the Rio Grande del Norte (Rio Bravo), as proved by the specimen collected by Lieutenant D. N. Couch, United States army, in the Rio San Juan, near Cadereita, province of New Leon.

We have examined two immature specimens of another species—perhaps *D. salmoides*; one collected at New Braunfels, Texas, by Dr. Lindheimer, the other in the Rio Brazos, Texas, by Dr. G. C. Shumard, and which must await another opportunity for a more critical determination.

DIOPLITES NUECENSIS, Grd.

Trout, or River Bass.

SPEC. CHAR.—Body elongated, sub-fusiform. Head constituting a little less than the third of the entire length. Posterior extremity of maxillary extending to a vertical line drawn posteriorly to the orbit. Scales on the cheeks nearly equal in size to those on the gill covers. Origin of ventrals posterior to the base of pectorals. Upper regions reddish brown, maculated. A lateral dark band. Inferior regions whitish, unicolor.

SYN.—*Grystes nuecensis*, B. & G., in Proc. Acad. Nat. Sc. Philad. VII, 1854, 25.

Trout, or River Bass, VERNACULAR.

A full description and a figure of this species will be found in the Ichthyology of the United States and Mexican Boundary Survey.

It is closely related to, if not identical with, *Grystes nobilis*, Agass., from the southern bend

of the Tennessee river. It has, also, much greater affinities with *D. fasciatus* than with *D. salmoides*.

List of specimens.

| Catalogue numbers. | Number of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimen. | Collected by— |
|--------------------|-----------------|--------------|-----------------------------------|-----------------|-------------------------|------------------|---------------------|------------------------|
| 396 | 2 | Adt . . . | Río Blanco and Frio | 1853 . . . | Lt. A. W. Whipple . . | 23 & 24 | Alcoholic | Dr. Kennerly |
| 397 | 1 | .. do . . . | Río Frio, Texas | do | do | 21 | do | do |
| 398 | 1 | .. do . . . | Leon river, Texas | do | do | 11 | do | do |
| 399 | 12 | Yg | Río Seco, Texas | do | do | 19 | do | do |
| 400 | 3 | .. do . . . | Río Blanco, Texas | do | do | 20 | do | do |
| 401 | 1 | .. do . . . | Río Medina, Texas | do | do | 18 | do | do |
| 402 | 1 | .. do . . . | Coal Creek, Ark | do | do | VI. | do | H. B. Möllhausen. |
| 403 | 2 | Adt . . . | Río Brazos | do | Dr. G. C. Shumard . . | | do | Dr. G. C. Shumard. |
| 371 | 1 | .. do . . . | Indianola to Nueces | 1856 . . . | Capt. Pope | | do | Captain Pope |
| 372 | 12 | Yg | do | do | do | | do | do |
| 387 | 1 | .. do . . . | Delaware creek | do | do | | do | do |
| 388 | 1 | Adt . . . | Río Frio, Texas | 1851 . . . | Col. J. D. Graham . . | | do | John H. Clark |
| 389 | 1 | .. do . . . | Río Nueces, Texas | do | do | | do | do |
| 390 | 1 | .. do . . . | Live oak creek, Texas | do | do | | do | do |
| 391 | 1 | .. do . . . | Turkey creek, Texas | do | do | | do | do |
| 392 | 6 | Yg | Río Leona, Texas | do | do | | do | do |
| 393 | 4 | .. do . . . | Elm creek, Texas | do | do | | do | do |
| 394 | 2 | .. do . . . | Texas | do | do | | do | do |
| 395 | 5 | .. do . . . | San Juan river, N. Leon | 1853 . . . | Lt. D. N. Couch | | do | Lieut. Couch |
| 303 | 1 | Yg | Río Sabinal, Texas | Nov. 1854 | Major Emory | 60 | do | Dr. Kennerly |
| 304 | 4 | .. do . . . | Dry creek, Texas | do | do | 55 | do | do |
| 305 | 1 | .. do . . . | San Pedro creek, Texas | do | do | 110 | do | do |
| 306 | 1 | .. do . . . | Minnevilla river, Texas | do | do | 52 | do | do |

POMOXIS, Rafin.

GEN. CHAR.—Body very much compressed; dorsal and ventral outlines arched. Head moderate in size. Mouth very large; lower jaw longest. Velvet-like teeth on the jaws, the vomer, and palatines, and on the base of the tongue also. Cheeks and opercular apparatus scaly. Branchial apertures continuous under the throat. Dorsal and anal fins elevated; their spinous portion rising gradually from the anterior spine to the soft portion, without any depression. Anal spiny rays, six or more. Insertion of ventral fins situated a little behind the base of the pectorals. Caudal fin either even upon its posterior margin or sub-concave. Scales well developed and ciliated posteriorly.

SYN.—*Pomoxis*, RAFIN. Jour. Acad. Nat. Sc. Phila. 1, 1818, 417, and, Ichth. Ohions. 1820, 33.—AGASS. Amer. Jour. of Sc. and Arts, XVII, 1854, 298.

The genus *Pomoxis*, as here circumscribed, embraces already several species. The most anciently known is that described by Lacépède under the name of *Labrus sparoides*, specimens of which having been obtained in South Carolina; hence:

1. POMOXIS SPAROIDES, Gr d.

SYN.—*Labrus sparoides*, LACEP. Hist. Nat. des Poiss. III, 1819, pp. 432 & 479.

Centrarchus sparoides, CUV. & VAL. Hist. Nat. des Poiss. VII, 1831, 459.—STORER, Synops. 1846, 38.

Centrarchus hexacanthus, HOLBR. Ichth. of So. Car.; plate vi, fig. 1.

The second species of this genus was first observed in the river Wabash by Lesueur, and by him sent to Paris, under the name of *Cantharus nigromaculatus*. Therefore:

2. POMOXIS NIGROMACULATUS, Gr d.

SYN.—*Cantharus nigromaculatus*, Lesueur fide CUV. & VAL. Hist. Nat. Poiss. III, 1829, 88.

Centrarchus sparoides, CUV. & VAL. Hist. Nat. des Poiss. III, 1829, 88.; pl. xlvi.

Centrarchus hexacanthus, CUV. & VAL. Hist. Nat. Poiss. VII, 1831, 459.—KIRTL. Journ. Bost. Nat. Hist. III, 1840, 480.; pl. xxix, fig. 2.—DEKAY, Fauna of New Y. IV, 1842, 31.—AGASS. Amer. Jour. of Sc. XVII, 1854, 299.

Cichla storeria, KIRTL. Rep. Zool. Ohio, 191.

A third species is described, or rather recorded, by Rafinesque, under the name of

3. POMOXIS ANNULARIS, Rafin.

SYN.—*Pomoxis annularis*, RAFIN. Jour. Acad. Nat. Sc. Philad. I, 1818, 417; pl. xvii, fig. I; & Ichth. Ohiens. 1820, 33.

AGASS. Amer. Jour. Sc. XVI, 1854, 298.

We propose now to describe a fourth species, under the name of

4. POMOXIS NITIDUS, Gr d.

PLATE II, FIGS. 5—8.

SPEC. CHAR.—Posterior extremity of maxillary corresponding to a line intersecting the pupil. Insertion of ventrals situated opposite the inferior edge of the base of the pectorals. Anterior spiny ray of anal fin under the fourth dorsal one. Posterior margin of caudal fin sub-concave. Upper regions reddish, spotted and fasciated with brown; inferior regions silver and golden.

SYN.—*Pomoxis nitidus*, GRD. in Proc. Acad. Nat. Sc. Philad. Nov. 1857.

The largest specimens of this species which we have examined and caused to be figured measure nearly six inches and a half. The body is very much compressed, arched above and below, sub-elliptical in a profile view. Its greatest depth, which corresponds to the origin of the dorsal fin, is about the third of the entire length, since it enters three times in the latter from the tip of the snout to the emargination of the caudal fin. The greatest thickness is rather less than the third of the depth just alluded to.

The head is contained three times and a half in the total length of the fish. The mouth is deeply cleft, obliquely directed upwards, the lower jaw being the longest, and the posterior extremity of the maxillary reaches a vertical line drawn through the middle of the eye. The teeth are velvet-like, the maxillary ones being scarcely more conspicuous than those on the vomer, palatines, and tongue. The eyes are quite large and sub-circular, their horizontal diameter entering a little more than four times in the length of the side of the head. The margin of the opercular bones are neither spiny nor crenated. The cheeks and opercle are scaly, the scales on the cheeks being smaller than on the opercle. Thirteen branchiostegals (seven on the right side and six on the left), may be observed within the branchial membrane. The branchial apertures themselves are continuous under the throat.

The origin of the dorsal fin is nearly equidistant between the extremity of the snout and the base of the caudal fin. There are six spiny rays, increasing in height from the first to the last,

which is nearly equal to the first soft and articulated ray. Of the latter we observe fifteen, the posterior five diminishing gradually in height. The soft portion of that fin is a great deal more developed than the spinous portion. The same is the case with the anal, which has likewise six spiny rays, increasing in depth from the first to the sixth, which is shorter than the first articulated ray. The external margin of the fin is rounded. Its anterior spine is situated opposite the fourth dorsal one; but since the entire base of the anal fin is equal to that of the dorsal, the posterior margin of the anal extends further backwards than the dorsal. The caudal fin enters four times and a half in the total length; its posterior margin is sub-concave, and its lobes sub-angular. The origin of the ventral fins is opposite the inferior edge of the insertion of the pectorals, hence situated slightly backwards with reference to the latter. A stout and acerated spine may be observed upon their anterior or external margin, considerably shorter than the first soft ray. When these fins are brought into contact with the abdomen, their extremities project beyond the origin of the anal fin, and consequently overlap the vent. Even the tips of the ventrals extend beyond a vertical line drawn through the origin of the anal fin.—

Br. VI: VIII; D VI, 15; A VI, 17; C 8, 1, 8, 7, 1, 6; V I, 5; P 15.

The soft rays of the dorsal and anal fins bifurcate twice, whilst those of the caudal, ventrals, and pectorals exhibit subdivisions of the third degree. The lateral line is arched, following in that respect the curve of the back.

The scales are well developed and ciliated upon their external (posterior) margin. They differ considerably in shape, according to the regions to which they belong. In the lateral line (fig. 7) they are longer than deep, and upon the dorsal and abdominal regions deeper than long, (figs. 6 and 8). Diverging grooves are observed upon the anterior section of the scale only. Exiguous or attenuated scales may be observed upon the base of the caudal, extending to a certain distance along the rays, a feature not represented on the figure.

The upper regions of the head and body are reddish or brownish, the head uniformly so, the back presenting obsolete, transverse blackish bands of fasciæ, composed of agglomerated small spots. The same spots may be traced upon the dorsal and caudal fins. The inferior regions are yellowish brown, with either a silver or a golden hue. The anal fin is occasionally spotted; the ventrals and pectorals are unicolor. A black spot may be seen upon the upper and posterior part of the opercle.

References to the figures.—Plate II, fig. 5, represents a profile view of *Pomoxis nitidus*. Fig. 6 is a scale from the dorsal region; fig. 7 a scale of the lateral line, and fig. 8 a scale from the abdominal region.

The scales are somewhat magnified for the purpose of exhibiting their structure. They are taken upon the same vertical line, corresponding, generally speaking, to the greatest depth of the body.

List of specimens.

| Catalogue number. | Corresponding No. of. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimen's. | Collected by— |
|-------------------|-----------------------|-------------------|--------------|-------------------------|-----------------|----------------------|------------------|-----------------------|----------------|
| 161 | ad. | 3 | ----- | Houston river, Ky.----- | 1854 | E. L. Berthoud. | ----- | Alcoholic. | E. L. Berthoud |

AMBLOPLITES, Rafin.

GEN. CHAR.—Body compressed; dorsal and ventral outlines sub-depressed. Head large. Mouth large also; lower jaw longest. Velvet-like teeth on the jaws, the vomer, palatines, and tongue. Checks and opercular apparatus scaly. Branchial apertures continuous under the throat. Spinous portion of dorsal fin lower than the soft, and extends upon a longer base. Anal fin provided with five or more spiny rays. Insertion of ventral fins a little behind the base of the pectorals. Caudal fin posteriorly sub-concave. Scales well developed, and generally ciliated posteriorly.

SYN.—*Ambloplites*, RAFIN. Ichth. Ohiens. 1820, 33.—AGASS. Amer. Journ. of Sc. XVII, 1854, 299.

This genus is very closely allied to the preceding one, from which it is to be distinguished by the conformation of its dorsal fin. The latter is composed of a greater number of spiny rays, occupying a base of a greater extent than the soft and articulated rays. The spines themselves are lower than the soft rays, so that a kind of depression may be said to exist between the two portions of that fin.

Two species are referred to this genus, *A. ichtheloides* and *A. aeneus*. Of the latter we give the following figure and description.

1. AMBLOPLITES ÆNEUS, Agass.

Rock Bass, &c.

PLATE I.

SPEC. CHAR.—Posterior extremity of maxillary extending to a vertical line intersecting the pupil. Insertion of ventrals opposite the base of the pectorals. Anterior spiny ray of anal fin under the ninth dorsal one. Posterior margin of caudal fin slightly emarginated. Upper regions of head and body of a coppery brown; inferior regions, yellowish brown.

SYN.—*Cichla aenea*, LESU. Journ. Acad. Nat. Sc. I, 1822, 214, fig.—KIRTL. Rep. Zool. Ohio, 168, 191.

Centrarchus aeneus, CUV. & VAL. Hist. Nat. Poiss. III, 1829, 84.—RICH. FAUN. BOR. AMER. III, 1836, 18. Pl. lxxv.—DEKAY, New Y. Fauna, 1842, 27, Pl. ii, fig. 4.—KIRTL. Bost. Jour. Nat. Hist. IV, 1842, 229. Pl. xi, fig. 1.
STORER, Synops. 1846, 37.

Rock Bass, Goggle-eyed Bass, Black Sun Fish, VERNACULAR.

The general aspect of this species is sub-elliptical when seen in profile; the dorsal and abdominal outlines being sub-depressed. The greatest depth of the body is more than the third of the total length. The greatest thickness holds the same relations towards the depth as the latter holds towards the length.

The head is very large, though constituting something less than the third of the total length. Its occipito-frontal declivity is gradual towards the snout, which assumes a wedge-shaped appearance upon the plate. The lower jaw is longest and protrudes slightly beyond the upper. The cleft of the mouth is large and obliquely directed upwards. The posterior extremity of the maxillary extends to a vertical line intersecting the pupil.

The tongue is very large and fleshy, bearing a sub-elliptical patch of velvet-like teeth almost as conspicuous as those situated upon the palatine bones, the front of the vomer, and upon the jaws. The eye is large and circular; its diameter entering nearly four times and a half in the length of the side of the head. The anterior nostril is equidistant between the anterior rim of the orbit and the margin of the upper jaw; the posterior nostril is equal in development with the former and lies between it and the orbit. The external margin of the opercular bones is without spines or serratures of any kind; the opercle, sub-opercle, and inter-opercle are covered with scales considerably larger than those which may be observed on the checks. The branchial apertures are continuous under the throat; there are six branchial rays.

The dorsal fin extends to the entire dorsal region properly so called. The spinous portion is composed of ten rays, increasing slightly in height from the first to the last, which is shorter than the following soft articulated rays. The latter, thirteen in number, occupy the third of the base of the entire fin. The anal terminates almost evenly with the dorsal; its soft portion, composed of twelve rays, resembles the dorsal in its general appearance. It is preceded by five spines, shorter than the soft rays, and diminishing in depth forwards. The anterior spiny ray of this fin is situated opposite the seventh dorsal spine. The caudal fin constitutes about the fifth of the total length; it is posteriorly emarginated, with the extremity of its lobes rounded. The origin of the ventral fins is situated a little in advance of the origin of the dorsal and opposite the inferior edge of the base of the pectorals. Their extremities will extend to the vent when bent backwards alongside the abdomen, but not as far as the origin of the anal fin. The vent itself is situated somewhat anteriorly to the origin of the anal fin. The pectorals are broad and of medium size; their extremities not extending quite as far posteriorly as those of the ventrals.

Br. VI; VI. D X, 13; A V, 12; C 4, 1, 8, 7, 1, 3; V I, 5; P 16.

The lateral line is arched and almost parallel to the outline of the back. The scales are deeper than long on the dorsal and abdominal regions (figs. 2 and 4), and longer than deep in the lateral line (fig. 3). Their posterior margin is entire; radiating furrows exist upon the anterior section only. We observe twenty-two longitudinal series of scales upon the line of greatest depth: sixteen between the lateral line and the mesial line of the belly, and five above the lateral line, and a few irregular series along the base of the dorsal fin. The scales are considerably reduced in size on the nuchal and pectoral regions. Elongated and attenuated scales may likewise be observed along the articulated rays of both the dorsal and anal fins up to their first bifurcation. Upon the caudal fins they assume a still greater development.

The upper regions are of a coppery brown, darkest upon the dorsal region, becoming lighter towards the sides, whilst the inferior regions are yellowish brown. A blackish spot at the base of each scale gives the appearance of longitudinal darker streaks. These spots, however, are sometimes very obsolete. A jet black patch may be seen towards the upper and posterior angle of the opercle. The fins are unicolor, partaking of the general hue of the region to which they belong.

References to the figures.—Plate I, fig. 1 represents *Ambloplites æneus* somewhat reduced in size. Fig. 2 is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

The scales are magnified.

List of specimens.

| Catalogue number. | Corresponding No. of | No. of specimens. | Sex and age. | Locality. | When collected. | Whence and how obtained. | Original number. | Nature of specimens. | *By whom collected. |
|-------------------|----------------------|-------------------|--------------|---------------------------|-----------------|--------------------------|------------------|----------------------|---------------------|
| 162 | ----- | 1 | Adt. | Fort Snelling, Minn.----- | 1852 | Gov. Stevens.----- | ----- | Alcoholic. | Dr. Geo. Suckley. |

2. AMBLOPLITES INTERRUPTUS, Grd.

The Perch of the San Franciscans.

PLATE II, FIGS. 1—4.

SPEC. CHAR.—Posterior extremity of maxillary reaching a vertical line drawn back of the pupil. Posterior margin of caudal fin sub-emarginated. Origin of anal fin opposite the eleventh ray of the dorsal. Interrupted dark bands on the sides. Two streaks diverging from the eye—one running towards the opercular spot, the other obliquely downwards.

SYN.—*Centrarchus interruptus*, GRO. Proc. Acad. Nat. Sc. Philad. VII, 1854, 129, and VIII, 1856, 132.

Centrarchus maculosus, AYRES, Proc. Cal. Acad. Nat. Sc. I, 1854, 8; & in Proc. Bost. Soc. Nat. Hist. V, 1855, 99.

Perch in San Francisco.

The general form is rather elongated, and very much compressed. The nuchal region is convex, whilst the oculo-cephalic is depressed or sub-concave. The head forms a little less than the third of the total length. The snout is tapering, and the lower jaw the longest. The mouth is rather large; its cleft oblique upwards. The posterior extremity of the maxillary, which is considerably dilated, reaches a vertical line drawn back of the pupil. The eye is large and circular, comprised about four times, or a little more, in the length of the side of the head. The opercular apparatus has neither spines nor serratures. The gill openings are continuous under the head, and there are six branchial rays. The origin of the dorsal nearly corresponds with a line passing along the margin of the opercular flap; it is composed of thirteen spiny rays and eight to eleven soft and articulated ones. The base of the spinous portion is twice the length of the soft; the latter is higher than any of the spines. The first, or anterior spine, is exceedingly small, the second is twice as high; the others increase till the sixth, seventh, and eighth, when they again diminish to the twelfth; the thirteenth is a little higher than the few preceding ones. The lobes of the caudal are rounded; the middle of the posterior margin is slightly concave. The fin itself constitutes nearly the sixth of the entire length. The origin of the anal is placed opposite the eleventh dorsal spine; it is composed of six or seven spines, and nine or ten articulated rays; the space occupied by the spines is equal in length to that over which the soft rays are inserted. The vent is situated somewhat in advance of the anal fin. The origin of the ventrals corresponds to the vertical line passing in front of the base of the pectorals; their spine is long and acute, and the tips of the soft rays overlap the vent. The tips of the pectorals extend a little further backwards than that of the ventrals; the origin of both the ventrals and pectorals, is a little in advance of the origin of the dorsal.

Br. VI—VI. D XIII, 8—11; A VI or VII, 9 or 10; C 5, 1, 8, 7, 1, 4; V I, 5; P 13.

The scales are of moderate development, higher than long, provided upon their posterior margin with several series of minute spines. The lateral line is concurrent with the dorsal outline. The scales on the cheeks are a little smaller than on the opercular apparatus, either of which being almost entirely smooth upon their posterior margin. The upper surface of the head and jaw are smooth and naked.

Ground color greyish brown above, silvery grey beneath. Irregular transverse bands of dark brown or black, interrupted along the lateral line, the portion of the band above it being somewhat alternating with the portion beneath it. A large black spot may be observed at the upper and posterior angle of the opercle. Two vittæ or streaks diverge from the eye backwards.

References to the figures.—Plate II, fig. 1, represents *Ambloplites interruptus* in profile and size of life. Fig. 2 is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catalogue numbers. | Corresponding Nos. of | No. of specimens. | Sex and age. | Locality. | When collected. | Whence and how obtained. | Original number. | Nature of specimen. | By whom collected. |
|--------------------|-----------------------|-------------------|--------------|------------------------------|-----------------|--------------------------|------------------|---------------------|--------------------|
| 278 | ----- | 6 | Adult. | San Joaquin river, Cal. | 1853 | Lieut. Williamson | ----- | Alcoholic. | Dr. Heermann. |
| 279 | ----- | 2 | ..do.. | Sacramento river, Cal. | 1855 |do..... | ----- | ..do.. | Dr. Newberry. |
| 280 | ----- | 2 | ..do.. | San Francisco, California.. | 1853 | Lieut. Whipple..... | ----- | ..do.. | Dr. Kennerly.. |

CALLIURUS, Rafin.

GEN. CHAR.—Body generally elongated and sub-elliptical; compressed. Head of moderate development. Mouth large; jaws sub-equal, lower one longest. Velvet-like teeth on the jaws, front of vomer, and palatines. Tongue generally smooth. Cheeks and opercular apparatus scaly. Edge of preopercle occasionally serrated. Branchial apertures continuous under the throat. Spinous portion of dorsal fin longer and lower than the soft portion, with a depression between them. Anal fin with three spiny rays only. Insertion of ventral fins placed behind the base of the pectorals. Caudal fin posteriorly sub-emarginated. Scales large, or of moderate development.

SYN.—*Calliurus*, RAFIN. Ichth. Ohiens. 1820, 26.—AGASS. Amer. Journ. of Sc. XVIII, 1854, 300.

In general appearance the species of this genus resemble those of *Ambloplites* very closely; they are elongated without being slender, and but very seldom short and deep like *Bryttus* and *Pomotis*. The only prominent difference between *Calliurus* and *Ambloplites* consists in the presence of three anal spines in *Calliurus*, instead of five, as is the case in *Ambloplites*. From *Dioplites* it differs by the two dorsal fins not being separated as is the case in the latter.

The cheeks, as well as the opercular apparatus, are covered with scales, and a black patch marks the posterior portion of the opercle, as in *Dioplites*, *Pomoxis*, *Ambloplites*, *Bryttus*, and *Pomotis*.

1. CALLIURUS MELANOPS, Grd.

PLATE III.

SPEC. CHAR.—Mouth very large; cleft directed obliquely upwards. Posterior extremity of maxillary extending to a vertical line drawn posteriorly to the orbit. Eye large. Insertion of ventrals situated opposite the base of the pectorals, a little in advance of the origin of the dorsal; their tips not extending to the vent. Scales very large. Ground color reddish brown, with a blackish spot upon the centre of each scale. A black patch at the upper and posterior margin of the opercle. Soft portion of dorsal and anal spotted at their base.

SYN.—*Calliurus melanops*, GRD. in Proc. Acad. Nat. Sc. Philad. November 1857.

This species establishes a transition between *Ambloplites* and *Calliurus*, and naturalists may place it in either of these genera. It has the general physiognomy of *Ambloplites*: its large scales, and its teeth upon the tongue; whilst it approximates *Calliurus* by the presence of three spiny rays to the anal fin.

Its form is graceful, elongated, with the dorsal and abdominal outlines regularly curved. The body is quite compressed posteriorly; the nape is swollen and rounded. The greatest depth is equal to the length of the head, and contained about three times in the total length.

The head, therefore, constitutes about the third of the total length. The mouth is very large;

its cleft directed obliquely upwards; the lower jaw longest, as in *Ambloplites*. The posterior extremity of the maxillary is broadly expanded, extending to a vertical line drawn immediately behind the orbit. The outer maxillary teeth form quite a conspicuous row in either jaw. The tongue is broad and fleshy; the teeth along its middle surface constitute an irregular band. The posterior nostril is much larger than the anterior one, and is situated close to the orbit, whilst the latter is nearly midway between the anterior rim of the orbit and the margin of the upper jaw. The eye is large and circular; its diameter enters a little short of five times in the length of the side of the head. The external edge of the opercular bones is entire and smooth; their surface is covered by large scales. The whole surface of the cheeks is similarly scaly, the scales being but a little smaller than on the opercular apparatus. The branchial apertures are continuous under the throat; the branchiostegals number six on the right side and five on the left.

The dorsal fin is composed of ten spiny rays and ten soft and articulated ones, although the spinous portion occupies the two-thirds of the base of the fin. The spines increase slightly in height towards the fourth, fifth, and sixth; hence, posteriorly, they are nearly equal. The soft rays are a good deal higher than the spines; and so are the soft rays of the anal, nine in number, preceded by three stoutish spines only. The caudal fin constitutes the sixth of the entire length; it is sub-emarginated posteriorly, and composed of seventeen rays and a few rudiments. The insertion of the ventrals takes place opposite the base of the pectorals, and somewhat in advance the origin of the dorsal fin. When brought backwards, their extremities do not extend as far as the vent, which is placed near the anterior margin of the anal. Five soft and articulated rays, with one spine, are the usual number in these fins. The pectorals are longer than the ventrals, for, their posterior extremities reach almost to a vertical line intersecting the vent.

Br. VI: V. D X, 10; A III, 9; C 4, 1, 8, 7, 1, 3; V I, 5; P 15.

The scales, inconspicuously pectinated, are quite large, deeper than long, subciliated posteriorly, and provided with diverging furrows upon their anterior section only. Twenty-two series may be observed upon the line of greatest depth, fifteen below the lateral line, and six above. The lateral line itself is arched and concurrent with the dorsal line, and nearer to it posteriorly than anteriorly. The scales upon the nape or fronto-occipital region, are but a little smaller than on the dorsal region properly so called. Under the thorax they are likewise well developed, though smaller than elsewhere. The soft portions of both the dorsal and anal fins are provided with irregularly attenuated scales upon their base, in the same manner as the caudal.

The ground color is reddish brown, darker above than beneath. The head is irregularly spotted with darker brown. The centre of each scale being provided with a blackish spot, the general appearance of the fish is quite dark. The fins themselves are dark and obsoletely spotted. A large black patch is to be seen at the upper and posterior angle of the operculum.

References to figures.—Plate III represents *Calliurus melanops* size of life, adult and young. Fig. 1, the adult from Leon river. Fig. 5, the young, from Rio Medina. Figs. 3 and 6, scales from the dorsal region. Figs. 2 and 7, scales from the lateral line. Figs. 4 and 8, scales from the abdominal region.

List of specimens.

| Catalogue numbers | No. of specimens. | Sex and age. | Localities. | When collected. | Whence and how obtained. | Original numbers. | Nature of specimens. | Collected by— |
|-------------------|-------------------|--------------|---------------------------|-----------------|--------------------------|-------------------|----------------------|---------------|
| 281 | 1 | Adult.. | Leon river, Texas | 1853 | Lieut. Whipple..... | 11 | Alcoholic..... | Dr. Kennedy. |
| 373 | 2 | Young.. | Rio Medina, Texas..... | 1853 |do..... | 18 |do..... |do..... |
| 410 | 1 |do... | Dry creek, Texas | 1854 | Major Emory..... | 57 |do..... |do..... |
| 411 | 1 |do... | San Pedro creek, Texas .. | 1854 |do..... | 58 |do..... |do..... |

2. CALLIURUS DIAPHANUS, Gr d.

PLATE IV, FIGS. 1—4.

SPEC. CHAR.—Mouth large; gape oblique upwards. Posterior extremity of maxillary extending to a vertical line drawn in advance of the pupil. Eye large. Insertion of ventrals situated posteriorly to the base of pectorals, and the origin of the dorsal; their tips overlapping the vent. Scales large. Greyish olive above; yellowish or whitish beneath. *Soft portion of dorsal and anal fins provided with a black spot.

SYN.—*Calliurus diaphanus*, GRD. in Proc. Acad. Nat. Sc. Philad. November 1857.

The general form of this species is more slender than *C. melanops*, although the two species resemble each other in the size of the mouth, eyes, and scales. The greatest depth is equal to the length of the head. The head enters about three times and a half in the total length. The mouth is not so deeply cleft as in the preceding species, but the lower jaw is quite as prominent and protruding beyond the upper. The posterior extremity of the maxillary extending only to a vertical line drawn immediately in advance of the pupil. The palatine teeth constitute a very narrow band. The tongue is rather thin and perfectly smooth or toothless. The diameter of the eye enters about four times and a half in the total length. We observe three nasal apertures on each side, disposed upon a triangle on the left side and upon a curve on the right. The external edge of the opercular bones is smooth. The branchios-tegals are six on each side.

The soft portion of the dorsal fin is more developed than in *C. melanops*. Slender and exiguous scales may be observed upon its base, as also upon the base of the caudal and soft portion of the anal fin. The insertion of the ventrals is situated posteriorly to the base of the pectorals, and a little posterior also to the origin of the dorsal fin. The outermost soft ray terminates into a filiform appendage which protrudes beyond the vent; the vent itself being placed at a short distance from the origin of the anal fin. The pectorals are of moderate development, and do not extend as far back as the ventrals. The formula of the rays is as follows:

Br. VI: VI; D X, 11; A III, 10; C 4, 1, 8, 7, 1, 3; V I, 5; P 13.

The scales are large and very inconspicuously pectinated, the serratures being quite deciduous, thus explaining their absence on the figures of Plate IV. The diverging furrows are quite numerous, and extend upon the anterior section of the scale only. The scales themselves are deeper than long, sub-truncated anteriorly, and rounded upon the remaining three edges.

The ground color is greyish olive above; yellowish or whitish beneath. The soft portion of

the dorsal and anal fins exhibit a black spot or patch at the base of their posterior margin. Black dots are scattered all over the body, but may not occur in all the specimens. The pectoral fins are of a light olive; the ventrals, olivaceous upon their base, are greyish towards their extremities. The other fins are greyish olive.

References to the figures.—Plate IV, fig. 1, represents *Calliurus diaphanus*, size of life. Fig. 2, a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catalogue number. Number of specimens. | Locality. | When collected. | Whence and how obtained. | Original number. | Nature of specimen. | Collected by— |
|---|----------------------|-----------------|--------------------------|------------------|---------------------|-------------------|
| 374 | Rio Blanco, Tex..... | 1852 | Lt. Whipple..... | 23 | Alcoholic..... | Dr. Kennerly..... |

3. CALLIURUS FORMOSUS, Grd.

PLATE V, FIGS. 1—4.

SPEC. CHAR—Mouth large, gape oblique upwards. Posterior extremity of maxillary extending to a vertical line passing beyond the middle of the pupil. Eye moderate. Insertion of ventrals situated under the base of pectorals and a little posteriorly to the anterior margin of the dorsal, their tips reaching the vent. Scales moderate. Reddish brown above, spotted with black; greyish beneath. Soft portion of dorsal and anal fins provided with a black patch.

SYN.—*Calliurus formosus*, GRD. in Proc. Acad. Nat. Sc. Philad. November 1857.

This species, we venture to say, will prove very closely allied to, if not identical with, *C. punctulatus* of Rafinesque. But not being able to establish the fact with any degree of certainty, we send it forth under the above appellation.

The general form of the body is intermediate between that of *C. melanops* and *C. diaphanus*. Proportionally as deep anteriorly as *C. melanops*, it tapers much more rapidly backwards. The cleft of the mouth and the extension of the maxillary bone resemble *C. diaphanus* most. The eye is smaller than in either of the preceding species.

The greatest depth of the body, measured upon the thoracic region, is a little more than the third of the entire length, and a little greater also than the length of the head. The nape is quite convex, and the upper surface of the head very declivous. The head itself constitutes a little less than the third of the length. The upper jaw, though longer than the upper, is less protruding than in *C. melanops* and *C. diaphanus*. The gape of the mouth is less oblique upwards, and the posterior extremity of the maxillary extends to a vertical line which would pass posteriorly to the middle of the pupil. The tongue is broad, fleshy, and toothless. The eye is of moderate size, sub-circular in shape; its diameter entering five times in the length of the side of the head.

The spinous portion of the dorsal fin is lower, or else less arched in its upper outline, than in the two preceding species, whilst the soft portion of the same fin is even more developed than in *C. diaphanus*; the posterior extremities of the longest rays being even with those of the anal, and reaching a vertical line which would intersect the insertion of the caudal. The caudal itself is but slightly emarginated posteriorly, and enters about five times and a half in

the total length. The insertion of the ventrals takes place opposite the inferior margin of the base of the pectorals, and a little posteriorly to the origin of the dorsal; their tips overlap the vent, which is situated near the origin of the anal fin. The pectorals are subovate, of moderate development, and extending as far back as the ventrals.

Br. VI: VI; D X, 11; A III, 9; C 3, 1, 8, 7, 1, 4; V I, 5; P 13.

The external spiny ray of the ventral fins is rather slender and acute, closely approximating the first soft ray, and apparently confounded with it, upon a superficial examination.

The scales are moderate in their development, a little deeper than long, with radiating furrows upon their anterior section, and so very decidedly pectinated that the serratures fall off in the handling of the specimens. They are considerably smaller upon the nape and dorsal region generally than towards the flanks, and a good deal smaller also upon the cheeks than upon the opercular apparatus. Under the throat their size is likewise reduced. The caudal and the soft rays of both the dorsal and anal fins are provided upon their base with exiguous and irregularly shaped scales.

The upper region of the head and body is reddish brown; the dorsal region, the middle of the flanks, and the side of the head being spotted with black. Beneath, the color is uniformly greyish. The dorsal and anal fins exhibit a large black patch at the base of their posterior margin. The fins otherwise are greyish olive, the external margin of the dorsal, caudal, and anal being yellowish white, whilst the ventrals and pectorals are unicolor—the former yellowish, the latter greyish. The black patch at the posterior portion of the opercle is surrounded by a yellowish or whitish ring.

References to the figures.—Plate V, fig. 1, represents *Calliurus formosus*, size of life. Fig. 2 is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catalogue number. | Corresponding No. of | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|----------------------|-------------------|--------------|---|-----------------|----------------------|------------------|----------------------|-------------------|
| 375 | ----- | 1 | Adult. | Tributary of Gypsum creek, Canadian. | 1853 | Lieut. Whipple. | XV. | Alcoholic. | H. B. Möllhausen. |
| 376 | ----- | 1 | ----- | Headwaters of Brazos river. | 1853 | Capt. Pope ----- | ----- | do----- | Captain Pope. |
| 377 | ----- | 7 | ----- | do-----do----- | 1853 | do----- | ----- | do----- | do----- |
| 378 | ----- | 2 | ----- | do-----do----- | 1853 | do----- | ----- | do----- | do----- |
| 379 | ----- | 1 | ----- | Headwaters of Colorado, Texas. | 1853 | do----- | ----- | do----- | do----- |
| 380 | ----- | 1 | ----- | do-----do----- | 1853 | do----- | ----- | do----- | do----- |
| 381 | ----- | 1 | ----- | Fort Washita, Red river | 1853 | do----- | ----- | do----- | do----- |
| 382 | ----- | 1 | ----- | Fort Smith, Arkansas | 1853 | Lieut. Whipple | ----- | do----- | Dr. Shumard. |
| 420 | ----- | 6 | ----- | do-----do----- | 1853 | do----- | ----- | do----- | H. B. Möllhausen. |
| 419 | ----- | 6 | ----- | Río Brazos----- | 1853 | Dr. Shumard----- | ----- | do----- | Dr. Shumard. |

4. CALLIURUS LONGULUS, G r d.

PLATE V, FIGS. 5—8, and PLATE VI, FIGS. 5—8.

SPEC. CHAR.—Mouth moderate, gape oblique upwards. Posterior extremity of maxillary extending to a vertical line intersecting the pupil. Eyes moderate. Insertion of ventrals situated opposite the inferior edge of the base of the pectorals and posteriorly to the origin of the dorsal, their tips extending to the vent. Scales moderate. Reddish brown above; greyish beneath. Soft portion of dorsal and anal fins provided with a black patch.

SYN.—*Pomotis longulus*, B. & G. Proc. Acad. Nat. Sci. Philad. VI, 1853, 391; and, in MARCY'S Expl. Red River, La., 1853, 245, pl. xii.

Bryttus longulus, B. & G., Proc. Acad. Nat. Sci. Philad. VII, 1854, 25.

Successively placed by us in the genera *Pomotis* and *Bryttus*, this species is now referred to *Calliurus*, the genus to which it properly belongs.

It is not without a certain general resemblance with *C. formosus*, and the inquiries respecting *C. punctulatus* are applicable to it as well as to *C. formosus*. One point in regard to *C. punctulatus* strikes us as desirable to be known in order to settle this question: the black patch upon the posterior portion of the dorsal and anal fins, and about which Rafinesque is silent. Is the inference to be drawn that, since Rafinesque omits to inform us on that point, the black patches alluded to do not exist?

The traits by which this species is to be distinguished from *C. formosus* consist chiefly in the structure of the mouth, which is not so deeply cleft as in the latter; hence the posterior extremity of the maxillary does not extend so far back with reference to the orbit.

The general aspect of the fish, when seen in profile, is sub-elliptical, and occasionally quite regularly so. The greatest depth is equal to the third of the total length, in which the head enters about three times and a half. The jaws are sub-equal, the lower one projecting but slightly beyond the upper. The posterior extremity of the maxillary reaching a vertical line drawn through the middle of the pupil. The tongue is smooth. The eye is rather moderate in size and sub-circular in shape; its horizontal diameter entering about four times and a half in the length of the side of the head.

Br. VI: VI; D X, 12; A III, 9; C 4, 1, 8, 7, 1, 3; V I 5; P 14.

The scales are deeper than long, seemingly identical with those of *C. formosus*, except that the pectinations are more strongly marked.

The color is reddish brown above and greyish beneath. Sometimes the flanks appear as if streaked with light bands corresponding to the rows of scales, and owing to the periphery of the scale being darker than its middle. The sides of the head are variegated with sinuous light lines. The dorsal and anal are provided with a black patch upon the posterior portion of their base.

References to the figures.—Plate V, fig. 5, represents *Calliurus longulus*, size of life, from the Rio Cibolo. Fig. 6 is a scale from the dorsal region. Fig. 7 is a scale from the lateral line. Fig. 8, a scale from the abdominal region.

Plate VI, fig. 5, represents the same species, size of life, from the Rio Seco. Figs. 6, 7, and 8, are enlarged scales from the dorsal region, the lateral line, and the abdominal region.

The species is more correctly illustrated on plate V than on plate VI.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|-------------------|----------------------------|-----------------|----------------------------------|------------------|----------------------|--------------------|
| 404 | 1 | Otter creek, Arkansas ---- | 1851 | Capt. Marcy and McClelland. .... | ..... | Alcoholic. | Captain Marcy ---- |
| 405 | 2 | Rio Cibolo, Texas ----- | 1851 | Colonel Graham ----- | ..... | do. | John H. Clark ---- |
| 406 | 4 | Mineville, Texas ----- | 1853 | Major Emory ----- | ..... | do. | Dr. Kennerly ---- |
| 407 | 5 | Rio Seco, Texas ----- | 1853 | Lieutenant Whipple ----- | 19 | do. | do. |
| 408 | 2 | Platte river ----- | 1856 | Captain Pope ----- | ..... | do. | Captain Pope ----- |
| 409 | 4 | Rio Pecos ----- | 1856 | do. ----- | ..... | do. | do. |

5. CALLIURUS MICROPS, G r d.

PLATE IV, FIGS. 5—8.

SPEC. CHAR.—Mouth moderate; gape oblique upwards. Posterior extremity of maxillary extending to a vertical line drawn midway between the anterior rim of the orbit and the pupil. Eye small. Insertion of ventrals situated posteriorly to the base of pectorals and the origin of the dorsal; their tips not reaching the vent. Scales moderate. Reddish brown above, with centre of scales lighter; greyish beneath. Soft portion of dorsal provided with a black patch.

SYN.—*Calliurus microps*, GRD. in Proc. Acad. Nat. Sc. Philad. November, 1857.

This species is very characteristic, owing to the comparatively small size of its eyes and the reduced cleft of its mouth, to which might be added the disproportional size between the scales on the cheeks and those on the opercular apparatus. The posterior extremities of both the dorsal and anal fins do not extend as far back as the insertion of the caudal.

The head constitutes a little less than the third of the total length, which is exactly three times the greatest depth. The outline of the body is rather regularly elliptical. The edge of the preopercle is minutely serrated.

The scales are higher than long; the pectinations of their posterior margin being altogether obliterated.

Br. VI: VI; D X, 11; A III, 9; C 3, 1, 8, 7, 1, 2; V I, 5; P 13.

The extremities of the pectorals are nearly even with the tips of the ventrals, which do not reach the vent, situated a little way in advance of the anterior margin of the anal fin.

The dorsal region is dark reddish brown, as well as the upper surface of the head. The sides of the head and flanks are of a lighter hue; and since the middle of the scales on the latter region are marked with a very light spot, the sides of the body appear as if provided with longitudinal white stripes. The inferior region is greyish or whitish. The fins are unicolor, of a greyish olive; the posterior portion of the dorsal fin alone exhibiting a dark or jet black spot.

References to the figures.—Plate IV, fig. 5, represents *Calliurus microps*, size of life. Fig. 6, is a scale from the dorsal region. Fig. 7, a scale from the lateral line; and, Fig. 8, a scale from the abdominal region.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|------------------------|-----------------|------------------------|----------------------|------------------|
| 412 | 2 | Fort Washita | 1853 | Captain Pope..... | Alcoholic. | Captain Pope.... |
| 413 | 6 | Rio Brazos, Texas..... | 1854 | Dr. G. C. Shumard..... | do..... | Dr. Shumard.... |
| 414 | 6 | do.....do..... | 1854 | do..... | do..... | do..... |

6. CALLIURUS MURINUS, Grd.

PLATE VII, FIGS. 1—4.

SPEC. CHAR.—Mouth moderate; gape oblique upwards. Posterior extremity of maxillary extending to a vertical line drawn inwardly to the anterior rim of the orbit. Eye moderate. Insertion of ventrals situated posteriorly to the base of pectorals and opposite the origin of the dorsal; their tips reaching the vent. Scales large. Dark blackish brown. Soft portion of dorsal fin provided with a black patch.

SYN.—*Calliurus murinus*, GRD. in Proc. Acad. Nat. Sc. Philad. November, 1857.

This species is closely allied to *C. microps*, from which it differs chiefly by its larger eye, a more elevated spinous dorsal, the insertion of the ventrals opposite the origin of the dorsal fin, instead of being placed posteriorly to it, the tips of the ventrals reaching the vent, and larger scales also. Besides, the latter are possessed with rather conspicuous pectinations. The edge of the preopercle is finely serrated, and the scales on the cheeks are but a little smaller than those on the opercular apparatus.

Br. VI : VI; D X, 12; A III, 10; C 4, 1, 8, 7, 1, 3; V I, 5; P 14.

The color is blackish brown above, lighter beneath; sometimes obsoletely banded transversally; the sides of the head exhibiting sometimes sinuating bluish lines. The fins are of a dark greyish hue, unicolor except the dorsal, which is provided with a black blotch upon the posterior portion of its base.

References to the figures.—Plate VII, fig. 1, represents *Calliurus murinus*, size of life. Fig. 2, is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|---------------------------------|-----------------|-------------------|----------------------|------------------|
| 415 | 1 | Indianola to Nucces, Texas..... | 1856 | Captain Pope..... | Alcoholic. | Captain Pope.... |
| 416 | 2 | Delaware creek..... | 1856 | do..... | do..... | do..... |
| 417 | 3 | do.....do..... | 1856 | do..... | do..... | do..... |
| 418 | 1 | Headwaters of Rio Brazos..... | 1854 | do..... | do..... | do..... |

BRYTTUS, Cuv. & Val.

GEN. CHAR.—Body sub-elliptical, compressed. Head moderate; mouth small; jaws equal. Velvet-like teeth on the jaws, front of vomer, and palatine bones. Tongue smooth. Cheeks and opercular apparatus scaly. Edge of preopercle smooth and entire. Branchial apertures continuous under the throat. Spinous portion of dorsal fin longer than the soft, and nearly as high, with scarcely any depression between the two. Three anal spines. Insertion of ventral fins, situated posteriorly to the base of the pectorals. Caudal fin posteriorly emarginated. Scales well developed.

SYN.—*Bryttus*, CUV. & VAL. Hist. nat. des Poiss. VII, 1831, 461.—STORER, Synops. 1846, 43.

“It is impossible,” says Cuvier, “to find a greater resemblance than that observed between these fishes (*Bryttus*) and the *Pomotis*. The small narrow band of velvet-like teeth which exists along the external edge of each palatine bone is the only character by which they may be distinguished.”

Now the same thing is almost true with reference to *Calliurus*, and at first we were at a loss to draw a limit between the latter and *Bryttus*. Upon comparing, however, the various species which have come under our notice, we have traced a few characters which may be regarded as generical features in *Bryttus*. Thus, the general shape of the body resembles *Pomotis* most, being rather sub-elliptical and deep, than elongated. The mouth is smaller than in *Calliurus*, and the jaws equal, as in *Pomotis*, likewise. The spinous portion of the dorsal fin is more elevated than in *Calliurus*, and again resembling that of *Pomotis*. So we may truly say that the species of *Bryttus* are *Pomotis* provided with a narrow band of palatine teeth.

The geographic range of this genus is more restricted yet than that of *Pomotis*, its species, so far, having only been found in the south and southwestern portions of the area inhabited by the *Pomotis*.

1. BRYTTUS ALBULUS, Grd.

PLATE VI, FIGS. 1—4.

SPEC. CHAR.—Body sub-elliptical, rather contracted and deep. Nape convex, and snout sub-conical. Posterior extremity of maxillary extending to the anterior rim of the orbit. Insertion of ventrals situated posteriorly to the base of the pectorals and the anterior margin of the dorsal; their tips overlapping the vent. Scales rather large. Pale reddish brown, lighter beneath than above. Fins greyish olive; dorsal with a black patch.

SYN.—*Bryttus albulus*, GRD. in Proc. Acad. Nat. Sc. Philad. November, 1857.

The body is very much compressed; the head entering three times and a half in the total length, whilst the greatest depth enters in the same length twice and a half time. The eye is well developed, sub-circular, its diameter being contained about four times in the length of the side of the head. The posterior extremity of the maxillary reaches a vertical line intersecting the anterior rim of the orbit. The tips of the posterior rays of the anal project a little beyond those of the dorsal; the posterior extremity of the caudal being but slightly emarginated. The second and third anal spines are stout and deep; the first is short and slender. The tips of the ventrals do not extend to the anterior margin of the anal, though overlapping the vent, which is situated somewhat in advance of the latter. The posterior extremity of the pectoral fins does not extend as far back as that of the ventrals.

Br. V: V; D X, 11; A III, 10; C 4, 1, 8, 7, 1, 3; V I, 5; P 13.

The scales are well developed, and deeper than long; twenty-three rows of them may be counted upon the line of greatest depth; sixteen below, and six above the lateral line. On the cheeks the scales are smaller than on the opercle. Rudimentary scales may be observed upon the caudal fin and soft portion of the dorsal and anal.

The color is pale reddish brown above, lighter beneath. The fins are greyish olive, the dorsal being provided with a black patch upon its posterior basal margin. The opercular patch is large, margined posteriorly with a white membranous flap.

References to the figures.—Plate VI, fig. 1, represents *Bryttus albulus*, size of life. Fig. 2, a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catalogue number. | Corresponding No. of | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|----------------------|-------------------|--------------|-------------------------|-----------------|-----------------------|------------------|----------------------|---------------|
| 421 | ----- | 4 | Ad't. | Rio Blanco, Texas ----- | 1853 | Lieut. A. W. Whipple. | 20 | Alcoholic. | Dr. Kennerly. |

2. BRYTTUS SIGNIFER, Grd.

PLATE VII, FIGS. 5—8.

SPEC. CHAR.—Body contracted and deep. Nape convex, and snout sub-conical. Posterior extremity of maxillary extending to a vertical line drawn in advance of the pupil. Insertion of ventrals situated posteriorly to the base of pectorals and the origin of dorsal, their tips overlapping the vent. Scales moderate. Reddish brown, lighter beneath than above. dorsal and anal fins provided with a black patch.

SYN.—*Bryttus signifer*, GRD in Proc. Acad. Nat. Sc. Philad. November, 1857.

This species may easily be distinguished from the preceding one by its mouth being more deeply cleft, and its caudal fin more emarginated. The outline of the spinous portion of the dorsal fin is more arched and the scales somewhat smaller, though, as usual, deeper than long. The scales on the cheeks are smaller than on the opercle, although the average difference in size between the two is not so great as in *B. albulus*. The posterior extremities of the dorsal and anal fins are nearly even, but do not extend to the insertion of the caudal.

Br. V: V; D X, 11; A III, 10; C 3, 1, 8, 7, 1, 2; V I, 5; P 15.

Color reddish brown, lighter beneath. The fins being greyish, the dorsal, and occasionally the anal, are provided with a black patch upon their basal posterior margin. The opercular black patch is margined with a white membranous flap.

References to the figures.—Plate VII, fig. 5, represents *Bryttus signifer*, size of life. Fig. 6 is a dorsal scale. Fig. 7, a scale from the lateral line. Fig. 8, a scale from the abdominal region.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|-------------------|-------------------------|-----------------|----------------------------|------------------|----------------------|--------------------|
| 422 | 6 | Rio Medina, Texas. | 1853. . . | Lieut. A. W. Whipple . . . | 18 | Alcoholic. . . . | Dr. Kennerly . . . |

3. BRYTTUS HUMILIS, G r d .

PLATE VII, FIGS. 9—24.

SPEC. CHAR.—Body sub-elliptical. Nape convex, and snout sub-conical. Posterior extremity of maxillary extending beyond the anterior rim of the orbit. Insertion of the ventrals situated posteriorly to the base of pectorals, and a little in advance of the origin of the dorsal, their tips overlapping the vent. Scales large. Reddish brown or dusky, maculated. Fins unicolor; dorsal sometimes blotched.

SYN.—*Bryttus humilis*, GRD. in Proc. Acad. Nat. Sc. Philad. November, 1857.

This species has a greater affinity with *B. albulus* than with *B. signifer*. The spinous portion of the dorsal resembles more, it is true, that of *B. signifer*, but the structure of the head and the size of the scales remind us of the same traits in *B. albulus*.

The snout being sub-conical and rather pointed, the mouth has room for a wider gape than in the case of a truncated or rounded head. The maxillary teeth are quite apparent, though exiguous. The posterior extremity of the maxillary bone extends to a vertical line drawn inwardly of the anterior rim of the orbit. The eye is sub-circular and proportionally larger than in *B. signifer*; its diameter enters four times in the length of the side of the head. The latter constitutes the third of the total length, the caudal fin excluded. The preopercle and suborbital bones exhibit a very cavernous structure, a feature rather uncommon in the Ichthyic group now under consideration. The opercular flap has a tendency towards assuming a greater development than in either of the species of *Bryttus* we are, so far, acquainted with.

The dorsal fin is higher upon its spinous portion than in *B. signifer*. The ventrals are of but moderate development, although their extremities overlap the vent, without, however, reaching the anal fin. On the other hand, the pectorals are slender and elongated, extending posteriorly beyond a vertical line intersecting the origin of the anal fin. The ventrals themselves are inserted a little in advance of the origin of the dorsal.

Br. V: V; D X or XI, 10; A III, 9; C 3, 1, 8, 7, 1, 2; V I, 5; P 12.

The enlarged figures of the scales speak for themselves; wherever the pectinations of their posterior margin are missing, it is owing to their exiguity or else their deciduous character. Their anterior margin is rather abruptly truncated.

The color is reddish brown or dusky, mostentimes maculated, or rather spotted with black, especially upon the posterior half of the body (fig. 13). The fins are unicolor. Fig. 21 ought to exhibit a dorsal spot, which may be seen upon the specimen.

References to the figures.—Plate VII, fig. 9, represents size of life, *Bryttus humilis*, caught near Rock Mary. Fig. 10, a dorsal scale. Fig. 11, a scale from the lateral line. Fig. 12, a scale from the abdominal region.

Fig. 13 represents a specimen, size of life, from Sugar Loaf creek, Arkansas. Fig. 14 is a dorsal scale of the same. Fig. 15, a scale from the lateral line. Fig. 16, a scale from the abdominal region.

Figs. 17 and 21, immature specimens, size of life, from Sugar Loaf creek also. Figs. 18 and 22, scales from the dorsal region. Figs. 19 and 23, scales from the lateral line. Figs. 20 and 24, scales from the abdominal region.



List of specimens.

| Catalogue number. | No. of specimens | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|------------------|----------------------------|-----------------|--------------------------|------------------|----------------------|---------------------|
| 423 | 1 | Near Rock Mary..... | 1853 | Lieutenant A. W. Whipple | 17 | Alcoholic | H. B. Möllhausen .. |
| 424 | 1 | Old Fort Arbuckle..... | 1853 |do..... | XVIII |do..... |do..... |
| 425 | 1 | Sugar Loaf creek, Arkansas | 1853 |do..... | |do..... |do..... |
| 426 | 1 |do..... | 1853 |do..... | |do..... |do..... |
| 427 | 2 |do..... | 1853 |do..... | |do..... |do..... |
| 428 | 2 |do..... | 1853 |do..... | |do..... |do..... |
| 429 | 1 | Cotton-wood creek, Utah . | 1853 | Lieutenant Beckwith..... | |do..... | Lieutenant Beckwith |
| 430 | 1 | Brazos river, Texas | 1854 | Dr. G. C. Shumard..... | |do..... | Dr. Shumard |

POMOTIS, Rafin.

GEN. CHAR.—Body either sub-circular or sub-elliptical; very much compressed. Head small or moderate. Mouth proportionate to the size of the head; jaws generally equal, lower one sometimes longest. Velvet or card-like teeth upon the jaws and front of the vomer only. Tongue smooth. Checks and opercular apparatus scaly. Edge of preopercle generally denticulated or finely serrated. An opercular flap more or less developed, and spotted. Branchial apertures continuous under the throat. Spinous portion of dorsal fin longer, and less elevated than the soft portion. Three anal spines. Insertion of ventrals situated posteriorly to the base of the pectorals. Posterior margin of caudal fin emarginated or sub-crescentic. Scales well developed and pectinated.

SYN.—*Pomotis*, RAFIN. Ichth. Ohiens. 1820, 28.—CUV. & VAL. Hist. nat. Poiss. III, 1829, 90; & VII, 1831, 454.—STORER, Synops. 1846, 40.

The above diagnosis we have drawn up for mere temporary purposes, to enable our readers to understand more fully the species which we enumerate under this heading. As it is, it embraces all the species of the genus *Ichthelis*, which, if not subdivided, will have to supersede the appellation of *Pomotis*. The species referred by Rafinesque to his sub-genus *Telipomis* must previously be investigated before any further alteration can be safely made in the generical nomenclature of these fishes.

The sunfishes, as they are generally called, are peculiar to North America, and quite numerous in all the rivers flowing towards the Atlantic coast and the Gulf of Mexico, occurring likewise in the ponds and lakes of the same geographic range. On the other hand, they are entirely wanting in the western waters of our continent.

1. POMOTIS LUNA, Grd.

Northern Sunfish, or Moon Sunfish.

PLATE VIII, FIGS. 1—4.

SPEC. CHAR.—Body suborbicular in profile. Head moderate; snout subconical. Mouth small; posterior extremity of maxillary extending to a vertical line drawn in advance of the anterior rim of the orbit. Eye moderate. Suborbital and supra-septular bones not crenated. Edge of preopercle very slightly crenated. Opercular flap small. Spinous portion of dorsal fin of moderate height, and lower than the soft; its origin being situated opposite the base of the pectorals, and consequently in advance of the origin of the ventrals. Caudal fin posteriorly emarginated. Tips of ventrals overlapping the vent

but do not reach the anterior margin of the anal. Extremities of pectorals nearly even with the tips of ventrals. Greenish brown above, yellowish beneath; sides of head with blue and yellow lines. Fins unicolor, vertical ones greenish olive, the others yellowish.

SYN.—*Pomotis vulgaris*, RICHARDS. Faun. Bor. Amer. III, 1836, 24; pl. lxxvi.—AGASS. Lake Super. 1850, 293.

Pomotis luna, GRD. in Proc. Acad. Nat. Sc. Philad. November, 1857.

Northern Sunfish, Vernacular.

The head constitutes about the fourth of the total length, and the diameter of the eye, which is circular, enters a little over four times in the length of the side of the head. The lower jaw projects somewhat beyond the upper, the gape of the mouth being directed obliquely upwards. A vertical line drawn from the origin of the dorsal fin would intersect the middle of the base of the pectorals, and fall considerably in advance of the origin of the ventral fins.

Such are the principal traits characteristic of the present species; a more elaborate description of which is given by Sir John Richardson, in the work above referred to. When we come to write the Monograph of this genus a better opportunity will be afforded for comparing it to *P. vulgaris*, properly so to be called, and which, so far, appears to be more closely allied to it than any other of its congeners.

The coloration, as preserved upon the specimens immersed in alcohol, has considerably faded away. The sides of the head have lost the blue and yellow lines so well represented in the *Fauna boreali americana*; even the opercular flap is of a uniform black.

References to the figures.—Plate VIII, fig. 1, represents *Pomotis luna*, somewhat reduced in size. Figure 2, is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region. The pectinations of the scales having been removed with the epidermis.

List of specimens.

| Catalogue number. | No. of specimen. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|-------------------|------------------|--------------|----------------------|-----------------|---------------------|---------------------|---------------------|
| 480 | 1 | Adult. | Fort Snelling, Minn. | 1852 | Gov. I. I. Stevens. | Alcoholic..... | Dr. George Suckley. |

2. POMOTIS SPECIOSUS, B. & G.

The Southern Sunfish.

PLATE VIII, FIGS. 5—8.

SPEC. CHAR.—Body sub-elliptical in profile; head small, snout bluntly sub-conical; mouth small; posterior extremity of maxillary extending to the anterior rim of the orbit; inferior edge of preorbital bone, and limb of preopercle finely serrated, opercular flap small; spinous portion of dorsal fin elevated; anal spines well developed; caudal emarginated. Reddish brown, lighter beneath, young transversally banded; fins greyish or yellowish; a black patch upon the dorsal.

SYN.—*Pomotis speciosus*, B. & G. Proc. Acad. Nat. Sc. Philad. VII, 1854, 24.

This species is described and figured in the Report of the United States and Mexican Boundary Survey, by whom it was first collected. The species is allied to *P. incisor*, CUV. & VAL. Hist. nat. des Poiss. VII, 1831, 467, from which it, however, differs by a larger eye, a

more advanced position of the dorsal fin, with reference to the insertion of the ventrals. The pectoral fins themselves assume the elongated aspect which they have in *P. heros*.

References to the figures.—Plate VIII, fig. 5, represents, size of life, an immature specimen of *Pomotis speciosus*, caught in the Rio Seco, Texas. Fig. 6 is a dorsal scale. Fig. 7, a scale from the lateral line. Fig. 8, a scale from the abdominal region.

List of specimens.

| Catalogue number. | No. of specimens. | Sex and age. | Locality. | Whence tained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|-------------------|--------------|---------------------------|----------------------|------------------|----------------------|--------------------|
| 432 | 3 | Adult.. | Brownsville, Texas | Capt. Van Vliet..... | 1 & 2 | Alcoholic..... | Capt. Van Vliet... |
| 482 | 5 | Young |do..... |do..... | |do..... |do..... |
| 433 | 3 | Adult.. | Near Indianola, Texas.... | Capt. J. Pope | |do..... | Capt. Pope..... |
| 434 | 24 | Young | Devil's river, Texas..... | Major Emory | 63 |do..... | Dr. Kennerly |
| 435 | 3 | .. do .. | Cadereita, New Leon..... | Lieut. Couch..... | 23 |do..... | Lieut. Couch..... |
| 436 | 1 | .. do .. | Rio Medina, Texas..... | Lieut. Whipple..... | 18 |do..... | Dr. Kennerly |
| 437 | 12 | .. do .. | Rio Seco, Texas |do..... | |do..... |do..... |
| 478 | 1 | Adult.. | New Braunsfels, Texas ... | Dr. Lindheimer | |do..... | Dr. Lindheimer ... |

3. POMOTIS HEROS, B. & G.

PLATE IX, FIGS. 13—16.

SPEC. CHAR.—Head, mouth, and eye larger than in *P. speciosus*; edge of preopercle inconspicuously serrated; pectorals projecting beyond the tips of ventrals; anal fin provided occasionally with a black patch, as well as the dorsal.

SYN.—*Pomotis heros*, B. & G. Proc. Acad. Nat. Sc. Philad. VII, 1854, 25.

This species, like the preceding one, was first collected by the United States and Mexican Boundary Commission, consequently its description and figure will be found annexed to the Report on that survey. It is more closely allied to *P. incisor* than even *P. speciosus*. It has also intimate affinities with *P. solis*, CUV. & VAL. Hist. nat. des Poiss. VII, 1831, 468.

References to the figures.—Plate IX, fig. 13, represents the young of *Pomotis heros*, caught in the Rio Blanco, Texas. Fig. 14 is a dorsal scale. Fig. 15, a scale from the lateral line. Fig. 16, a scale from the abdominal region.

List of specimens.

| Catalogue number. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|-------------------|--------------|---|-----------------|--------------------------------------|------------------|----------------------|-------------------|
| 438 | 4 | Adult.. | Río Cibolo, Texas..... | 1851 | Col. J. D. Grabam. | ----- | Alcoholic... | John H. Clark .. |
| 439 | 1 | .. do. . | Río Nueces, Texas. | 1856 | Capt. John Pope .. | ----- | .. do. | Captain Pope ... |
| 440 | 8 | Young. | Dry Creek, near Victo- ria, Texas | 1854 | Major Emory..... | 54 | .. do. | Dr. Kennerly ... |
| 441 | 1 | .. do. . | Dry Creek, near Victo- ria, Texas | 1854 |do..... | 56 | .. do. |do..... |
| 442 | 7 | .. do. . | Dry Creek, near Victo- ria, Texas | 1854 |do..... | 53 | .. do. |do..... |
| 443 | 12 | .. do. . | Río San Juan, and near Cadereita, N. L. | 1852 | Lieut. Couch | 15 & 19 | .. do. | Lieut. Couch |
| 444 | 1 | ----- | Río Blanco, Texas..... | 1853 | Lieut. Whipple.... | 20 | .. do. | Dr. Kennerly ... |
| 445 | 4 | ----- | Fort Bliss, N. M..... | 1857 | Dr. S. W. Crawford, U. S. A. | ----- | .. do. | Dr. Crawford ... |

4. POMOTIS AQUILENSIS, B & G.

PLATE IX, FIGS. 1—4, and PLATE X, FIGS. 8—11.

SPEC. CHAR.—Body sub-elliptical in profile. Head moderate; snout bluntly sub-conical. Mouth moderate; posterior extremity of maxillary extending to a line intersecting the anterior rim of the orbit. Eye moderate. Edge of the preopercle slightly denticulated or serrated. Opercular flap variable, oftentimes elongated and well developed. Extremities of pectorals not extending as far back as those of the ventrals which overlap the vent and reach the anterior margin of the anal fin. Reddish brown; fins greyish olive, unicolor; dorsal and anal provided with a black patch.

SYN.—*Pomotis aquilensis*, B. & G. Proc. Acad. Nat. Sc. Philad. VI, 1853, 387.

Pomotis nefastus, B. & G. Proc. Acad. Nat. Sc. Philad. VII, 1854, 24.

This species is also one of those which were first brought home by the United States and Mexican Boundary Commission, to whose Report we must refer for more ample informations. Subsequent researches have convinced us of the specific identity between *P. nefastus* and *P. aquilensis*. The species is one of those subjected to great variations by the outgrowth of various regions of the body. The opercular flap assumes different degrees of development according to the specimens, being larger, of course, in full grown ones than in the young. The individual on Plate IX, fig. 1, is somewhat deformed in the abdominal outline, the snout being at the same time protruding beyond all proportions, giving rise to a conspicuous nuchal depression. It comes nearest to the variety which we had formerly described as *Pomotis nefastus*. The black patches of the dorsal and anal fins are obliterated.

References to the figures.—Plate IX, fig. 1, represents an outgrown specimen of *Pomotis aquilensis*, (*P. nefastus*), size of life, procured in the Río Blanco, Texas.—Fig. 2 is a dorsal scale.—Fig. 3, a scale from the lateral line.—Fig. 4, a scale from the abdominal region.

Plate X, fig. 8, represents, size of life, a young specimen of the same species, caught in Sugar-loaf creek, Arkansas.—Fig. 9 is a dorsal scale.—Fig. 10, a scale from the lateral line.—Fig. 11, a scale from the abdominal region.

List of specimens.

| Catalogue number. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original numbers. | Nature of specimens. | Collected by— |
|-------------------|-------------------|--------------|---------------------------------------|-----------------|------------------------|-------------------|----------------------|-----------------|
| 446 | 1 | Young | Eagle Pass..... | 1853 | Maj. Emory..... | ----- | Alcoholic. | A. Schott ---- |
| 447 | 1 | do. | San Felipe, Texas..... | 1851 | Col. J. D. Graham..... | ----- | do. | John H. Clark. |
| 448 | 5 | Adult | Rio Cibolo, Tex..... | 1851 | do..... | ----- | do. | do. |
| 449 | 10 | Young | Rio Nueces, Tex..... | 1851 | do..... | ----- | do. | do. |
| 450 | 24 | do. | Rio Sabinal, Tex..... | 1854 | Maj. Emory..... | 62 | do. | Dr. Kennerly. |
| 451 | 12 | do. | do..... | 1854 | do..... | 61 | do. | do. |
| 452 | 10 | Adult | San Pedro, near San Antonio, Tex..... | 1853 | Lieut. Whipple..... | 5 | do. | do. |
| 453 | 1 | do. | Near San Antonio, Tex..... | 1853 | do..... | 10 | do. | do. |
| 454 | 1 | do. | Leon river, Tex..... | 1853 | do..... | 11 | do. | do. |
| 455 | 1 | do. | Rio Blanco, Tex..... | 1853 | do..... | 23 | do. | do. |
| 481 | 3 | Young | Sugar Loaf creek, Ark..... | 1853 | do..... | ----- | do. | Möllhausen..... |
| 456 | 1 | Adult | Rio Nueces, Tex..... | 1856 | Capt. John Pope..... | ----- | do. | Capt. Po ---- |

5. POMOTIS POPEII, Grd.

SPEC. CHAR.—Body sub-elliptical in profile. Head and mouth small; snout bluntly sub-conical. Posterior extremity of maxillary extending to a vertical line scarcely intersecting the anterior rim of the orbit. Eye small. Edge of preopercle not denticulated. Opercular flap moderate. Tips of ventrals overlapping the vent without reaching the anterior margin of the anal. Extremities of pectorals not extending as far back as the ventrals. Origin of dorsal fin situated opposite the insertion of the ventrals. Uniform reddish brown; fins olivaceous.

In its general aspect this species greatly resembles *P. aquilensis*, from which it differs by a proportionally smaller head, hence a smaller mouth, for, the posterior extremity of the maxillary, reaches a vertical line falling a little in advance of the anterior rim of the orbit. The edge of the preopercle is perfectly smooth. A vertical line drawn from the origin of the dorsal fin intersects the origin of the ventrals in passing behind the base of the pectoral fins. The head constitutes a little less than the fourth, not quite the third of the entire length. The posterior margin of the caudal is sub-crescentic, being more deeply emarginated than in *P. aquilensis*. The branchiostegal rays are five on either side. The fins rays number as in the preceding species. The scales are well developed, especially upon the middle of the flanks, being quite reduced in size under the thoracic arch; they are finely, though conspicuously, pectinated posteriorly.

The color is of a reddish-brown hue, rather pale upon the specimens preserved in alcohol. An obsolete black patch may be observed upon the posterior and basal portion of the dorsal fin. This patch, in all probability, is more apparent on the living specimens. The fins otherwise are olivaceous, the inferior ones being tinged with grey.

List of specimens.

| Catalogue number. | Corresponding No. of. | Number of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|-----------------------|----------------------|--------------|------------------------------------|-----------------|--------------------|------------------|----------------------|---------------|
| 478 | ----- | 2 | Adult. | Headwaters of Colorado river ----- | 1854 | Captain Pope ----- | ----- | Alcoholic. | Captain Pope. |

6. POMOTIS FALLAX, B. & G.

PLATE VIII, FIGS. 9—12 ; PLATE IX, FIGS. 5—12, & PLATE X, FIGS. 1—7.

SPEC. CHAR.—Body sub-circular or sub-elliptical. Head moderate ; snout bluntly sub-conical. Mouth large ; posterior extremity of maxillary extending to the anterior rim of the pupil. Eye moderate. Edge of preopercle not crenated. Opercular flap very large. Spinous portion of dorsal fin of medium height ; its origin situated opposite the base of the pectorals. Caudal emarginated posteriorly. Tips of ventrals extending to the anterior margin of the anal. Blackish or reddish brown ; lighter beneath than above. Sides of head provided with bluish spots, sometimes confluent into irregular lines. A black patch upon the base of the dorsal fin.

SYN.—*Pomotis fallax*, B. & G. Proc. Acad. Nat. Sci., Philad., VIII, 1854, 24.

Pomotis convexifrons, B. & G. Proc. Acad. Nat. Sci., Philad., VII, 1854, 24.

This is the most polymorphic species which we have so far met with amongst fresh water fishes. We have caused it to be fully illustrated in order to give a correct idea of its most prominent variations. The species which we had formerly enumerated under the name of *P. convexifrons* is one of these.

A comparison of the figures on Plate X will show that the upper outline of the head and body both are subject to very great variations, and that the dorsal fin itself participates in giving to the region it belongs its diversified aspect. Again the snout is more or less protruding, affecting considerably the physiognomy of the species, as well as the opercular flap, which, in some specimens, reaches most abnormal proportions. (Fig. 5.)

This species was first collected by the United States and Mexican boundary commission, to whose Report we would refer our readers.

References to the figures.—Plate VIII, fig. 9, exhibits, size of life, an immature specimen of *Pomotis fallax*, from Rio Seco, Texas. Fig. 10 is a dorsal scale. Fig. 11, a scale from the lateral line. Fig. 12, a scale from the abdominal region.

Plate IX, fig. 5, represents, size of life, *Pomotis fallax*, from Sans Bois creek, a tributary of Canadian river. Fig. 6 is a dorsal scale. Fig. 7, a scale from the lateral line. Fig. 8, a scale from the abdominal region.

Fig. 9, of the same Plate, exhibits an immature specimen, size of life, from Rio Medina, Texas. Fig. 10, a dorsal scale. Fig. 11, a scale from the lateral line. Fig. 12, a scale from the abdominal region.

Plate X, figs. 1, 5, 6 and 7 represent various outlines of the same species, all from a tributary of Gypsum creek, itself an affluent of the Canadian river. Fig. 2 is a dorsal scale. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catalogue number. | Number of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|----------------------|--------------|---------------------------------|-----------------|----------------------|------------------|----------------------|--------------------|
| 462 | 4 | Yg .. | Comanche spring, Texas..... | 1853 | Lt. Parke..... | --- | Alcoholic .. | Dr. A. L. Heermann |
| 463 | 4 | Adt.. | Sans Bois creek, Canad..... | 1853 | Lt. Whipple..... | 1 | do..... | H. Möllhausen.... |
| 464 | 6 | ..do.. | Trib. of Gypsum creek, Canad... | 1853 | do..... | --- | do..... | do..... |
| 465 | 6 | Yg .. | Rio Seco, Tex..... | 1853 | do..... | 19 | do..... | Dr. Kennerly..... |
| 466 | 3 | ..do.. | Rio Medina, Tex..... | 1853 | do..... | 18 | do..... | do..... |
| 467 | 2 | ..do.. | do..... | 1853 | do..... | --- | do..... | do..... |
| 467 | 2 | Adt.. | Rio Cibolo, Tex..... | 1851 | Col. Graham..... | --- | do..... | John H. Clark.... |
| 468 | 1 | ..do.. | Elm creek, Tex..... | 1851 | do..... | --- | do..... | do..... |
| 469 | 5 | Yg .. | Rio Salado, Tex..... | 1851 | do..... | --- | do..... | do..... |
| 460 | 6 | ..do.. | Live Oak creek, Tex..... | 1854 | Maj. Emory..... | 64 | do..... | Dr. Kennerly..... |
| 461 | 5 | ..do.. | San Pedro creek, Tex..... | 1854 | do..... | 59 | do..... | do..... |
| 468 | 12 | ..do.. | Delaware creek..... | 1856 | Capt. John Pope..... | --- | do..... | Capt. John Pope... |
| 469 | 12 | ..do.. | do..... | 1856 | do..... | --- | do..... | do..... |
| 470 | 12 | ..do.. | do..... | 1856 | do..... | --- | do..... | do..... |

7. POMOTIS BREVICEPS, B. & G.

The Blunt headed Sunfish.

SPEC. CHAR.—Body sub-elliptical. Head moderate; snout bluntly rounded; mouth small; posterior extremity of maxillary extending midway between the anterior rim of the orbit and the pupil. Eye small. Edge of preopercle finely crenated. Opercular flap very large. Spinous portion of dorsal fin of medium height; its origin situated posteriorly to the upper edge of the base of the pectorals. Caudal posteriorly emarginated. Reddish brown; a black spot at the posterior margin of the dorsal fin.

SYN.—*Pomotis breviceps*, B. & G., Prod. Acad. Nat. Sc. Philad. VI, 1853, 309; &, in Marcy's Expl. Red Riv. La. 1853, 246, Pl. xiii.

This species, though very characteristic, resembles somewhat the normal type of *P. fallax*. Its body is sub-elliptical; its head, of moderate development, terminated by a bluntly rounded snout, and constituting the fourth of the total length. The mouth is rather small, and the posterior extremity of the maxillary extends midway between the anterior rim of the orbit and the pupil. The eye is small also. As to the preopercular edge, it is finely crenated. The opercular flap is very large. The spinous portion of the dorsal fin is of medium height, superiorly convex, its origin being placed posteriorly to the upper edge of the base of the pectoral fins. The anal is well developed, especially its soft portion; the spines themselves are stoutish, but rather short. The ventrals are of moderate development; their extremities overlap the vent, but do not extend as far as the anterior margin of the anal. The pectorals are of moderate development also, roundish; their extremities not extending so far back as those of the ventrals.

Br. V: V; D X, 11; A III, 9; C 4, 1, 8, 7, 1, 3; V I, 5; P 14.

The scales are well developed, much deeper than long, anteriorly sub-truncated, rounded upon the remaining edges, and conspicuously pectinated posteriorly. Five series of them are often observed upon the cheeks, and of about one-third smaller than those covering the opercle. The

smallest scales of the body are observed under the chest. The soft portions of the dorsal and anal fins, as also the caudal, exhibit numerous small and polygonal scales.

The ground color of the body is reddish brown, of a lighter hue beneath than above. The fins are olivaceous or greyish, an obsolete dark spot being occasionally observed upon the posterior margin of the base of the dorsal. The opercular flap is jet black, margined with a light filet. The sides of the head exhibit irregular or meandric bluish (as preserved in alcohol) lines.

List of specimens.

| Catalogue number. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|-----------------|--------------------------------------|-----------------|----------------------|----------------------|---------------|
| 471 | 1 | Ad't | Head waters of Colorado..... | 1853 | Captain John Pope... | Alcoholic | Capt. Pope |
| 472 | 1 | ---do--- | Ft. Washita, tributary of Red river. | 1853 |do..... |do..... |do..... |
| 474 | 3 | ---do--- | Head waters of Rio Brazos..... | 1853 |do..... |do..... |do..... |
| 473 | 1 | ---do--- | Otter creek, tributary of Ark..... | 1852 | Captain Marcy |do..... | Capt. Marcy |
| 475 | 10 | Ad't and yg. | Brazos river..... | 1853 | Dr. G. C. Shumard.. |do..... | Dr. Shumard |
| 476 | 12 | ---do--- |do..... | 1853 |do..... |do..... |do..... |
| 477 | 4 | ---do--- | Ark. river, near Fort Smith..... | 1853 |do..... |do..... |do..... |

LABRAX, Cuv.

GEN. CHAR.—Body more or less elongated or deep, compressed. Head moderate. Edge of preopercle denticulated or else serrated. One or more flattened spines upon the opercle. Mouth moderate; jaws equal. Velvet-like teeth on the jaws, front of vomer and palatine bones. Tongue provided with bands of velvet-like teeth. Cheeks and opercular apparatus scaly. Branchial apertures continuous under the throat. Two dorsal fins contiguous upon their base only. Anal fin provided with three spiny rays. Ventrals inserted posteriorly to the base of the pectorals. Caudal fin posteriorly emarginated. Scales well developed and pectinated posteriorly, so as to appear rough to the touch.

SYN.—*Labrax*, (PALLAS,) CUV. R \acute{e} gn. Anim. II. 1817, 268.—STORER, Synops. 18,
Lepibema, RAFIN. Ichth. Ohiens. 1820, 23.

The “striped bass” or “rock fish” of the Atlantic coast, as well as the “white perch” or “little white bass” of our ponds and rivers, both belong to this genus.

They are fishes familiar to all, at least in an esculent point of view. The species described below is one of rather small size when compared to the “striped bass” or “rock fish,” although it is larger than the “white perch.”

So far the fresh water species of this genus have not been observed further west than the basin of the Mississippi, and none of them have as yet been noticed along the Pacific coast.

LABRAX CHRYSOPS, Grd.

Striped Bass, &c.

PLATE XI, FIGS. 1—4.

SPEC. CHAR.—Body rather short, very deep and compressed. Profile of head sub-conical; both jaws sub-equal. Posterior extremity of maxillary bone extending to a vertical line drawn within the anterior rim of the orbit, about midway to the pupil. Scales very large. Olivaceous above, silvery on the sides, interrupted by dark brown longitudinal stripes, and white beneath.

SYN.—*Perca (Lepibema) chrysops*, RAFIN. Ichth. Ohiens. 1820, 22, and 23.

Perca multilineata, LESU. Ms.

Labrax multilineatus, CUV. & VAL. Hist. nat. Poiss. III, 1829, 488.—KIRTL. in Bost. Journ. Nat. Hist. V, 1847, 21. Pl. vii, Fig. 1.—DEKAY, New York Fauna, III, 1842, 14.—Storer, Synops. 1846, 22.

Striped bass, gold eye, rock perch, rock fish, rock bass, VERNACULAR.

This being quite a common fish in the western rivers and streams, we have considered it a desideratum among the illustrations accompanying this report. It is known under various vernacular appellations, most commonly, however, under that of *striped bass*, especially in the valley of the Ohio.

This species has been described by various authors, as will be seen by referring to the above synonymy. It is remarkable by its short, deep, and compressed body, the greatest depth of which is a little less than the third of the entire length, whilst the greatest thickness is rather more than the third of the depth.

The head is of but moderate size, subconical when viewed in profile. It enters a little short of four times in the total length. The mouth is medium sized; the jaws sub-equal, the lower one slightly protruding beyond the upper. The posterior extremity of the maxillary extends to a vertical line which would be drawn midway between the anterior rim of the orbit and the pupil. A few scales may be observed upon the dilated part of that bone. The tongue is moderate and rather thin, provided upon its edge with velvet like teeth disposed upon a horse shoe figure, the convexity of which is turned forwards. The eye is well developed and circular, its diameter entering about four times and a half in the length of the side of the head. The cheeks and preopercle are covered with scales somewhat smaller than those covering the rest of the gill covers. The limb of the preopercle is finely serrated or denticulated. A flattened spine may be seen across the opercle. There are six branchiostegal rays on either side; the branchial apertures themselves being continuous under the throat.

The spinous dorsal fin is larger than the soft one; it is sub-triangular in its outline, while the latter is more of a trapezoid. The first spine is the smallest, the fourth is the highest; they diminish again from the fifth to the ninth; the tenth spine is nearly equal to the eighth, and belongs rather to the second than the first portion of the fin. The anal extends a little posteriorly to the soft portion of the dorsal; it is preceded by three spines, the first of which is quite small and acerated, the second nearly as deep as the third, but much stronger or stouter. The posterior margin of the caudal is sub-crescentic, the fin itself constituting about the sixth of the entire length. The insertion of the ventral fins is situated posteriorly to the origin of the dorsal and the base of the pectorals. Their posterior extremity is far from reaching the vent which is placed at a small distance from the anterior margin of the anal fin. The pectorals are broad and sub-ovate, their extremities not extending so far posteriorly as the ventrals.

Br. VI: VI; D X, 13; A III, 9; C 3, 1, 8, 7, 1, 2; V I, 5; P 16.

The scales are rather large, disposed upon nineteen longitudinal series across the line of greatest depth, six or seven above the lateral line, and eleven beneath it. The scales themselves are deeper than long, sub-truncated anteriorly, and rounded upon the remaining edges. A few inconspicuous furrows may be observed upon the anterior section of the scales, whilst the posterior section exhibits numerous minute prickles. Scales extend over the caudal and soft portion of both the dorsal and anal fins.

The upper region of the head and body is of an olivaceous tint, varying in shades, whilst the sides are silvery, and the inferior region whitish. Longitudinal stripes of dark brown, or black, may be seen on the sides of the body, three above the lateral line, and three or four beneath it. The

latter are less regular than the former; all being, however, wider than the stripe which follows the course of the lateral line.

References to the figures.—Plate XI, fig. 1, represents *Larax chrysops*, somewhat reduced in size. Fig. 2 is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|-------------------|-----------------------------|-----------------|--------------------|------------------|----------------------|----------------|
| 383 | 2 | St. Louis, Missouri | 1854 | Dr. Engelman ..... | ..... | Alcoholic | Dr. Engelman. |
| 384 | 1 | New Orleans, Louisiana | 1853 | Lieut. Couch | 25 |do..... | Lieut. Couch . |

STIZOSTEDION, Rafin.

GEN. CHAR.—Body elongated, slender, sub-cylindrical, slightly compressed. Head well developed. The preopercle is denticulated or serrated upon its edge; a flattened spine or two, towards the upper region of the opercle. Mouth large; jaws sub-equal. Canine teeth upon the jaws, front of vomer and palatine bones. Tongue smooth. Checks and opercular apparatus entirely or partially scaly. Branchial apertures continuous under the throat. Two dorsal fins entirely separated; anterior one spinous; anal fin without spiny rays. Ventrals inserted posteriorly to the base of pectorals. Caudal fin posteriorly crescentic. Scales of moderate development, strongly pectinated, and rough to the touch.

SYN.—*Stizostedion*, RAFIN. Ichth. Ohiens. 1820, 23.

Lucioperca, CUV. Règn. Anim. 2d ed. II, 1829.

It is to be regretted that such a handsome name as *Lucioperca* should be superseded by that of *Stizostedion*.

This genus includes fishes of voracious habits, and growing sometimes to a very considerable size. Its species are not numerous, although widely spread over the cold part of the temperate zone.

The common appellations of pike-perch, salmon, sandre, &c., are applied to the various species which are brought to our markets, and served upon our tables.

STIZOSTEDION BOREUS, Grd.

Okow, or Horn Fish.

PLATE XI, FIGS. 5—8.

SPEC. CHAR.—Body slender, elongated, and sub fusiform. Snout conical; mouth deeply cleft; posterior extremity of maxillary bone extending to a vertical line drawn posteriorly to the orbit. Scales on cheek and opercle not deciduous, larger upon the opercle than upon the cheek. Insertion of ventral fins situated posteriorly to the base of pectorals, and somewhat anteriorly to the origin of first dorsal. Posterior margin of caudal crescent shaped. Anus situated opposite the origin of the second dorsal fin. Yellowish or olivaceous, spotted with black.

SYN.—*Lucioperca borea*, GRD. Poc. Acad. Nat. Sci. Philad. November, 1857.

Okow, CREES, }
Horn Fish, FUR TRADERS, } RICHARDS. Faun. Bor. Amer. III, 1836, 14.

This species, though closely allied to its congeners, is nevertheless distinguishable by the gape of its mouth, which is proportionally greater, since the posterior extremity of the maxil-

lary extends to a vertical line drawn posteriorly to the orbit. There is a great disproportion in the size of the scales which cover the cheeks and the opercular apparatus, being a good deal the smallest on the cheeks. Finally, the position of the ventral fins, and that of the anus, differ from their situation in the other species.

The head enters four times and a half in the total length; it is sub-conical, with the snout rounded and the jaws equal, or nearly so. In large specimens the lips become very fleshy, and, if any difference be observed in the respective length of the jaws, the upper one will be found slightly protruding beyond the lower. The tongue is smooth. The eye is sub-elliptical, and of moderate development, its horizontal diameter entering about seven times in the length of the side of the head. Both nostrils are nearer the orbit than the extremity of the snout. The convex and external edge of the preopercle is serrated or denticulated. A single flattened spine may be observed upon the opercle.

The origin of the first dorsal is situated a little in advance of the insertion of the ventrals and backwards of the base of the pectoral fins. It is as high as the second dorsal, but longer upon its base, than the latter. The caudal fin enters about six times in the total length. The anal is as deep as the second dorsal is high, though a good deal shorter.

Br. VII: VII; D XIII, 20; A 15; C 5, 1, 8, 7, 1, 4; V I, 5. P 13.

“ XII “ 13 “ “ 14.

The scales are of moderate development, deeper than long, except in the lateral line. They are minutely pectinated upon their posterior section. Sub-truncated anteriorly, they are rounded upon the remaining three edges. Diverging furrows are observed upon the anterior section only. The base of the soft portion of both the second dorsal and anal fins, as also the caudal to a great extent, are covered with scales. The cranial region is likewise scaly.

The ground color of the dorsal region is reddish olive, olivaceous upon the sides, and yellowish or whitish beneath. The back and upper part of the flanks are spotted or blotched with black or brown. The belly and inferior surface of the tail are unicolor. The side of the head is mottled or barred in the young, in which we also observe upon the dorsal region, in addition to the marking already alluded to, three transversely oblique and large blotches. The pectorals are spotted with black upon their base, otherwise they are unicolor, yellowish, like the ventrals and anal. The dorsals and caudal are transversely spotted with black.

References to the figures.—Plate XI, fig. 5, represents *Stizostedion boreus*, somewhat reduced in size. Fig. 6 is a scale from the dorsal region. Fig. 7, a scale from the lateral line. Fig. 8, a scale from the abdominal region.

List of specimens.

| Catalogue number. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|--------------|----------------------------|-----------------|------------------------|----------------------|---------------|
| 385 | 1 | Adult | Fort Sarpy, Nebraska | 1854 | Colonel Vaughan..... | Alcoholic | Dr. Hayden.. |
| 386 | 1 | ..do.. | Mil river, Missouri..... | 1853 | Governor Stevens..... |do..... | Dr. Suckley.. |
| 510 | 1 | ..do.. | Fort Union, Missouri..... | 1856 | Lieut. G. K. Warren... |do..... | Dr. Hayden.. |

PARALABRAX, Girard.

GEN. CHAR.—General physiognomy that of *Labrax*, but the first dorsal fin is contiguous to the second, as in *Serranus*. The profile of body is sub-fusiform; the caudal fin sub-truncated or slightly emarginated posteriorly. The head is sub-conical; the lower jaw a little longer than the upper. Mouth rather large; card-like teeth on the pre maxillaries, dentaries, vomer and palatines, with a row of small canine teeth along the edge of the jaws. Tongue, smooth. Small and homogenous spines upon the outer curve of the preopercle. Two small and inconspicuous spines upon the edge of the opercle. Edge of sub-orbital entire; humerus denticulated. Opercular apparatus and cheeks covered with scales, smaller on the cheeks than on the opercles. Gill openings continuous under the head; branchiostegal rays six in number. Scales minutely serrated posteriorly.

SYN.—*Paralabrax*, GRD. Proc. Acad. Nat. Sc. Philad. VIII, 1856, 131.

The diminutive size of the canine teeth has been the cause of the misunderstanding, on a former occasion, of the true generic affinities of this genus. Its relationships, indeed, are more with *Serranus* than with *Labrax*, and it is in the vicinities of the former that it ought to be placed in the ichthyic method. From *Serranus* it may be distinguished by the outline of the spinous dorsal fin and the relative development of the canine teeth.

1. PARALABRAX NEBULIFER, GRD.

PLATE XII, FIGS. 1—4.

SPEC. CHAR.—Snout sub-conical; extremity of maxillary reaching the anterior edge of the pupil. Eyes moderate. Base of pectorals a little in advance of that of the ventrals. Irregular dark blotches distributed over the dorsal region.

SYN.—*Labrax nebulifer*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 142.

Paralabrax nebulifer, GRD. Proc. Acad. Nat. Sc. Philad. VIII, 1856, 132.

The general form is stoutish, and the profile sub-fusiform. The greatest depth of the body, which corresponds to the origin of the anterior dorsal, is contained about four times in the total length. The greatest thickness, measured in the same region as the depth, is somewhat more than the half of the latter. The body therefore is, as usual, compressed from head to tail.

The head, which is contained three times and a half in the total length, has a sub-conical appearance, since its upper surface is rounded or sub-convex and gradually sloping towards the snout. The posterior extremity of the maxillary extends backwards to a line intersecting the anterior rim of the pupil. The eye is sub-circular; its horizontal diameter being contained about six times in the length of the side of the head. The nostrils are nearer to the eye than the extremity of the snout. The preopercular spines are very uniform in size and shape, being small, sub-conical, and acute. The edge of the opercle exhibits two flattened and inconspicuous spines, especially the uppermost, which is scarcely perceptible. Seven branchiostegals may be observed within the gill membrane.

The spinous portion of the dorsal is not quite as long as the soft; its origin is somewhat behind the base of the pectorals and composed of nine rays, the third of which being the highest, whilst the second and first are the smallest; the fourth, fifth, sixth, seventh, eighth, and ninth, diminish gradually in the order enumerated, so as to give the upper margin of that fin a concave outline. A tenth spine, higher than the ninth, may be observed at the anterior margin of the soft portion of that fin which is composed of fourteen articulated and subdivided rays. The caudal is sub-crescentic or else sub-truncated. Three well developed spines may be observed at the anterior margin of the anal fin, the origin of which may be said to be opposite the second articulated ray of the dorsal. There are seven (or eight if the last, which is double, counts two) articulated and bifurcated rays, deepest upon the

middle of that fin. The origin of the ventrals is situated opposite the anterior spine of the dorsal and a little posterior to the base of the pectorals. They are composed of one spine and five articulated and subdivided rays. The posterior or outer margin of those fins is nearly straight. The pectorals, composed of seventeen soft rays, are rounded posteriorly, and extend further back than the ventrals, though neither the ventrals nor the pectorals reach the anus, which is nearly three-eighths of an inch in advance of the anterior margin of the anal.

The fins and branchiostegals may thus be formulated :

Br. VII: VII; D X, 14; A III, 7; C 4, 1, 7, 6, 1, 3; V I, 5; P 17.

The scales are of medium size, a little longer than deep, and posteriorly serrated or provided with minute spines. They are larger on the flanks than on the dorsal and abdominal regions. The lateral line is nearly concurrent with the dorsal outline. Minute scales may be observed upon the base of the dorsal, caudal, and pectoral fins. The upper surface of the head, cheeks, and opercular apparatus are likewise scaly; the scales being smaller on the head and cheeks than on the opercle, where they are even larger than on the back, properly so called.

The ground color is reddish brown above, and yellowish beneath; the upper part of the body being provided with large, cloud-like, purplish black blotches. A dark purplish streak extends obliquely downwards and backwards from the inferior rim of the orbit to the throat, across the cheeks and branchiostegal apparatus. The fins are purplish, very intensely so on the ventrals, the base of second dorsal, and the space between the third and fourth spines of the dorsal. The snout exhibits small roundish spots.

References to the figures.—Plate XII, fig. 1, represents *Paralabrax nebulifer*, in profile, two-thirds its natural size. Fig. 2, is a scale from the dorsal region. Fig. 3, a scale of the ventral region. Fig. 4, is taken from the lateral line.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|---------------------|-------------------------|----------------------|------------------------|
| 282 | 2 | Monterey, Cal | Lieut. Trowbridge | Alcoholic. | Lieut. Trowbridge..... |

2. PARALABRAX CLATHRATUS, Grd.

PLATE XII, FIGS. 5—8.

SPEC. CHAR.—Snout rather pointed; extremity of maxillary intersecting the middle of the pupil. Eyes rather large. Base of pectorals even with the base of ventrals. Blotches of dorsal region assuming a fenestrated disposition.

SYN.—*Labrax clathratus*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 143.

Paralabrax clathratus, GRD. Proc. Acad. Nat. Sc. Philad. VIII, 1856, 132.

The most striking difference between this species and the preceding one consists in the general profile of the body, which is less elongated, and, especially in that of the head, which is more pointed and conical. The eye also is much larger, and contributes for a share in giving this fish its specific physiognomy.

The body is very much compressed, its greatest depth is to be measured across the middle of

the abdomen, instead at the origin of the dorsal fin. That depth enters nearly four times in the entire length. The head is contained three times and a half in the total length. The posterior extremity of the maxillary extends to a vertical line, intersecting the middle of the pupil. The eye is large and circular, its diameter entering five times only in the length of the side of the head. The preopercular spines have the same appearance as in the preceding species, but those at the edge of the opercle are somewhat more conspicuous. The origin of the dorsal fin is placed at a small distance back of a vertical line, which would pass through the insertion of the pectorals. The number of spines is the same as in *P. nebulifer*; but the fourth spine is highest, instead of the third, hence a marked difference in the outline of these fins. The base of the spinous portion is longer than that of the soft, whilst the reverse is the case in the preceding species. The posterior margin of the caudal fin is slightly more emarginated, and proportionally longer compared to the entire length. The base of the anal is comprised six times and a half in the entire length of the fish, and thus proportionally longer than in *P. nebulifer*, in whose entire length the base of its anal enters seven times and a half. A vertical line drawn from the origin of the dorsal, passes immediately in advance of the base of the ventrals, and intersects the base of the pectorals. The tips of the pectorals reach a vertical line which would pass in advance of the vent. The latter is nearer to the anterior margin of the anal than in the preceding species.

The formula of the rays is very similar to that of the preceding species:

Br. VII: VII; D X, 13; A III, 7; C 3, 1, 7, 6, 1, 2; V I, 5; P 15.

The scales have the same general shape and structure as in *P. nebulifer*. The course of the lateral line, however, is more distant from the dorsal outline. Minute scales may be observed upon the base of all the fins, with the exception of the ventrals.

The ground color is purplish brown above, whitish beneath. The upper part of the back and sides are covered with darker blotches, assuming an irregular fenestrated appearance. The pectorals are yellowish. The other fins have a purplish hue; the soft dorsal is spotted. A sub-ocular vitta, as in the preceding species, though passing nearer the angle of the mouth.

References to the figures.—Plate XII, fig. 5, represents the profile of *Paralabrax clathratus*, size of life. Fig. 6, a scale from the dorsal region. Fig. 7, a scale from the abdominal region. Fig. 8, a scale from the lateral line.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | Whence obtained. | Nature of specimens. | Collected by.— |
|-------------------|-------------------|----------------------|---------------------|----------------------|-----------------|
| 283 | 1 | San Diego, Cal. | Lt. Trowbridge..... | Alcoholic | A. Cassidy..... |

Family TRACHINIDAE, Bonap.

This family, a subdivision of that of *Percidae*, is characterized by the dorsal fin occupying nearly the whole length of the back; by the position of the ventrals, the insertion of which is

situated in advance of the base of the pectoral fins; and in being provided mostly with velvet-like teeth, and sometimes with canine teeth intermingled.

The representatives of this family are all of marine habits; those recorded below are new to science, and peculiar to the fauna of our western coast.

Like most of the percoids, they are esteemed upon European tables. How far the species described below is savorous, the settlers of western America alone are prepared to tell. Its compressed and thin body may not be deemed worthy of the trouble of culinary skill, unless it should reach a larger size than we at present know.

HETEROSTICHUS, Girard.

GEN. CHAR.—Body very compress-d, and thin posteriorly. Mouth moderate, lower jaw longest; canine teeth upon the jaws, velvet-like teeth upon the vomer and palatines. Opercular apparatus without either spines or denticulations. Branchiostegal rays six in number. One continuous dorsal fin, occupying nearly the whole length of the back, with its upper outline variously depressed; soft portion much shorter than the spinous. Anal fin very long, provided anteriorly with but few spinous rays, and extending posteriorly near the base of the caudal. Caudal fin slender. Scales very small. Lateral line arched above the pectorals.

SYN.—*Heterostichus*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 143.

The most prominent feature of this genus, which is allied to *Percis*, *Pinguipes*, and *Percoptis*, consists in its very compressed body; also in the development and structure of its dorsal fin. The latter originates near the occipital region, and extends to near the base of the caudal. The line described by its upper edge is undulating, owing to the diversity of the rays composing it. The extent of the anal fin, as also the reduced size of the scales, may likewise rank amongst characters of no minor importance.

So far we are acquainted with but one species of this genus, a description of which is here offered, accompanied by a very accurate figure.

HETEROSTICHUS ROSTRATUS, G r d .

PLATE XIII.

SPEC. CHAR.—Head conical, tapering towards the snout; lower jaw longest. Canine teeth small and slender, disposed upon one single row. Caudal fin small, posteriorly emarginated. Anal fin very long, deepest posteriorly. Articulated rays of dorsal highest. Scales minute. Yellowish brown, with irregular transverse blackish blotches. A postocular, triangular, blackish brown blotch.

SYN.—*Heterostichus rostratus*, GRD. Proc. Acad. Nat. Sc. Philad VII, 1854, 143.

The head is rather small and sub-conical, continuous with a compressed body, anteriorly deep, tapering posteriorly to a caudal peduncle, the least depth of which is about the fourth of the greatest depth. The latter, measured across the pectorals, is contained five times in the entire length. The greatest width, anteriorly, is about the half of the greatest depth: fig. 2 will give an idea of its gradual decline posteriorly. The head constitutes about the fourth of the total length, or a little less; its upper outline is very much depressed and slightly concave. The snout being elongated, and the mouth cleft almost to the anterior rim of the orbit. The mouth is rather above the medium size, and might almost be called large. The lower jaw is the longest, and protrudes beyond the upper one. The posterior extremity of the maxillaries reach a vertical line passing in advance of the pupil, and are toothless. The premaxillaries are broadly developed, bearing exteriorly one row of conical and slender teeth, and inwardly an oblong patch (one on each, and closely approximating) of velvet-like teeth; a patch of similar teeth

may be observed upon the anterior part of the vomer and the palatine bones, transverse and triangular, with the summit directed forwards on the former, longitudinal and oblong on the latter. A very narrow space separates the palatine patches from the vomerine one. On the dentaries, or lower jaw, there is one row of conical teeth, altogether similar in shape to those on the upper jaw, or premaxillaries, but are somewhat larger. The eye is of moderate development, sub-elliptical in shape; its horizontal diameter is contained seven times in the length of the side of the head, and about twice anteriorly to the orbit. The various pieces constituting the opercular apparatus are perfectly smooth, and unprovided with either spines or serratures upon their posterior edges. The branchiostegal rays, six on either side, are very much developed; the branchiostegal membrane being torn off in the specimen before us, we are at a loss to know whether there was an isthmus, or whether the branchial aperture from either side met under the throat. At any rate, if an isthmus was present, it could not have been very wide. We are inclined, however, to think that the apertures were continuous. The cheeks and the upper portion of the opercle are covered with very small scales.

Most of the dorsal region is occupied by a fin, spinous in structure for the four-fifths of its length; a vertical line drawn from its origin would intersect the opercle through about its middle. The anterior seven rays are situated along the declivity of the nape; the first is the highest of all, and the seventh the smallest, giving to that portion of the fin a sub-triangular shape. The rest of the spinous portion, composed of thirty rays, maintains a uniform height throughout, and is less elevated than the soft portion. The latter, composed of thirteen or fourteen articulated but undivided rays, is convex upon its upper margin. The posterior rays, when bent backwards, do not quite reach the base of the caudal fin. The caudal fin constitutes the ninth of the total length; its posterior margin is concave, and its lobes are rounded. The rays composing it are simple, or else not bifurcated like those of the dorsal fin. The anal is quite long, and deeper than the dorsal. Its base extends somewhat more posteriorly than that of the latter, and its posterior rays, when bent backwards, nearly approximate the base of the caudal. The anterior two rays are spinous, and shorter than the rest, which remain simple or undivided, as in the caudal and dorsal. The portion of that fin placed opposite the soft rays of the dorsal is a little deeper than the remaining portion. The base of the anal fin is somewhat less than the half of the entire length of the fish. The insertion of the ventrals is situated much in advance of the insertion of the pectorals, immediately under the throat. They are long and slender, composed of four undivided rays, the external of which in a rather rudimentary state. The insertion of the pectorals is placed in advance of a vertical line, which would be drawn from the seventh dorsal spine. They are composed of thirteen undivided rays.

Br. VI: VI; D XXXVII, 13; A II, 34; C 4, 1, 5, 4, 1, 3; V I, 3; P 13.

The scales are exceedingly small, unimbricated, and but very imperfectly arranged into series. They are a little longer than deep, anteriorly almost straight, laterally rounded, and convex posteriorly. Radiating grooves run in all directions from the centre to the periphery. The lateral line is composed of a series of very conspicuous tubes: starting from the upper and posterior angle of the opercle, it forms an undulated arch above the pectoral fins, reaching the middle line of the flanks opposite the origin of the anal, hence straightway to the base of the caudal. Under the abdomen the scales are minute, almost imperceptible. It has already been remarked that the cheeks and the upper portion of the opercle were covered with minute scales. We find the latter extending over the rays of the caudal to a considerable extent; also

along the rays of the dorsal and anal fins. They may be observed, smaller still, on the base of the pectorals.

The ground color is yellowish brown above, and olivaceous along the lower half of the flanks. There are irregularly transverse, blackish brown blotches, sometimes interrupted, when they constitute longitudinal bands or vittæ. The head is deep brown above. An elongated, triangular, deep brown blotch, may be observed extending from the posterior rim of the orbit, its summit, across the upper part of the opercular apparatus, its termination. The sides, and the lower surface of the head are yellowish. The abdomen is dull yellow. The fins have the general hue of the regions to which they belong. The dorsal and anal are blotched in the direction of the transverse bands; the pectorals and caudal are olivaceous, with traces of transverse narrow blackish bars, the ventrals being unicolor.

The entire length of the specimen figured and described is about eleven inches.

References to the figures.—Plate XIII, fig. 1, represents *Heterostichus rostratus* somewhat reduced in size. Fig. 2 is an outline from above. Fig. 3, a scale from the dorsal region. Fig. 4, a tube from the lateral line. Fig. 5, a scale from the abdominal region.

List of specimens.

| Catalogue No. | No. of specimens. | Sex and age. | Locality. | Whence obtained. | Nature of specimens. | Collected by— |
|---------------|-------------------|--------------|-----------------------------|------------------------|----------------------|-----------------|
| 284 | I | Ad't. | San Diego, California | Lieut. Trowbridge..... | Alcoholic. | A. Cassidy..... |

Family SPHYRAENIDÆ, Bonap.

We come now to a family composed, so far, of very few generic representatives, in which the body, being covered with scales cycloid in structure, assumes an elongated and rather slender aspect, though some species grow to a very large size. To give an idea of this, we need but mention that the "barracuda" of our southern States, a fish attaining seven or eight feet in total length, is one of its members. The snout is quite elongated and tapering forwards, the jaws being provided with sharp teeth. There are two dorsal fins, widely separated from each other, the first occupying about the middle of the back, the second about half way between the latter and the caudal. The anal is opposite the second dorsal, and the ventrals are inserted under the first dorsal. The cheeks and opercular apparatus are covered with scales.

The fishes of this family are all marine, and of rather voracious propensities, they being carnivorous, strong, and swift. Their flesh is not held in very great esteem.

SPHYRAENA, Artedi.

GEN. CHAR.—Long and acute teeth upon the premaxillaries, dentaries, vomer and palatines; lower jaw longer than the upper. Premaxillaries forming the external margin of the upper arcade of the mouth. Caudal fin strongly bifurcated. Second dorsal fin well developed, and composed of conspicuous and articulated, or soft rays. Scales small.

SYN.—*Sphyraena*, ARTEDI, Gen. Pisc. Append., 1738. Editio emend. *Walbaum*, 1792, 576.—*Cuv. & Val.*, Hist. nat. Poiss. III, 1829, 325.—*Storer*, Synops., 1846, 47.

This genus is distinguished from *Paralepis* by the protrusion of the lower jaw beyond the upper, the more advanced position of both dorsal fins, and hence of the ventrals. In *Paralepis* the second dorsal being rather small, composed of inconspicuous rays.

SPHYRAENA ARGENTEA, G r d .

PLATE XIV.

SPEC. CHAR.—Head constituting a little more than the fourth of total length. Origin of anal under middle of second dorsal. Origin of ventrals a little in advance of middle of second dorsal. Bluish black above, whitish on the sides, yellowish beneath. Lateral line dark. Argentine reflect all over.

SYN.—*Sphyraena argentea*, GRD. PROC. Acad. Nat. Sc. Philad. VII, 1854, 144.

The body is stoutish, thickest upon the middle of its length and somewhat compressed, the depth being about one-third more than the thickness. The head, constituting a little more than the fourth of the entire length, which, in the specimen figured and described, is thirty-five inches. The snout is conical and pointed, and the mouth of moderate size; the posterior extremity of the maxillary leaves a distance of three-fourths of an inch between it and a vertical line made to pass in advance of the anterior rim of the orbit. The premaxillary teeth are very small; those on the dentary (lower jaw) are moderately developed; on the vomer and palatines they are conspicuous and strong. The eye is sub-elliptical in shape and of medium development; its anterior rim is a little nearer to the tip of the lower jaw than the posterior edge of the opercular apparatus. The posterior margin of the first dorsal fin is nearly equidistant between the extremity of the lower jaw and the base of the central rays of the caudal. It is higher than long, and composed of five spiny rays, the posterior one of which being the smallest and the second the highest. The second dorsal is composed of eleven soft rays, the anterior being quite small; its upper margin is concave; its anterior margin more than twice the height of the posterior, and a little higher than the length of its base. The caudal is deeply forked, composed of eighteen strongly developed rays, and a few rudimentary ones exteriorly to each lobe. The anal has the shape and structure of the second dorsal; its origin is situated opposite the middle of the fin just mentioned. The insertion of the ventrals is about opposite the middle of the first dorsal, mayhap somewhat in advance. Their external spine is strong and acerated. The pectorals are somewhat longer than the ventrals.

Br. VII: VII; D V, 11; A 10; C 4, 1, S; 8, 1, 3; V I, 5; P 13.

The scales are rather small, especially on the dorsal region; they are largest in the lateral line. Their shape is quite irregular, being higher than long on the back and belly, and longer than high on the lateral line, which is straight. The opercular apparatus and the temporal region are densely covered with scales. The upper surface of the head is smooth. The color of the upper region of the head and the body above the lateral line is bluish-black, whitish on the sides and yellowish on the abdomen. The scales exhibit an argentine reflection, which extends to the sides of the head and lower jaw. The lateral line is blackish. The interradiar membrane of the dorsal, caudal, anal, and pectorals, is yellowish, whilst the rays themselves are greyish. The ventrals exhibit a uniform yellowish hue.

References to the figures.—Plate XIV, fig. 1, represents the profile of *Sphyraena argentea*, natural size. Fig. 2, a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|----------------------|-----------------------|----------------------|-----------------|
| 286 | 1 | San Diego, Cal ----- | Lieut. Towbridge----- | Alcoholic----- | A. Cassidy----- |

Tribe of Cataphracti, or mailed cheeks.

A feature common to all the "mailed cheeks" consists in the extension backwards of one, and sometimes two, of the sub-orbital bones as far as the limb of the preopercle, thus constituting a bridge, or else a bony buttress across the cheeks.

We begin the series with the Heterolepid family, which, by its general aspect, reminds us of the Trachinids of the percoid tribe, thus bringing the two groups in closer union.

The family of *Triglidae*, of exclusively marine habits, and which is composed of the gurnards, sea-robins, and sea-swallows of the Atlantic coast, has furnished no representatives along the Pacific coast.

The cottoids, or sculpins, and bull-heads, on the other hand, seem to compensate for the absence of the former in the fresh waters of the western slope of the Rocky mountains, and especially in the sea.

The scorpaenids, or sea scorpions, and rose fishes, exclusively marine also, are well represented, particularly in species of the rose-fish genus, or Norway haddock.

The gasterosteid, or sticklebacks, of the fresh and brackish waters are likewise quite numerous.

Family HETEROLEPIDAE, Girard.

The natural characters which may be assigned to this family, in order to distinguish it from the other groups of Cataphracti, or mailed cheeks, consist in an elongated, sub-fusiform, and rather compressed body, covered with small scales, varying in size, shape, and structure, being either ctenoid or cycloid. The dorsal region is almost entirely occupied by a long and continuous fin, or two distinct fins, more or less contiguous, composed of undivided rays in the former case, of undivided and of articulated ones in the second. The anal fin is elongated, and, generally speaking, resembles the soft portion of the dorsal, with the exception that the interradiation membrane is more or less emarginated. The ventral fins are situated under the pectorals.

Canine teeth exist upon the jaws; either canine, or velvet-like ones, or both kinds upon the vomer and palatines. The head above is spineless, provided sometimes with membranous flaps, like *Scorpaena*. The opercle and preopercle are either smooth or provided with small spines. A bony arcade, formed by the sub-orbitals, may be traced across the cheek, concealed under the flesh, skin, and scales of that region, and which tells of the affinities of this family with the tribe of Cataphracti.

Species of this family were first made known by Pallas, in 1810,* under the names of *Labrax lagocephalus*, *L. decagrammus*, *L. superciliosus*, *L. monopterygius*, *L. octogrammus*, and *L. hexagrammus*. The latter is figured in the illustrated edition of Cuvier's Animal Kingdom, plate lxxxiii, fig. 2, under the head of *Chirus*, a generical name attributed to Steller.

We regret to say that we have had no access to the Memoirs of the Academy of St. Petersburg, above alluded to, and therefore we remain very imperfectly acquainted with the specific descriptions of Pallas, and ignore totally the origin of the genus *Chirus*, as well as its generical characters as formulated by its author.

On a former occasion,† when we described the three following species under the name of *Chirus*, we attempted to circumscribe that genus. Subsequently we thought the range ascribed to it too wide, and availed ourselves of the opportunity to subdivide it, preserving the name of

CHIRUS, Steller.

for those species which are characterized by an elongated body, a small head, and a mouth but little cleft. The jaws being provided with small, conical, and unequal teeth. The opercular apparatus smooth and without spiny processes. A single and continuous dorsal fin occupying most of the dorsal region, and composed of undivided rays. The insertion of the ventral fins being situated immediately posterior to the base of the pectorals. Lateral lines multiple.

This character of the presence of several lateral lines, which *Chirus* has in common with *Chiropsis*, is one of the most curious in the class of fishes, and known to occur in but few instances out of the present family; such the genus *Chela*, a cyprinoid inhabiting the fresh waters of East India. We would mention *Porrichthys*, of the toad-fish family, as another instance, and, perhaps, *Peprilus* of the Scomberoid family.

The fishes of the present family are of a tolerable size, being brought to the San Francisco market, and sell pretty well, especially the species of *Chiropsis*, which are not uncommon. We are inclined to think the flesh of *Ophiodon* and *Oplopoma* more delicate and more highly flavored than in the one just alluded to. They are all inhabitants of the sea.

CHIROPSIS, Girard.

GEN. CHAR.—Body sub-fusiform; head well developed; mouth of medium size. Slender canine teeth on both jaws; velvet-like teeth on the front of the vomer and on the palatines. Opercle and preopercle without either spines or serratures. Cheeks, opercular apparatus, and upper surface of head covered with small scales. A supraocular, arborescent, membranous flap. Gill openings continuous under the throat. Branchiostegal rays six in number. Two dorsal fins, a spinous and an articulated one, occupying most of the dorsal region. Insertion of ventrals situated behind that of the pectorals. Caudal posteriorly rounded or sub-truncated. Scales finely serrated posteriorly. Several lateral lines.

SYN.—*Chiropsis*, GRD. in Proc. Acad. Nat. Sc. Philad. November, 1837, 201.

This genus may be distinguished from that of *Chirus* of Steller by a more compact body, a larger head, and larger mouth, two dorsal fins, the anterior alone composed of undivided rays, and perhaps also by the presence above the orbits of a membranous arborescent flap. All the species of *Chiropsis* known to us up to the present day have the latter character more or less conspicuously developed. The lips are rather thickish and well developed, the mouth more or less protractile, and the pectorals broad, with their inferior rays thick and not dichotomised, and the interradiial membrane emarginated. The scales might almost be termed polymorphic in their outline, so great are the variations observed among them.

* Mém. de l'Académie de St. Pétersbourg, vol. XI.

† Proc. Acad. Nat. Sc. Philada, VII, 1854, 132.

1. CHIOPSIS CONSTELLATUS, Grd.

PLATE XIX.

SPEC. CHAR.—Dorsal fins contiguous. Caudal fin posteriorly sub-concave. Anal exteriorly rounded, or convex. Scales on the middle of the flanks conspicuously larger than elsewhere. Greenish-brown with groups of black dots on the anterior part of body and sides of head. Pectorals densely dotted with black.

SYN.—*Chirus constellatus*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 141.

The body is sub-fusiform, compressed, deepest upon the thoracic region, and diminishing posteriorly towards the base of the tail. The greatest depth is greater than the length of the head, and a little more than the fourth of the total length. The head is contained four times and a half in the total length. The snout is sub-conical, the mouth moderately cleft, and the extremity of the maxillary extends to a vertical line drawn somewhat inwardly to the anterior rim of the orbit. The eye is sub-elliptical, its horizontal diameter being contained a little over four times in the length of the side of the head. The supra-orbital membranous flap is but moderately developed, inserted nearly at right angle with the rim of the orbit, just above the posterior third of the latter. The edge of the flap is fringed, though not so represented on the figure. The branchiostegals are six on either side, and all well developed. The anterior dorsal is somewhat higher than the second, though shorter upon its base. Both fins are contiguous, a feature which the figure fails to represent. The posterior margin of the caudal is likewise sub-concave or sub-emarginated, contrarily to its aspect in the figure published. The caudal fin enters about six times and a half in the total length. The anal is nearly as long as the soft dorsal, but not quite so deep. The tips of the ventrals and pectorals are nearly even, but do not extend quite as far as the vent, which is situated somewhat in advance of the origin of the anal fin.

Br. VI: VI; D XXI, 25; A 24; C 5, 1, 8, 7, 1, 4; V I, 5; P. 19.

The scales are disposed upon distinct series, which may be traced obliquely or longitudinally. In shape, they are much longer than deep, somewhat irregular in their outline, and, generally speaking, ciliated upon their posterior margin, in part (fig. 5), or whole (figs. 7 and 8). Diverging furrows exist upon the anterior section of the scale only. We observe five lateral lines; the uppermost meets its fellow of the opposite side upon the occipital region; hence they diverge and follow the base of the dorsal fin as far as the middle of the soft portion, and there terminate. The second of these lines starts from the nape, and runs along the dorsal region to the base of the caudal fin. Anteriorly, four longitudinal series of scales may be observed between the first and second lines. The third line occupies the usual region; it originates above the opercle, and, concurrent with the dorsal outline, runs towards the middle of the caudal fin. Eight longitudinal series of scales may be counted within the area included between the second and third lines, at their origin. The fourth line may be traced along the lower portion of the flanks from the edge of the branchial fissures, passing beneath the base of the pectorals, hence above the insertion of the ventrals, to disappear towards the peduncle of the tail. Thus the area enclosed by the third and fourth lines embraces the entire side of the abdomen, which is provided with the largest scales. Finally, the fifth line is observed along the mesial line of the thorax and abdomen, commencing near the thoracic belt, branching off right and left one-third of the way between the insertion of the ventrals and the origin of the anal, to terminate near the base of the caudal. The figure does not give an accurate view of the direction of this fifth line. Small scales may be observed upon the base of the caudal, dorsal, and pectoral fins. The upper part of the head, the opercular apparatus, and the cheeks are densely covered with

small scales similar in size and shape to those observed upon the thoracic and abdominal regions. The snout and region in advance of the orbit is perfectly smooth, as also the chin, interopercle and branchial apparatus.

The color is greenish or yellowish brown, lighter beneath than above; obsolete, cloud-like patches appear occasionally on the sides of the body; black dots, disposed in groups varying in number, occupy the anterior and upper region of the back and sides of the head, irregularly arranged in each group around a central whitish or yellowish spot; blackish maculae may also be observed upon the cheeks and opercular apparatus; the pectorals and ventrals are spotted with yellow and black; the other fins are greyish or blackish.

References to the figures.—Plate XIX, figure 1, represents *Chiropsis constellatus*, somewhat reduced in size. Figure 2 is an outline of an upper view, showing the comparative thickness of the fish, as well as the three upper lateral lines. Figure 3, is a section of the body across the line of greatest depth. Figure 4, a scale of the uppermost line. Figure 5, a scale from the area between the first and second lines. Figure 6, a scale from the second line. Figure 7, a scale between the second and third lines. Figure 8, a scale between the third and fourth lines. Figure 9, a scale from the fourth line; and figure 10 a scale from the fifth line.

List of specimens.

| Catalogue number. | Corresponding No. of. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens | Collected by— |
|-------------------|-----------------------|-------------------|--------------|--------------------------|-----------------|-------------------|------------------|---------------------|-------------------|
| 263 | ----- | 1 | Adult | San Francisco, Cal.----- | 1853 | Lieut. Whipple | ----- | Alcoholic | Dr. Kennerly |
| 264 | ----- | 1 | do. | do.----- | do. | Lieut. Williamson | ----- | do. | Dr. Heermann |
| 265 | ----- | 2 | do. | Presidio, Cal.----- | do. | Lieut. Trowbridge | ----- | do. | Lieut. Trowbridge |

2. CHIROPSIS PICTUS, Grd.

PLATE XX, FIGS. 1—4.

SPEC. CHAR.—Dorsal fins contiguous; caudal fin sub-truncated posteriorly. Ground color dark brown, with numerous vermilion spots, bordered with black, upon the sides and lower fins. Under surface of head, throat, and belly whitish or yellowish.

SYN.—*Chirus pictus*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 132.

Gryses lineatus, AYRES, Proc. Cal. Acad. Nat. Sc. I, 1854, 9.

The dorsal outline is more depressed than in the other species of this genus. The greatest depth, which is equal to the length of the head, is, as usual, upon the thoracic region, but it diminishes very gradually towards the peduncle of the tail. The head enters about four times and a half in the total length, as in *C. constellatus*, but the caudal fin, instead of being contained six times and a half in the total length, enters in it seven and a half times. The eye is sub-circular, smaller than in the preceding species, for, its diameter is contained five times in the length of the side of the head. The lips are very fleshy, and the teeth less conspicuous than in *C. constellatus*. The supraocular flaps are well developed, and fringed upon their edges. The base of the first dorsal is a little shorter than that of the second, which is equal to the base of the anal. The fins, as a general feature, are less developed than in *C. constellatus*.

Br. VI: VI; D XIX, 23; A 21; C. 4, 1, 7, 8, 1, 6; V I, 5; P 19.

The scales are more uniform than in *C. constellatus*; they are much smaller upon the opercular apparatus and cheeks than in the latter species. The interopercle, snout, branchiostegal apparatus, are smooth. The type of scales is the same as in the other species of this genus: ciliated posteriorly, and furrowed upon the anterior section only. Those constituting the lateral lines having no ciliæ; and, besides, distinguishable by their pyriform outline, the attenuated extremity being the posterior one. The ordinary scales are much longer than deep. There are five lateral lines, as in the preceding species; the uppermost is not quite so near the dorsal line, and hence closer to the second. No marked differences are observed in their direction, origin, and termination, except that in the fifth, the point of divergence begins at a little distance behind the origin of the ventrals. The diverging curve is elongated. Small scales may be seen upon the base of the caudal, dorsal, and pectoral fins.

The ground color is dark brown above; lighter beneath. Numerous vermilion spots, margined with black, and varying in size, are distributed without system all over the body. The dorsals and caudal fin are blackish brown, unicolor in the adult, blotched in the young. The anal is bluish black, with a series of large vermilion spots. The ventrals are similarly bluish black, but the spots are smaller. The base of the pectorals is brown, with three black crescents; exteriorly yellowish.

References to the figures.—Plate XX, fig. 1, represents *Chiropsis pictus*, somewhat reduced. Fig. 2 is a scale from the abdominal region. Fig. 3 a scale from the middle lateral line. Fig. 4 a scale from the dorsal region.

List of specimens.

| Catalogue number. | Corresponding number of— | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|--------------------------|-------------------|--------------|-------------------------|-----------------|----------------------|------------------|----------------------|------------------|
| 266 | | 2 | Adult | San Francisco, Cal..... | ..... | Lieut. Williamson .. | ..... | Alcoholic. | Dr. Heermann.. |
| 267 | | 1 | ..do.. |do..... | ..... | .....do..... | ..... | .....do... | Dr. Newberry.. |
| 268 | | 3 | ..do.. | Humboldt Bay, Cal..... | ..... | Lieut. Trowbridge .. | ..... | .....do... | Lt. Trowbridge . |

3. CHIOPSIS GUTTATUS, G r d.

PLATE XX, FIGS. 5-8.

SPEC. CHAR.—Dorsal fins contiguous. Caudal fin posteriorly sub-concave. Ground color olivaceous; upper regions with crowded small black spots; fins blackish brown.

SYN.—*Chirus guttatus*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 132.

The body in its general outline is intermediate in form between *C. constellatus* and *C. pictus*, though more like the latter in its general bearing, the dorsal and ventral outlines being more arched. The greatest depth is somewhat greater than the length of the head and contained about four times in the total length. The head is proportionally larger than in the two foregoing species. The caudal fin, on the other hand, enters nearly seven times and a half in the total length, as is the case in *C. pictus*. The eye is larger than in *C. pictus*, since its diameter is contained but four times in the length of the side of the head. The supraocular flaps are

quite small, and, as usual, fringed. The base of the first dorsal is a little longer than that of the second, which is nearly equal to the base of the anal. The first dorsal is more elevated anteriorly than in *C. pictus*. The posterior extremity of the pectoral fins does not extend quite as far back as the tips of the ventrals, which approximate the vent, without, however, reaching it.

Br. VI: VI; D XXI, 25; A 24; C 5, 1, 7, 6, 1, 6; V I, 5; P 19.

The scales are somewhat larger than in *C. pictus*, but similar in shape and structure. There are also five lateral lines, the uppermost of which running nearer the dorsal line than in *C. pictus*. The point of divergence of the fifth of these lines begins nearly midway between the origin of the ventrals and the vent. The curve is also more open. The scales covering the opercular apparatus are larger than in *C. pictus*. The base of the caudal, pectorals, and dorsals exhibit small scales, as in the foregoing species.

The ground color is olivaceous; the sides and upper part of the head are clouded with dusky brown or red. The upper region of the body exhibits crowded, small, blackish spots, extending likewise over the head. The dorsal, caudal, and pectorals are clouded with brown, the anal and ventrals being blackish. The inferior region of the head and belly is unicolor, and of a lighter hue than the back.

References to the figures.—Plate XX, fig. 5 represents *Chiopsis guttatus*, somewhat reduced in size. Fig. 6 is a scale from the dorsal region. Fig. 7, a scale from the middle lateral line. Fig. 8, a scale from the sides of the body.

List of specimens.

| Catalogue number. | Number of specimens. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|----------------------|--------------------------|-----------------|----------------------|----------------------|---------------------|
| 269 | 3 | San Francisco, Cal. | 1853 | Lt. Williamson | Alcoholic..... | Dr. Heermann..... |
| 270 | 1 | Presidio, Cal. | 1853 | Lt. Trowbridge..... | do..... | Lt. Trowbridge..... |
| 271 | 1 | Astoria, Oregon | 1853 | do..... | do..... | do..... |

4. CHIOPSIS NEBULOSUS, Grd.

SPEC. CHAR.—Dorsal fins contiguous. Caudal posteriorly sub-concave. Lower portion of cheeks and opercular apparatus scaleless. Base of anal longer than soft dorsal. Upper region black; inferior region olivaceous.

This species has the general appearance of *C. constellatus*, though a good deal more elongated. The greatest depth is equal to the length of the head, which is contained four times and a half in the total length, in which the caudal enters seven times and a half. The lower half of the cheeks and opercular apparatus is scaleless. The eye is of moderate development, sub-elliptical in shape, its horizontal diameter being contained five times in the length of the side of the head. The supraocular flap is very slender and fimbriated. The spinous portion of the dorsal fin is a good deal longer than the soft portion. The latter is also shorter than the anal, the origin of which is situated in advance of the junction of the two dorsals. The pectorals are very broad; their extremities do not extend quite as far back as the tips of the ventrals, which remain at a considerable distance from the vent.

Br. VII: VIII; D XXV, 19; A 25; C 6, 1, 7 6, 1, 5; V I, 5; P 19.

The branchiostegals are seven in number. The base of the dorsals is scaleless; that of the caudal and pectorals exhibit, as usual, small scales. The upper lateral line does not extend beyond the middle of the spinous portion of the dorsal; the fourth is lost about the anal region; the divergence of the fifth takes place somewhat nearer the origin of the ventrals than the vent. The scales, at large, are of moderate development.

The upper region of the head and body is almost black; the lower portions of the flanks are clouded with black, upon an olivaceous ground. The inferior region of the head and body is olivaceous, punctated with black. The fins are olivaceous, maculated with black, the maculæ upon the anal fin being fewer and much larger than upon the dorsals.

List of specimens.

| Catalogue number. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|--------------|--------------------------------|-----------------|----------------------|----------------------|-----------------|
| 272 | 1 | Adult | Fort Steilacoom, Puget's Sound | 1856 | Governor Stevens.... | Alcoholic..... | Dr. Suckley ... |
| 273 | 1 | do | do | 1856 | do | do | do |

OPLOPOMA, Girard.

GEN. CHAR.—Body elongated. Membranous flaps above the orbits; preopercle spinous; snout conical; mouth large; lower jaw longest. Canine teeth upon the premaxillaries, dentaries, front of vomer, and the palatines. Gill openings continuous; branchiostegals, six on either side. Dorsal fins continuous. Caudal posteriorly sub-crescentic or else concave. Insertion of ventrals a little posterior to the pectorals. Body covered with small, cycloid scales.

SYN.—*Oplopoma*, GRD. Proc. Acad. Nat. Sc. Philad. VIII, 1856, 135.

With the general aspect of *Chirus* and *Chiropsis*, in the shape of the body, cut of the fins, and the presence of a supraocular flap; this genus is related to *Ophiodon* by the shape of the head, the presence of one lateral line only, and the structure of the scales, which are of the cycloid type. Indeed, there is a closer affinity between *Oplopoma* and *Ophiodon* than between the other members of the same group. The pectoral fins resemble those of *Chiropsis* more than those of *Ophiodon*.

OPLOPOMA PANTHERINA, Grd.

PLATE XVIII, Figs. 1—3.

SPEC. CHAR.—Body elongated and tapering. Upper surface and sides of head granular. Preopercular spines few, small and blunt. Posterior extremity of maxillary extending beyond the orbit. Origin of anterior dorsal fin situated in advance of the convexity of the preopercle. Scales extending over the base of both the caudal and pectoral fins. Blackish brown above, reddish brown beneath. Dorsal and lateral regions spotted with black.

SYN.—*Oplopoma pantherina*, GRD. Proc. Acad. Nat. Sc. Philad. VIII, 1856, 135.

The body is very elongated, deepest anteriorly, and tapering gradually from the thoracic region backwards. It is compressed, much deeper than broad throughout its entire length; its profile is sub-fusiform. The head, which constitutes a little more than the fourth of the total length, is elongated and conical, slightly depressed upon the occipital region and between the orbits, sloping rapidly towards the snout. A foliated membranous appendage is to be observed

upon the superior posterior part of the orbit, being about three-eighths of an inch long and half as broad where broadest, inserted transversely, so as to lean backwards and slightly downwards along the orbit. The lower jaw is longer than the upper. The mouth is slightly oblique upwards and rather large, since the posterior extremity of the maxillary extends to a vertical line drawn somewhat posterior to the entire orbit. The jaws are furnished with canine teeth of different size; the largest may be observed upon the branches of the dentaries and upon the vomer; the next in size are on the premaxillaries and the palatines. All these are accompanied by small conical and acerated teeth, irregularly distributed over the bones upon which they are inserted; a group of them may be seen on each side of the symphysis of the premaxillaries. The surface of the tongue is perfectly smooth, thin, and pointed anteriorly. The eye is well developed; sub-elliptical in shape; its longitudinal diameter entering about six times in the length of the side of the head. There are two nostril openings on either side, quite apart from one another; the anterior, which is the largest, is situated in advance of the eye, being much nearer the orbit than the extremity of the upper jaw; the posterior is placed upon the anterior superior rim of the orbit. The convexity of the preopercle is provided with some short and obtuse spines, or rather obtuse processes, mostly hidden under the skin. The rest of the opercular bones are smooth and without spines; the opercle has the shape of an acute triangle, with its summit pointing obliquely towards the back, having at its inferior edge a prominent subopercle, extending beyond the summit of the opercle, and likewise in a very oblique position. The interopercle is also a well developed bone. The gill openings are very widely open, in the shape of an obtuse curve, extending beneath to the hyoide apparatus, and continuous from both sides. The branchiostegals are well developed, six in number, on either side.

The anterior dorsal is nearly twice the length of the posterior, and a little higher upon its middle. It commences at a short distance from the occiput, in advance of a vertical line which would intersect the limb of the preopercle. It is composed of twenty-four spinous and acerated rays, the four anterior being shorter than the sixth and the following, simulating together an independent fin, though much less distinctly than in *Heterostichus rostratus*. The second dorsal, which is united to the first at its base, is composed of twenty-one articulated rays, with two rudimentary ones and a small spine upon its anterior margin, from which a membrane is sent to the posterior spine of the first dorsal. Most of the articulated rays of the second dorsal are bifurcated twice. The caudal fin, which constitutes a little less than the eighth of the total length, is posteriorly concave or sub-crescentic, and composed of twelve branched and two undivided rays, with a few rudiments on each side. The origin of the anal is nearly opposite the anterior margin of the second dorsal, with which it is even posteriorly. It is a lower fin, composed of twenty-one articulated rays and a small spine concealed in the skin at its anterior margin. Most of the rays are bifurcated, and the interrarial membrane emarginated throughout. The ventrals are well developed, composed of five branched rays and a rather strong spine, though covered by the integuments. Their insertion takes place posteriorly to a vertical line passing immediately behind the base of the pectorals. Their posterior extremity does not extend as far as the tips of the latter fins, and leaves the vent far off. The insertion of the pectorals is quite oblique and reaches the inferior surface of the thorax; they are very large, broad, and long, composed of seventeen articulated and branched rays, the inferior ones stouter and shorter, with their interrarial membrane emarginated.

Br. VI—VI; D XXIV, 23; A I, 21; C 2, 1, 6, 6, 1, 2; V I, 5; P 17.

The vent is placed considerably in advance of the anterior margin of the anal, and provided posteriorly with a fleshy, sub-conical appendage.

The scales are small, cycloid in structure, elongated, sub-elliptical, much longer than deep; rudimentary or very small ones may be observed upon the base of the pectorals and caudal and extending to a certain distance along their rays. The upper surface of the head is scaleless, but finely granular. The temporal and facial regions are also granular, whilst over the opercular apparatus the skin is perfectly smooth. The lateral line is composed of a series of membranous tubes.

The ground color is blackish brown above, and reddish brown beneath. The dorsal and lateral regions are scattered all over with small black spots, which may be observed on the opercular apparatus and cheeks. The inferior regions are unicolor.

References to the figures.—Plate XVIII, fig. 1, represents *Oplopoma pantherina*, somewhat reduced in size. Fig. 2, a dorsal scale. Fig. 3, a scale from the abdominal region.

List of specimens.

| Catalogue number. | Measurement. | No. of specimens. | Locality. | When collected. | Whence obtained. | Nature of specimen. |
|-------------------|---------------|-------------------|---------------------------|-----------------|------------------------|---------------------|
| 275 | Inches. 22 | 1 | Cape Flattery, W. T. | 1855 | Lieut. Trowbridge..... | Alcoholic..... |

OPHIODON, Girard.

GEN. CHAR.—Mouth deeply cleft; canine teeth on both jaws; very long patches of velvet-like teeth on the vomer and on the palatines. Convexity of preopercle provided with small spines. Minute scattered scales on the head, cheeks, and opercular apparatus. No membranous flap above the orbit. Gill openings continuous under the throat; isthmus, therefore, absent. Branchiostegal rays six in number. Scales very small, not serrated posteriorly. Lateral line concurrent with the dorsal outline.

SYN.—*Ophiodon*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 133.

The body and head are more slender than in *Chiropsis*; the mouth more deeply cleft and the canine teeth much more developed. The velvet-like teeth constitute longer patches. There is one continuous dorsal fin, the spinous portion of which is longer than the soft and articulated portion, whilst in *Chiropsis* the spinous portion constitutes a separate fin, and is shorter or equal to the soft portion. The absence of a membranous flap above the orbit and the presence of small spines on the preopercle will likewise distinguish *Ophiodon* from *Chiropsis*. The scales, pectinated in one and smooth in the other, will afford the means of discriminating very readily between both genera.

OPHIODON ELONGATUS, GRD.

PLATE XVIII, FIGS. 4-7.

SPEC. CHAR.—Body lanceolated; head sub-conical, depressed. Mouth deeply cleft; posterior extremity of maxillary extending to the vertical of the posterior rim of the orbit. Spinous portion of dorsal fin much longer than the articulated one. Anal somewhat longer than soft portion of dorsal. Caudal slightly emarginated posteriorly. Extremities of the pectorals nearly even with the tips of the ventrals. Color above olivaceous brown, scattered all over with blackish, sub-circular spots. Beneath yellowish.

SYN.—*Ophiodon elongatus*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 133.

The largest specimen observed is about twelve inches in total length, the head forming nearly the fourth of it. The greatest depth of the body, taken across the middle of the abdominal region, enters about six times in the total length; the greatest thickness is one-third less than the depth. Both, depth and thickness, taper posteriorly, giving the body a sub-fusiform profile and a compressed shape. The peduncle of the tail is slender and short.

The head is sub-conical; its upper surface depressed and sloping forwards. The eye, situated towards the upper portion of the side of the head, is rather large and sub-elliptical in shape. Its horizontal diameter is contained five times in the length of the side of the head, once and a half in advance of the orbit. The nostrils are nearer to the orbit than to the tip of snout. The mouth is deeply cleft; the posterior extremity of the maxillary extending to a vertical line which would pass behind the orbit. The lower jaw is somewhat longer than the upper. The maxillaries are toothless; canine teeth, slender and curved backwards, are observed on both of the jaws, on the vomer, and on the palatines. The largest may be observed distant along the dentaries (lower jaw), where they constitute a series, with smaller ones between. They are equally large at the inner and anterior extremity of the premaxillaries (upper jaw), but the rows which they constitute along the branch of these bones are rather slender. On the vomer they are of various sizes, and intermingled, constituting a patch convex forwards. A narrow and elongated band exists along the palatines, small and exiguous, somewhat similar to those occupying the extreme external margin of the upper jaw. The tongue is smooth, thin, cochleiform. The bony arcade across the cheeks is narrow, but more conspicuous than in *Chiropsis*. The cheeks and upper part of the opercle exhibit streaks of minute scales. The limb of the preopercle is provided with small spinous processes, the uppermost directed backwards, the lowermost forwards. The opercle is sub-triangular, terminating into a point posteriorly. The subopercle is very long, well developed, extending a thin blade beyond the opercle. The branchiostegal rays, six on either side, are well developed; the branchial apertures are continuous under the throat.

There is a long and continuous dorsal fin, extending from a line intersecting the posterior curve of the preopercle to a short distance from the base of the caudal. It is composed anteriorly of slender spinous rays, occupying the five-eighths of the entire base; the spines are mostly the deepest anteriorly, diminishing gradually posteriorly; and since the fins extend over that portion of the body which is declivous forwards, this circumstance gives to the upper edge of this portion of the fin a sub-convex outline. The soft or articulated portion is deepest in the middle with a sub-convex outline sloping anteriorly just as the spinous portion is sloping posteriorly, the two lines meeting at the junction of the two portions of the fin where the outline is most depressed. A space of about an inch and a quarter separates the posterior rays of the dorsal from the base of the central rays of the caudal. The latter fin is of moderate development, slightly emarginated posteriorly; it is contained about eleven times in the total length. Its middle rays bifurcate three times upon their length. The anal, convex exteriorly, is somewhat deeper than the dorsal, and a little longer than the soft portion of the latter. Posteriorly they are nearly even. The rays are all soft or articulated, the three anterior short and slender, bifurcating only once towards their extremity. The insertion of the ventrals is situated behind the base of the pectorals; there are five, twice bifurcated rays, and an external slender spine closely united to the next articulated ray. The rays of the pectorals bifurcate but once; the nine uppermost are more slender than the eight remaining ones. The posterior

extremities of these fins are nearly even with the extremities of the ventrals, leaving a distance of an inch and three-quarters between them and the vent.

Br. VI: VI; D XXVI, 22; A 24; C 7, 1, 5, 6, 1, 6; V I, 5; P 17.

The scales are very small, truly cycloid in structure, elongated in shape, sub-ovoid, with their anterior margin undulated by the presence of a few radiating grooves. Those of the lateral line are smaller than those on either the back and abdominal region; the mucous tubes are greatly developed. The upper surface of the head is spread over with minute scales. The latter may likewise be observed along the rays of the caudal fin to nearly the half of their length.

The ground color of the upper regions of the body and head is olivaceous brown; there are irregular or sub-circular blackish spots scattered all over the back and sides, the head and cheeks; also over the dorsal and caudal fins, the ground color of which is the same as that of the back. The lower region of the flanks and the belly are uniform yellowish or dull whitish. The anal and ventrals are generally unicolor, and sometimes yellowish at the base, and brownish or blackish exteriorly. The ventrals are barred transversely with dark brown or black on a yellowish or olivaceous ground.

References to the figures.—Plate XVIII, fig. 4, represents *Ophiodon elongatus*, somewhat reduced in size. Fig. 5 is a scale from the dorsal region. Fig. 6, a scale from the lateral line. Fig. 7, a scale from the sides of the abdomen.

List of specimens.

| Catalogue numbers. | No. of specimens. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|--------------------|-------------------|-------------------------------|-----------------|-------------------------|----------------------|----------------------|
| 276 | 2 | San Francisco, California ... | 1853 | Lient. Williamson..... | Alcoholic..... | Dr. Heermann |
| 277 | 2 | Humboldt bay, Cal. | 1855 | Lieut. Trowbridge | do..... | Lient. Trowbridge... |

Family COTTIDÆ, Girard.

A trait belonging to all cottoids, properly so called, consists in the absence of true scales, and which we have found so diversified in the foregoing family. The skin, however, does not constitute a smooth and uniform covering to the head and body throughout all the members of the present family, and in that respect we meet with almost the same diversity of dermic productions. In some genera the skin, indeed, is perfectly smooth; in others, it is studded with minute prickles, either simple or compound, rendering it very rough to the touch; others, again, exhibit longitudinal series of bony shields; and, still, others are provided with parallel rows of small scale-like plates of various forms and structure.

The head is always very large; the body very thick anteriorly, and tapering rapidly posteriorly. Its upper surface, in most instances, exhibits spines or tuberosities. The opercular apparatus is likewise provided with spines, larger still, thus well deserving the name of "sculpins," by which these fishes are commonly designated.

There are two dorsal fins, sometimes contiguous upon their base, sometimes separated. The anterior fin is always composed of spiny rays. The anal is situated opposite the second dorsal

and generally well developed. The ventrals are situated under the pectorals, posteriorly to the base of the latter fins, and composed of a small number of rays. The pectorals themselves are very large, broad, or expanded, with their inferior rays undivided (though articulated) and projecting beyond the interradiial membrane, which is emarginated.

We observe three complete gills and a half one; the last gill aperture being wanting. The complete gills are those which are composed of two branchial combs; the half gill having but one of these.

The teeth are mostly of the velvet-like type, varying but little according to the genera. They occur upon the jaws in all; but the palate may be either entirely smooth, or else velvet-like teeth may occur upon the front of the vomer, or along the palatine bones also.

Were it not for their large and spiny head, and the repugnance of fishermen of handling them, the cottoids would be seen oftener in our markets, particularly the large marine species, which are quite palatable, especially when stewed or made into chowders. The wounds which they may inflict with their spines, supposed venomous, being the chief cause why the American seacoast people are unwilling to have anything to do with them. On a few occasions, however, when other fishes were scarce, we have seen the "sculpin" caught with hook and line, decapitated on being hauled up, and thus carried home; a safe method, indeed. Another reason for the antipathy of fishermen towards the "sculpin," is the mischief caused to their nets whenever it gets entangled into them.

COTTOPSIS, Girard.

GEN. CHAR.—Head perfectly smooth; small spines upon the opercular apparatus, especially the preopercle. Mouth moderately cleft; jaws equal. Teeth upon the premaxillaries, dentaries, front of vomer, and palatines. Gill openings separated beneath by an isthmus; branchiostegals six in number. Dorsal fins contiguous upon their base; anterior one lower than the posterior. Caudal sub-convex posteriorly. Insertion of ventrals under the base of pectorals. Skin beset with minute prickles. Lateral line continuous from head to tail, sometimes falling slightly upon the peduncle of the tail.

SYN.—*Cottopsis*, GRD. Proc. Bost. Soc. Nat. Hist. III, 1850, 303; Smith. Contr. to Knowled. III, 1852, 61.; &, Nouv. Mém. Soc. Helv. Sc. Nat. XII, 1851, 185.

The natural characters of this fresh water genus approximate it closely to *Leptocottus* of marine habits. The chief points in which they differ are observed in the gape of the mouth, the relative length of the jaws, and the structure of the skin. The spines on the preopercle might afford some minor distinctive marks; but so far as the physiognomy of these two genera is concerned, nothing is more distinct.

1. COTTOPSIS ASPER, Grd.

SPEC. CHAR.—Origin of first dorsal opposite the insertion of the upper ray of pectorals. First ray of anal under the fourth of second dorsal. Tip of pectorals extending to a vertical line passing posterior to the vent. Skin generally prickly; lateral line slightly deflected upon the peduncle of the tail. Greyish white, studded with clove-brown spots; beneath speckled.

SYN.—*Cottus asper*, RICH. Faun. Bor. Amer. III, 1836, 295 and 313, Pl. xcv, fig. 1.

Trachidermis richardsoni, HECK. Ann. Wien. Mus. II, 1837, 162.

Centridermichthys asper, RICH. Voy. Sulph. Ichthyol. 1844, 74; &, Rep. Ichthyol. China and Japan (Rep. Brit. Assoc.)

Cottopsis asper, GRD. Proc. Bost. Soc. Nat. Hist. III, 1850, 303; Nouv. Mém. Soc. Helv. Sc. Nat. XII, 1851, 185; &, Smith. Contrib. to Knowled. III, 1852, 62.

Some years ago, while preparing for publication the fresh water members of the cottoid group, it was with a sense of deep regret that we saw the work passing through the press without having had an opportunity of studying from nature the species at that time known to inhabit Columbia river. A succession of fortunate events have placed in my hands a series of specimens of

the "prickly bullhead," some of which collected near Astoria, others above the Cascades, at Fort Dalles. Their average size is between six and seven inches, a few inches smaller than those described by Sir John Richardson.

The body, viewed in profile, is sub-fusiform, tapering gradually backwards; it is compressed and deeper than broad throughout the whole length, though the difference in height and depth become greater posteriorly. The dorsal line is slightly arched, whilst the abdominal is nearly straight. The head, which is broader than deep, forms the third of the entire length, the caudal fin excluded. The upper surface is depressed, the cranial region widely concave, without the least trace of ridges, tubercles, or spines, except the minute spines of the turbinal bones which are hidden under the skin. The snout is sub-convex above, and rounded upon its periphery. The jaws are of equal length, though the inferior lip may project somewhat beyond the upper when the mouth is closed. The latter is broad; the posterior extremity of the maxillary extends to a vertical line intersecting the posterior edge of the pupil. The eyes are of medium size, sub-circular or elliptical in shape, contained, by their longest diameter, five times in the length of the side of the head; the interocular space is about one of their diameter; the rostral distance is greater of one-fifth or sixth. The anterior nostril is situated nearly midway between the rim of the orbit and the margin of the upper jaw. The convexity of the preopercle is armed with an acute spine, curved upwards and covered by the skin so as scarcely to be seen exteriorly. The inferior edge of the same bony piece exhibits two minor spines entirely buried under the integuments. The inferior angle of the opercle has a similar spine directed forwards. Finally, the scapular terminates into an acute point concealed under the skin and perceptible only to the touch.

The origin of the first dorsal is situated on a vertical line intersecting the base of the upper ray of the pectorals; it is composed of nine, sometimes ten, rays implanted upon a base not quite half the length of the second dorsal, to which it is connected by a low membrane; the sixth and seventh spines are the longest; the outline of the fin forms a convex, somewhat depressed line. The second dorsal commences a little in advance of the anus, extending also somewhat further back than the anal; it is composed of twenty-one or two undivided rays, projecting beyond their membrane. The caudal is slightly rounded posteriorly; it is contained six times and a half in the total length, composed of nine branched rays and a few simple ones. The origin of the anal is situated opposite the fourth ray of the second dorsal; it is not quite so deep as the latter is high; seventeen undivided rays may be observed in it. The interradi- al membrane is more deeply emarginated than in the second dorsal. The ventrals are situated posterior to the three inferior rays of the pectorals, and anterior to the upper ones. The extremities do not reach the anus. The pectorals are broad, obliquely obovate, composed of sixteen or seventeen undivided rays, with the interradi- al membrane emarginated between all of them, though less deeply between the upper rays, which are also more slender than the lower ones. Their extremity reaches a vertical line intersecting the anterior margin of the anal.

Br. VI—VI; D IX, 21; A 17; C 3, 1, 5, 4, 1, 2; V I, 4; P 17.

Br. VI—VI; D X, 22; A 17; C 3, 1, 5, 4, 1, 2; V I, 4; P 16.

Showing a very slight difference between the rays in specimens of different localities.

The lateral line is conspicuous, in the shape of a furrow exhibiting a series of contractions. From the upper angle of the thoracic arch it takes its course along the flanks, keeping nearer the dorsal than abdominal outlines, sometimes deflected under the posterior portion of the second dorsal, as in *Cottus proper*.

There are no scales; the skin of the head is perfectly smooth; the vertex, however, is provided

with soft, very small warts. The abdominal region, an area adjoining the base of the anal and caudal, and the interscapular space in advance of the first dorsal, are perfectly smooth; the skin covering the rest of the body is thickly studded with very small, subulate, acute spines directed backwards. These spines are too minute to be seen with the naked eye, but will resist the finger when drawn against their points.

The ground color of the upper and lateral regions is yellowish brown, with black dots and spots; the head and fins being greyish white, with crowded spots and dots of black. The abdomen and inferior region of the head are whitish, with crowded black dots.

The species inhabit the fresh waters of Oregon and Washington Territories.

List of specimens.

| Catalogue numbers. | Corresponding No. of. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|--------------------|-----------------------|-------------------|--------------|--|-----------------|-------------------------|------------------|----------------------|-----------------------|
| 287 | ----- | 6 | Adt. | Astoria, Oregon ----- | 1855 | Lieut. Trowbridge ----- | ----- | Alcoholic. | Lieut. Trowbridge--- |
| 288 | ----- | 1 | do | Fort Dalles, Oregon----- | 1856 | Governor Stevens----- | ----- | do----- | Dr. Geo. Suckley ---- |
| 289 | ----- | 1 | do | Ft. Steilacoon, Puget's S'd, W. T.----- | 1856 | do----- | ----- | do----- | do----- |

2. COTTOPSIS GULOSUS, Grd.

SPEC. CHAR.—Origin of anterior dorsal fin situated opposite the insertion of the upper ray of pectorals. First ray of anal fin placed under the fourth of second dorsal. Extremities of pectorals extending beyond the origin of the anal. Skin generally smooth; lateral line undergoing a sudden fall upon the peduncle of the tail. Reddish brown, spotted, and transversally barred with black; beneath unicolor.

SYN.—*Cottopsis gulosus*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 129.

The most distinctive characteristic of this species consists in the general smoothness of the skin and the interruption of the lateral line upon the peduncle of the tail, features which lead to the genus *Cottus* proper, from which, however, this species differs by the presence of a well developed band of teeth upon the palatine bones. The general aspect of grown specimens is rather contracted, thickish and short; the head is especially thick, and constitutes the third of the length, the caudal fin excluded. The body is compressed, as deep as broad upon the insertion of the pectorals, and deeper than broad posteriorly. The upper surface of the head is flattened, the snout slightly declivous and rounded anteriorly. The mouth is broad, the jaws equal, and the lips conspicuously developed. The eye is rather small and circular, as usual near the upper surface of the head, and contained five times in the length of the sides of the head. The upper preopercular spine, the largest, is visible externally, conical, acute, and directed backwards and upwards, whilst two much smaller ones, situated upon the inferior limb of the same bone, are directed downwards and forwards. The branchiostegal rays are all well developed; the width of the isthmus enters about three times in the distance between it and the extremity of the lower jaw.

The origin and relative position of the fins have nothing peculiarly different from *C. asper*. The extremity of the posterior rays of both the second dorsal and anal, however, extend nearly

evenly as far as the insertion of the caudal ; the base of the anal, as usual, ending before that of its opposite fin. The rays are all undivided.

Br. VI—VI ; D IX, 18 ; A 14 or 15 ; C 3, 1, 5, 4, 1, 2 ; V 1, 4 ; P 15.

The skin is smooth all over, except on a space immediately behind the pectorals, where the characteristic prickles of the genus may be seen, of a minuteness to deceive a superficial observer. The lateral line runs straightway from the upper part of the thoracic arch to opposite the last ray of the second dorsal, where it makes a sudden fall to reach the middle of the peduncle of the tail ; hence straight again towards the base of the caudal. Along the flanks it is much nearer the dorsal than the abdominal outlines. Large mucous pores are observed along the inferior surface of the dentaries and along the lateral line also.

The ground color of the upper regions is of a reddish brown, dotted or maculated, and sometimes even transversally banded with black. Beneath, unicolor, whitish, or dull yellowish. Fins blackish brown ; caudal and pectorals variegated with black ; external edge of ventrals whitish ; upper margin of dorsal yellowish.

The species inhabits the fresh waters of California.

List of specimens.

| Catalogue number. | Corresponding No. of— | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|-----------------------|-------------------|--------------|-------------------------|-----------------|-------------------|------------------|----------------------|---------------|
| 290 | ----- | 2 | Adt. | San Matteo creek, Cal | 1854 | R. D. Cutts | ----- | Alcoholic. | R. D. Cutts |
| 291 | ----- | 2 | Yg. | San Joaquin river, Cal. | 1853 | Lieut. Williamson | ----- | do. | Dr. Heermaun. |
| 292 | ----- | 1 | Yg. | Upper Pitt river, Or. | 1856 | do. | ----- | do. | Dr. Newberry |

3. COTTOPSIS PARVUS, Grd.

SPEC. CHAR.—Origin of first dorsal situated posteriorly to the insertion of the upper ray of pectorals. First ray of anal placed under the fourth of second dorsal. Extremities of pectorals extending to the anterior margin of the anal. Skin generally prickly ; lateral line slightly deflected upon the peduncle of the tail. Olivaceous, maculated with blackish.

SYN.—*Cottopsis parvus*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 144.

This species may readily be distinguished from *C. gulosus* by a body more fusiform and a head more depressed, in which particulars it resembles *C. asper* most. The head forms exactly the fourth of the total length ; its upper surface is gradually sloping towards the snout, which is obtusely rounded. The jaws are equal in length, and the cleft of the mouth oblique upwards ; the posterior extremity of the maxillary reaching a vertical line intersecting the pupil nearly through its middle. The eye is of medium size, elliptical in shape ; its horizontal and greatest diameter entering nearly five times in the length of the side of the head. The preopercular spines are quite inconspicuous.

The origin of the first dorsal is situated a little backwards of the insertion of the upper ray of the pectorals ; its upper margin forms a depressed convexity ; it is connected by a membrane to the second dorsal. The rays are eight in number, inserted upon a base entering twice and a half in the length of the second dorsal. The latter is composed of twenty or twenty-one undivided rays, the tips of the posterior ones not reaching the insertion of the caudal. It is

also much higher than the anterior dorsal. The caudal is subtruncated or rounded posteriorly, and constitutes a little less than the sixth of the entire length. The anterior ray of the anal is situated opposite to the fourth ray of the second dorsal. The tips of the posterior rays of that fin terminate almost evenly with those of the dorsal, although its base does not extend quite as far. The interradiial membrane is, as usual, deeply emarginated. The tips of the pectorals extend to a vertical line passing immediately in advance of the anal. The inferior eight rays having their interradiial membrane emarginated and are somewhat thicker than the upper ones.

Br. VI—VI ; D VIII, 21 ; A 17 ; C 4, 1, 5, 4, 1, 3 ; V I, 4 ; P 16.

“ “ A 15 ; 5, 1, 4, 4, 1, 4 ; “ P 15.

The head, a small area on each side of the anterior edge of the first dorsal, a narrow band on each side of the base of the anal, a space about the caudal fin and the belly, are perfectly smooth.

The rest of the surface of the body is densely beset with minute prickles, which in the young are more developed above the lateral line than beneath it. The lateral line itself is very conspicuous, running straightway from the upper part of the thoracic arch to near the termination of the second dorsal, hence, falling somewhat, reassumes a direct course to the base of the caudal.

The ground color of the body, head, and fins, is olivaceous, maculated with blackish ; occasionally the maculæ, in running into each other, will assume a sinuous aspect, especially on the sides of the head and towards the lower part of the flanks. The inferior regions are generally unicolor, with the exception of the lower jaw over which the maculæ may extend. The fins are all—some transversely, others obliquely—barred with a series of black confluent spots. A conspicuous black patch is observed at the upper and posterior portion of the first dorsal.

This species, like the preceding, inhabits the fresh waters of California.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|-----------------------|------------------------|----------------------|-------------------------|
| 293 | 3 | Monterey, Cal..... | Lt. Trowbridge..... | Alcoholic..... | Lt Trowbridge..... |
| 294 | 2 | Presidio, Cal..... |do..... |do..... |do..... |
| 295 | 4 | Fort Reading, Cal ... | Dr. J. F. Hammond..... |do..... | Dr. J. F. Hammond |
| 296 | 12 | Petaluma, Cal | E. Samuels |do..... | E. Samuels |

OLIGOCOTTUS, Girard.

GEN. CHAR.—Head smooth, with the exception of a few spines upon the preopercle and snout. Upper jaw slightly the longest. Teeth upon the premaxillaries, dentaries, front of vomer, and palatines. Gill openings continuous under the throat ; branchiostegals, six. Anterior dorsal lower than the posterior. Caudal posteriorly rounded. Insertion of ventrals backwards of the base of pectorals. Skin smooth or slightly prickly. Lateral line continuous for the whole length of the body.

SYN.—*Oligocottus*, GRD. Proc. Acad. Nat. Sc. Philad. VIII, 1856, 132.

The genus which we institute under the above denomination is the smallest we know of in the cottoid group, the stickle-backs excepted. It bears close affinities to both *Leiocottus* and

Leptocottus. From the former it differs by the presence of teeth on the palatine bones and the absence of maxillary barbels; from the latter by the continuity of the gill openings, the insertion of the ventrals; and, finally, from both, as well as from all the genera of this family, by the structure of the anal fin, the three anterior rays of which are stouter, more developed, and somewhat isolated from the rest, especially in the male sex.

1. OLIGOCOTTUS MACULOSUS, Grd.

SPEC. CHAR.—Head sub-conical. Mouth moderately cleft; posterior extremity of maxillary extending to a vertical line intersecting the pupil. A stoutish bicuspid process on the convexity of the preopercle. Two acute nasal spines. Dorsal fins contiguous. Origin of anal in advance of the anterior margin of second dorsal. Yellowish brown above, mottled or variegated with blackish; along the dorsal region a series of blotches of a deeper hue; lower half of sides vermiculated. Abdomen of a bright saffron hue in the male. Inferior surface of head with traces of black markings; throat and abdomen unicolor, as also the ventrals and anal. Dorsals, caudals, and pectorals transversely barred.

SYN.—*Oligocottus maculosus*, GRD. Pro. Acad. Nat. Sc. Philad. VIII, 1856, 133; & Journ. Bost. Soc. Nat. Hist. VI, 1857. Plate xxiv, Fig. 7.

Among all the specimens which we have examined, none attained an absolute size of three inches; and what gives us to think that we deal with adult individuals is the fact that the females are full of ripe spawn, and both sexes clothed with the brilliant hue peculiar to that eventful period in ichthyic life.

The head is but very slightly broader than deep; its upper surface is depressed and smooth, the interocular space grooved, the snout very declivous, and consequently short, narrow, and rounded upon its periphery. The upper jaw protrudes slightly beyond the lower one; the mouth is small, being but moderately cleft; the posterior extremity of the maxillaries extending to a vertical line intersecting the pupil. The eye is sub-circular, and its diameter contained four times in the length of the side of the head, exactly once in advance of its anterior rim. The head itself forms a little less than the fourth of the entire length. A rather stout bicuspid process arises from the convexity of the preopercle with its acute spines directed obliquely upwards. No other spines are apparent upon the opercular apparatus. We omitted, in speaking of the upper surface of the head, to mention two prominent and acute nasal spines; the nostrils being, as usual, placed one behind, and the other beneath, each spine. The branchial apertures are continuous under the throat, and the branchiostegal rays six in number.

The body is very much compressed, sub-fusiform, and deeper than broad even anteriorly. The anterior dorsal is lower than the posterior one, and contiguous to the latter near its base; its origin is situated in advance of the base of the pectorals, and consequently close to the occiput. It is composed of eight slender spines nearly equal in height, giving the outline of the fin the appearance of a depressed curve. Its base is somewhat more than the half of that of the second dorsal. The latter is composed of sixteen or seventeen slender and undivided rays, diminishing slightly in height from the second backwards, the first ray being a little shorter than the second. The extremities of the posterior rays do not quite reach the base of the caudal. The caudal fin is slender and proportionally well developed; it constitutes a little less than the fifth of the total length, being comprised three times on the space between its base and the thoracic belt. The origin of the anal fin is situated a little in advance of the anterior ray of the second dorsal, composed of thirteen undivided rays, the three anterior of which being deeper and stouter than the rest, particularly in the male, where they project beyond the general outline of the fin. The interradiial membrane is deeply emarginated. The extremities of the posterior rays do not extend so far back as those of the dorsal opposite. The ventrals are

slender, composed of three soft rays and one spine. Their origin is situated posteriorly to the insertion of the pectorals, and their tip reaches, and slightly overlaps the vent, which is situated near the anterior margin of the anal fin, and provided upon its posterior edge with a double membranous flap. The pectorals, composed of thirteen undivided rays, the eight inferior of which, stouter with their membrane emarginated, are well developed. Their insertion is unusually oblique, and extends towards the inferior surface of the thorax, while their extremities project beyond the origin of both the anal and the second dorsal.

Br. VI: VI; D VIII, 17; A 13; C 3, 1, 5, 4, 1, 2; V I, 3; P 13.

The skin is perfectly smooth and the lateral line well marked, running from the upper part of the thoracic arch to the base of the caudal, making a downward inflection or curve upon the middle of the flanks.

The ground color of the upper region of head and body is yellowish brown, mottled or variegated with blackish; along the dorsal region a series of blotches of a deeper hue may be observed from the occiput to the base of the caudal; the lower half of the sides is rather vermiculated than mottled in the male, and the abdomen of a bright saffron or yellow hue. The inferior surface of the head presents traces of black markings; the throat and abdomen are unicolor, as also the ventrals and anal. The dorsals, caudal, and pectorals are transversely barred upon a yellowish ground.

This species inhabits the salt waters of the Pacific coast from California to Washington Ter.

List of specimens.

| Catalogue number. | Corresponding No. of | No. of specimens. | Age and sex. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|----------------------|-------------------|--------------|-----------------------------|-----------------|-------------------------|------------------|----------------------|---------------------|
| 297 | ----- | 4 | Adt. | Tomales bay, California.... | 1855 | E. Samuels | ----- | Alcoholic.. | E. Samuels..... |
| 298 | ----- | 6 | .do. | San Francisco bay, Cal.... | 1853 | Lieut. Trowbridge | ----- |do..... | Lieut. Trowbridge.. |
| 299 | ----- | 1 | .do. | Ft. Steilacoom, Puget's S'd | 1853 | Gov. Stevens..... | ----- |do..... | Dr. Suckley..... |

2. OLIGOCOTTUS ANALIS, Grd.

SPEC. CHAR.—Head sub-conical. Mouth moderately cleft; posterior extremity of maxillary extending to a vertical line drawn across the posterior rim of the pupil. Preopercular spines moderate. Two acute nasal spines. Dorsal fins contiguous. Origin of anal situated posteriorly to the anterior margin of the second dorsal. Dorsal region prickly. Greenish olive, maculated and spotted with black. Abdomen whitish, unicolor.

SYN.—*Oligocottus analis*, GRD. in Proc. Acad. Nat. Sc. Philad. November, 1857, 201.

The present species seems to be more closely allied to *O. maculosus* than to *O. globiceps* in the shape of its head and in the approximation of its dorsal fins. It, however, resembles more *O. globiceps* by the structure and position of the anal fin. From both it differs by the situation of the vent, and the presence along the dorsal region of very minute prickles, such as are sometimes observed in other genera of the cottoid group.

The largest specimen before us measures nearly three inches and a half in total length. The head, which is sub-conical, constitutes about the fifth of it. Its upper surface is rounded, whilst it is nearly flat beneath, with the upper jaw slightly overlapping the lower, giving the mouth a nearly horizontal gape. The preopercular spines are moderate, less developed than in *O. maculosus*.

The body is very much compressed, darter-shaped in its profile, the back being quite arched. The origin of the dorsal fin corresponds to a vertical line which would intersect the inferior edge of the base of the pectorals; it is contiguous to the second, the posterior rays of which, when inclined backwards, approximate the base of the caudal. The origin of the anal fin is situated opposite the third ray of the second dorsal. It is slightly convex exteriorly, the membrane between the rays being emarginated, and the depth of the fin itself less than the height of the second dorsal, its posterior rays not extending quite as far back. The posterior margin of the caudal is sub-truncated, or slightly rounded; it is a little shorter than the head. The tips of the ventrals reach the anterior margin of the anal. The vent is situated about midway between the insertion of the ventrals and the anterior margin of the anal, thus quite in advance of the latter fin, a character quite peculiar to this species. The pectorals are very large, their extremities extending somewhat beyond the origin of the anal.

Br. VI: VI; D IX, 17; A 13; C 3, 1, 5, 4, 1, 2; V I, 3; P 15.

The dorsal region above the lateral line is beset with minute prickles, whilst the region beneath is quite smooth.

The ground color is greenish olive, the upper surface of the head being nearly black. The dorsal region exhibits a series of black blotches or spots, the intervening spaces, as well as the inferior region of the flauks, being dotted with black. The belly is whitish and unicolor, whilst the inferior surface of the head, being white also, is maculated with black. The dorsal fins are greyish black, occasionally spotted; the caudal, anal, and pectorals are olive, and barred with black, whilst the ventrals are dull yellow, or white, and unicolor.

This species has been observed on the coast of California.

List of specimens.

| Catalogue number. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|--------------|---------------------------|-----------------|-------------------|----------------------|------------------|
| 486 | 7 | Adult | Monterey, California..... | 1856 | A. S. Taylor..... | Alcoholic..... | A. S. Taylor.... |

3. OLIGOCOTTUS GLOBICEPS, G r d.

SPEC. CHAR.—Head rounded anteriorly. Mouth moderately cleft; posterior extremity of maxillary extending to a vertical line drawn posteriorly to the pupil. Rudimentary spines upon the preopercle. Two acute nasal spines. Dorsal fins separated. Origin of anal situated somewhat posteriorly to the anterior margin of the second dorsal fin. Reddish brown; upper regions maculated with black; beneath unicolor, and lighter than above.

The general physiognomy of this species reminds us forcibly of certain species of blennies and gobies, owing to its peculiarly rounded head, a feature not common in the cottoid group.

The head is as deep as broad; its upper surface is convex and smooth, the snout very abruptly truncated, rounded, hence broad and very short. The upper jaw is slightly protracted beyond the lower. The mouth is moderate, though proportionally broad; its short gape is in harmony with the abbreviated snout; the posterior extremities of the maxillary extend to a vertical line passing behind the pupil. The eye is circular, of moderate development, situated towards the upper surface of the head, above which the orbit is slightly raised.

Its diameter is contained three times and a half in the length of the side of the head, less than once in advance of the anterior rim of the orbit. The head itself forms about the fifth of the total length. A blunt and inconspicuous spine may be observed upon the convexity of the preopercle, with its apex directed obliquely upwards. The upper and posterior angle of the opercle terminates into a flat process. The nasal spines are exiguous and acerated. These are the only spines observed about the cephalic region. The branchial fissures are continuous under the throat, and the branchiostegal rays six in number, as in the preceding species.

The body is very much compressed, sub-fusiform in its outline, swollen upon the thoracic region, and tapering posteriorly.

The anterior dorsal, which is lower than the second, is separated from the latter by a narrow space. The tips of the posterior rays of the second dorsal approximate very closely the base of the caudal. The base of the first dorsal is contained once and a half in that of the second. The caudal fin enters five times and a half in the total length; its posterior margin is sub-convex or rounded. The origin of the anal fin is situated a little posteriorly to the anterior margin of the second dorsal, and does not extend as far back as the latter; its depth is about equal to the height of the second dorsal, its opposite. The ventrals are slender, overlap the vent, and reach the anterior margin of the anal; their origin is situated backwards of the base of the pectorals. The base of the pectorals is oblique; its lower end corresponds to a vertical line drawn somewhat in advance of the anterior margin of the first dorsal fin. Their extremities extend beyond the tips of the ventrals, and beyond the anterior margin of the anal also.

Br. VI: VI; D IX, 16; A 12; C 5, 1, 5, 4, 1, 6; V I, 3; P 14.

The skin is perfectly smooth, the lateral line very conspicuous; from the upper edge of the opercular apparatus, it slopes down the thoracic region towards the middle of the flanks, hence straightway towards the base of the caudal.

The ground color is reddish brown, the head and back maculated and spotted with black, the lower half of the flanks and belly unicolor. The fins are olivaceous, spotted and dotted with black.

This species occurs on the coast of California.

List of specimens.

| Catalogue number. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|--------------|--------------------------|-----------------|----------------------|----------------------|------------------|
| 300 | 4 | ♂ ♀ | S. Farallones, Cal | 1855 | Lt. Trowbridge | Alcoholic..... | Lt. Trowbridge . |

LEPTOCOTTUS, Girard.

GEN. CHAR.—Head perfectly smooth; spines upon the preopercle only. Mouth deeply cleft, upper jaw longer than the lower one. Teeth upon the premaxillaries, dentaries, front of vomer, and palatines. Gill openings separated beneath by an isthmus; branchiostegal rays six in number. Dorsal fins separated. Caudal sub-truncated posteriorly. Insertion of ventrals immediately under the base of pectorals. Skin smooth. Lateral line continuous for the whole length of the body.

SYN.—*Leptocottus*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 130.

The affinities of this genus with *Cottopsis* have already been alluded to above. From the marine genera it differs by well marked characters, one of which is the preopercular spine process and its rather small anterior dorsal fin. The upper aspect of the head is smooth, as in *Leiocottus*, and partly also as in *Scorpaenichthys*, but it has none of the cutaneous flaps which the latter is provided with.

LEPTOCOTTUS ARMATUS, Grd.

PLATE XV, FIG. 2.

SPEC. CHAR.—Head much depressed; upper jaw longer than the lower; posterior extremity of maxillary extending somewhat beyond the vertical of the posterior rim of the orbit. A preopercular process provided with three spines directed upwards. Blackish brown above; whitish beneath; dorsals, caudal and pectorals yellowish, barred with black; anterior dorsal with a black spot posteriorly. Ventrals and anal whitish.

SYN.—*Leptocottus armatus*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 131 & 145; & VIII, 1856, 133.

Acanthocottus inermis, AYRES, MSS.

The general physiognomy of this species is quite peculiar by its head and anterior portion of the body being broader than deep; at the origin of the first dorsal the depth is equal to the width, the latter diminishing more rapidly backwards than the former, so as to measure considerably less. The head forms a little less than the third of the whole length; its upper surface is very much depressed, and grooved upon its middle. The snout is broad and flattened, the upper jaw protruding over the lower one. The mouth is broad and rather large; the posterior extremity of the maxillary extending somewhat beyond a vertical line drawn across the posterior rim of the orbit. The anterior and tubular nostril is nearly midway between the margin of the upper jaw and the anterior rim of the orbit. The eyes are of medium size, and partly situated on the upper surface of the head; their shape is sub-elliptical, and their longitudinal diameter comprised about six times and a half in the length of the sides of the head. A stout and horizontal process may be observed upon the convexity of the preopercle, and terminated by three acute and hook-like spines curved upwards. Another process, small and obtuse, exists beneath upon the inferior limb of the same opercular bone. The head otherwise is smooth; the bones of the skull slightly perceptible, the middle sub-orbital inconspicuous, and the opercle margined by a loose membrane. The isthmus is broad; its width is contained nearly four times in the distance extending between its angle and the extremity of the lower jaw. The branchiostegals are well developed, and six on either side.

The first dorsal fin is lower than the second, and much longer than high; its upper margin forms a convex curve; it is composed of seven or eight slender spines, the third and fourth of which being the highest. The origin of that fin meets a vertical line drawn immediately behind the superior portion of the insertion of the pectorals. The second dorsal is nearly contiguous to the first at its base; it is composed of seventeen or eighteen slender and undivided rays, gradually diminishing in height posteriorly from the fifth, which is the highest. The caudal is slender and sub-truncated, constituting a little less than the seventh of the entire length, and composed of nine bifurcated rays, two simple ones, and a few rudiments above and below. The origin of the anal takes place nearly opposite the fifth ray of the second dorsal, extending posteriorly as far as the latter; its terminal rays, mayhap, projecting a little further backwards. Its shape is the counterpart of the second dorsal, but not quite so deep as the latter is high; it is composed of sixteen or seventeen slender and undivided rays, the membrane intervening which being slightly emarginated. The vent is situated at a short distance from the anterior

margin of that fin, and provided posteriorly with a small flap. The ventrals are small and slender, composed of four soft and one spinous rays. Their origin is but very little behind the inferior portion of the insertion of the pectorals. The distance between their posterior extremity and the vent is equal to the length of the same fins. The pectorals are broad and well developed; their extremities extend as far backwards as the third or fourth ray of the second dorsal, and consequently near the origin of the anal and stretching beyond the vent. They are composed of nineteen or twenty undivided rays, the inferior ones shorter and stouter than the upper, and their intervening membrane emarginated.

B VI: VI; D VIII, 18; A 17; C 6, 1, 5, 4, 1, 7; V I, 4; P 20.

The skin is perfectly smooth; the lateral line conspicuous, nearer the dorsal than the ventral outline along the anterior half of the flank, but running along its middle posteriorly, and thus reach the base of the caudal fin.

The ground color is of a coffee brown above, maculated or clouded with deep black. The inferior surface of the head, the extremity of the maxillaries, the inferior part of the opercular apparatus, the entire branchiostegal apparatus, the belly, ventral fins, the anal, and inferior part of the tail, are of a uniform whitish or yellow, with a metallic reflect, which extends even to the sides. The caudal and pectoral fins are yellowish, transversely barred with large bands of black. The dorsals are likewise yellow, longitudino-obliquely barred with black. A jet black spot, moreover, is to be observed upon the upper and posterior margin of the anterior dorsal fin.

This species seems to be quite common along the Pacific coast, from Puget's Sound, Oregon, to San Diego, California. The largest specimens were those from fort Steilacoom and the bay of Monterey, and measured from twelve to fourteen inches.

Reference to the figure.—Plate XV, fig. 2, represents *Leptocottus armatus*, size of life.

List of specimens.

| Catalogue numbers | No. of specimens. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|-------------------------------|-----------------|-------------------------|----------------------|-------------------|
| 301 | 6 | Cape Flattery, W. T. | 1853 | Governor Stevens..... | Alcoholic..... | Dr. Suckley |
| 302 | 4 | Fort Steilacoom, W. T. | 1853 |do..... |do..... |do..... |
| 303 | 12 | Shoal Water bay, W. T. | 1853 |do..... |do..... | Dr. Cooper |
| 304 | 3 | Humboldt bay, Cal. | 1853 | Lieut. Trowbridge..... |do..... | Lt. Trowbridge.. |
| 305 | 1 | San Francisco, Cal. | 1853 |do..... |do..... |do..... |
| 306 | 3 | Monterey, Cal. | 1853 |do..... |do..... |do..... |
| 307 | 1 | San Pedro, Cal. | 1853 |do..... |do..... |do..... |
| 308 | 2 | Fort Point, Cal. | 1853 |do..... |do..... |do..... |
| 309 | 4 | San Diego, Cal. | 1853 |do..... |do..... | A. Cassidy..... |
| 310 | 4 | San Francisco, Cal. | 1853 | Lieut. Williamson |do..... | Dr. Heermann .. |
| 311 | 3 | San Francisco, Cal. | 1856 |do..... |do..... | Dr. Newberry...- |
| 312 | 2 | Tomaes Bay, Cal. | 1855 | E. Samuels |do..... | E. Samuels..... |
| 502 | 1 | Sands of Monterey Beach | 1856 | A. S. Taylor..... |do..... | A. S. Taylor....- |

LEIOCOTTUS, Girard.

GEN. CHAR.—Head perfectly smooth; spines upon the preopercle only. Mouth moderately cleft; jaws equal. Teeth upon the premaxillaries, dentaries, and front of vomer; none on the palatines. Barbules at the maxillaries. Gill openings continuous under the throat; branchiostegal rays, five. Dorsals nearly contiguous upon their bases. Ventrals inserted backwards of the base of the pectorals. Caudal posteriorly subtruncated. Skin perfectly smooth, bearing neither prickles nor scales. Lateral line well marked, and continuous from head to tail.

SYN.—*Leiocottus*, GRD. Proc. Acad. Nat. Sci. Philad. VIII, 1856, 133.

This genus is allied to *Leptocottus*, of which it has the general physiognomy. It is, however, distinguished from it by a smaller mouth and equal jaws; by the absence of teeth upon the palatine bones, the continuity of the gill openings, and the presence of five branchiostegals, instead of six. It differs from *Scorpaenichthys* by a smooth head and the absence of teeth on the palatine bones.

LEIOCOTTUS HIRUNDO, GRD.

PLATE XVI, FIGS. 2 & 3.

SPEC. CHAR.—Snout declivous and rather pointed; posterior extremity of maxillary provided with two or three barbules, and reaching a vertical line drawn a little beyond the anterior rim of the orbit. Superior regions blackish brown; whitish under the abdomen, and yellow under the tail.

SYN.—*Leiocottus hirundo*, GRD. Proc. Acad. Nat. Sci. Philad. VIII, 1856, 133.

The general aspect of this species is elongated; sub-fusiform when viewed in profile. The body is compressed, deeper than broad upon its whole length. The head enters about three times in the length of the body and caudal fin; its upper surface is depressed, nearly flat; the fronto-nasal region very declivous, and the snout prominent. The mouth is but moderately cleft; the posterior extremity of the maxillary upon which two or three thread-like barbels may be observed, reaches posteriorly a line which would be drawn a little inwardly of the anterior rim of the orbit. Teeth exist upon the premaxillaries, dentaries, and front of the vomer, whilst the palatine bones are smooth and toothless. The jaws are equal, and surrounded by conspicuous lips. The nostrils are situated towards the upper surface of the snout, much nearer to the orbit than the extremity of the snout, and preceded by a small, inconspicuous spine. The eyes are large and sub-circular, approximating the upper surface of the skull. Their longitudinal diameter enters about four times in the length of the side of the head. A bifurcated spine may be observed upon the convexity of the preopercle, with the points turned upwards. Two smaller and obtuse spines exist along the inferior margin of the same bone.

A vertical line drawn from the origin of the first dorsal fin would strike the middle of the base of the pectorals, and therefore a portion of the opercle also. It is composed of nine spiny rays, the anterior one being the highest of all the dorsal rays. The second is next in size, and somewhat shorter than the highest rays of the second dorsal. The remaining rays are all much shorter than the second dorsal, and that portion of the fin which they constitute is convex upon its upper margin. The membrane of the posterior ray of the first dorsal does not quite extend to the anterior ray of the second dorsal. The second dorsal is composed of seventeen undivided rays, diminishing slightly in height posteriorly. The caudal is subtruncated, composed of nine bifurcated rays, and two undivided, together with a few rudimentary ones above and below. That fin forms about the fifth of the total length. The origin of the anal is situated opposite

the fourth ray of the second dorsal; it is composed of sixteen undivided rays less deep, and the membrane by which they are united, emarginated between all of them. The posterior extremities of the rays are even with those of the second dorsal. The vent is a little nearer to the insertion of the ventrals than the anterior margin of the anal fin. Upon its posterior margin is a fleshy tongue-shaped appendage. The origin of the ventrals is somewhat backwards of the base of the pectorals. They are slender, composed of one spine and three soft rays, overlapping considerably the anus, but not reaching the anal. The pectorals are quite large; their posterior extremity reaches a vertical line drawn in front of the fourth ray of the anal fin. It is composed of eighteen undivided rays, the nine inferior ones being shorter and stouter; the membrane between all is indentated or emarginated.

Br. V: V; D IX, 17; A 17; C 4, 1, 4, 5, 1, 3; V I, 3; P 18.

The body is perfectly smooth and scaleless. The lateral line, formed of a series of small tubes, is very conspicuous, uninterupted from head to the tail. It starts from the upper part of the opercle, hence descends along the abdomen, forming an open curve convex downwards, then follows a straight course along the middle of the tail.

The ground color of the upper part of the head and body is dark brown, blotched with black. The inferior region of the head is greyish; the abdomen dull whitish, with greyish spots or dots, and the tail yellowish. The fins are of a greenish olive hue, spotted or maculated with black.

References to the figures.—Plate XVI, figure 2, represents, in profile, *Leiocottus hirundo*, size of life. Figure 3 is a view of the under surface of the head.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | Whence obtained. | Nature of specimen. | Collected by— |
|-------------------|-------------------|---------------------------------|-------------------------|---------------------|------------------|
| 313 | 1 | Island of San Miguel, Cal | Lieut. Trowbridge | Alcoholic..... | Lt. Trowbridge.. |

SCORPAENICHTHYS, Girard.

GEN. CHAR.—Upper surface of head bony, corrugated. A membranous flap above the orbit, another upon the snout. A few small spines upon the preopercle. Mouth deeply cleft; jaws equal. Teeth on the premaxillaries, dentaries, front of vomer, and palatines. Gill opening continuous under the head; branchiostegal rays six in number. Dorsal fins contiguous upon their bases. Caudal truncated. Ventrals inserted back of the base of pectorals. Skin smooth, without either scales or plates. Lateral line distinct and continuous for the whole length of the body.

SYN.—*Scorpaenichthys*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 131.

This genus is very closely allied to *Hemitripteris*, having, like the latter, teeth upon the vomer and palatines, as well as upon the jaws. The membranous flaps which are observed on the head constitute another feature, reminding us of *Hemitripteris*. It differs, however, from it by the insertion more backwards of the ventral fins, the structure of the anterior dorsal, which is as high upon its posterior half than anteriorly, although a slight depression exists towards its middle, indicating its affinities with *Hemitripteris*. The second dorsal is longer than the first, the reverse of what it is in *Hemitripteris*, whilst the anal is proportionally shorter.

SCORPAENICHTHYS MARMORATUS, Gr d.

PLATE XVI, FIG. 1.

SPEC. CHAR.—Membranous flaps upon the upper and posterior part of the orbit, upon the snout, and at the posterior extremity of the maxillary bones. The latter extending to a vertical line passing immediately behind the eye. Two spines of moderate development upon the preopercle. Fins all well developed. Ground color either light or dark brown, marmorated with black.

SYN.—*Scorpaenichthys marmoratus*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 131 and 145; & VIII, 1856, 133.

Hemitripteris marmoratus, AYRES, Proc. Cal. Acad. Nat. Sc. I, 1854, 4.

The head is very large and robustly built, constituting the third of the whole length, the caudal fin excluded. It is nearly as deep as broad upon the occipital region; the cranial region is sub-depressed and sloping towards the orbits; hence very declivous to the end of the snout, which is obtusely rounded. The region of the skull, as also the suborbital, temporal, and opercular regions, exhibit the corrugated surface of the bones. The orbital flap is fringed somewhat arborescent, and the largest; the rostral is flat, triangular, and entire, implanted vertically upon the snout. Those upon the posterior extremity of the maxillaries are smaller still, and fringed. The eye is well developed and sub-circular near the upper surface of the head, above which the rim of the orbit is slightly raised. Their longitudinal diameter is contained six times in the length of the side of the head. The nostrils are nearer the orbit than the margin of the upper jaw; as usual, the posterior opening is situated inwardly in advance of the orbit behind the spinous turbinal, whilst the anterior opens on the sides of the snout. The mouth is large, which might be inferred from the development of the head, and the fact that the posterior extremity of the maxillary extends backwards to a vertical line drawn across the posterior rim of the orbit. Two spines, of rather moderate size, may be observed upon the convexity of the preopercle, the uppermost being the largest of the two. The gill openings are continuous under the throat; the branchiostegals are six on either side.

The body is compressed much deeper than broad, even anteriorly, with a profile either sub-fusiform or somewhat thickish, according to sexes and age. The fins are all well developed. The first dorsal, which is composed of eleven spines of nearly equal depth, has about the same height as the second dorsal; the interradial membrane is emarginated. The origin of the fin is near the occiput, even with a vertical line drawn across the insertion of the last ray but one of the lower part of the pectoral fins. The base of the same fin is a little less than the fourth of the entire length. The second dorsal, which is contiguous to the first, is composed of nineteen bifurcated rays, inserted over a base somewhat longer than the third of the total length. The caudal is subtruncated posteriorly, and contained about five times in the entire length; it is composed of nine branched and two simple rays and rudimentary ones. The origin of the anal is situated opposite the fifth ray of the second dorsal, and is not quite so deep as the latter is high; its base is a little less than that of the first dorsal; composed of thirteen, some of which bifurcated rays, with the interradial membrane deeply indentated. The extremity of the posterior rays projects slightly beyond those of the dorsal. The origin of the ventrals takes place posterior altogether to the insertion of the pectorals; these fins are rather long and slender, composed of one spine and five articulated rays; their extremity does not reach as far back as the vent, neither as far as the extremity of the pectorals. The latter are very broad, inserted upon the oblique margin of the gill opening, and extending to the inferior surface of the head. The rays are sixteen in number; the nine inferior ones thick and simple, with the

interradial membrane emarginated; whilst the upper ones are more slender and bifurcated upon their extremity, which is even with their membrane.

Br. VI: VI; D XI, 19; A 13; C 6, 1, 5, 4, 1, 5; V I, 5; P 16.

The skin is perfectly smooth; the lateral line runs uninterrupted from the upper part of the thoracic arch to the base of the caudal, following the middle of the flanks from the origin of the second dorsal backwards.

The ground color of the head, body, and fins is either of a light or a dark chocolate brown, over which are spread, without any apparent order, black patches and streaks, giving the whole a marmorated appearance.

Reference to the figure.—Plate XVI, figure 1, represents the profile view of *Scorpenichthys marmoratus*, somewhat reduced in size, and caught in the bay of San Francisco, California.

List of specimens.

| Catalogue number. | Corresponding No. of No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens | Collected by— |
|-------------------|--|--------------|---------------------------|-----------------|-------------------|------------------|---------------------|-------------------|
| 314 | 3 | Adt. | San Francisco, California | 1853 | Lieut. Williamson | ----- | Alcoholic | Dr. Heermann |
| 315 | 2 | | do do | do | do | ----- | do | Dr. Newberry |
| 316 | 1 | Adt. | Presidio, California | do | Lieut. Trowbridge | ----- | do | Lieut. Trowbridge |
| 317 | 1 | | S. Farallones, California | 1855 | do | ----- | do | do |
| 318 | 2 | | Monterey, California | 1853 | do | ----- | do | do |
| 319 | 6 | Adt. | Humboldt bay, California | 1854 | do | ----- | do | do |
| 320 | 1 | | Astoria, Oregon | 1854 | do | ----- | do | do |
| 321 | 3 | Yg. | Tomales bay, California | 1855 | E. Samuels | ----- | do | E. Samuels |

ASPICOTTUS, Girard.

GEN. CHAR.—Bones of the head exposed and corrugated. Opercular apparatus armed with strong spines. Mouth moderately cleft; jaws equal. Teeth on the premaxillaries, dentaries, and front of the vomer; none on the palatines. Gill openings separated beneath by an isthmus; brachiostegal rays six in number. Dorsal fins distinctly separated. Caudal posteriorly rounded. Insertion of ventrals opposite the base of pectorals. Lateral line formed by a series of bony scutellae extending from head to tail. Skin otherwise smooth.

SYN.—*Aspicottus*, RD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 130; & VIII, 1856, 133.

Clypeocottus, AYRES, Proc. Cal. Acad. Nat. Sc. I, 1854, 12.

To this genus is to be referred *Cottus bubalis*, of Euphrasen, an inhabitant of the Baltic and Norwegian seas. The latter species is so closely related to *A. bison*, described below, that it is only upon a careful comparison that the two can be distinguished.

The genus is well characterized by the great development of the suborbital bones and the presence of a lateral series of bony shields altogether different from the scale-like plates of *Hemitripterus* and *Artedius*.

ASPICOTTUS BISON, Grd.

PLATE XV, FIG. 1.

SPEC. CHAR.—The posterior extremity of the maxillary extends to a vertical line drawn midway between the posterior edge of the pupil and the posterior rim of the orbit. The scutellae constituting the lateral line are crowded, vertically elongated. Upper regions dark brown, mottled or blotched with black. Beneath dull yellowish, with meandric dark lines under the head and throat. Ventrals uniform yellowish white; other fins mottled yellow and black.

SYN.—*Aspicottus bison*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 130; & VIII, 1856, 133.

Clypeocottus robustus, AYRES, Proc. Cal. Acad. Nat. Sc. I, 1854, 11

The head, which constitutes about the third of the whole length, the caudal fin excluded, is very large, and much broader than deep. The body in being likewise broader than deep upon its anterior third, the consequence is the short and stoutish appearance of this species. The upper surface of the head is corrugated, the orbital region is convex and raised above the general surface; the cranium is slightly depressed between two parieto-occipital ridges. The eyes are sub-circular, of moderate development; their longitudinal diameter enters about five times in the length of the sides of the head. The posterior nostril is the smallest, and is situated immediately in advance of the orbit and behind the turbinal bone on the upper surface of the snout. The anterior nostril opens on the side of the snout exteriorly to the turbinal and nearer the orbit than the margin of the jaw; its posterior margin is provided with a fringed membranous expansion. The snout is declivous and rounded; the jaws are equal, and the mouth broad though not deeply cleft, since the posterior extremity of the maxillary does not extend as far back as the posterior rim of the orbit. The middle suborbital is stout and conspicuous, terminating into a flattened point at the concavity of the preopercle. The latter is provided with four spines, the uppermost being very long, and extending backwards to the posterior edge of the opercle, which it sometimes overlaps; the two next ones are small and directed obliquely downwards; the fourth may be seen at the lower extremity of that bone and directed obliquely forwards. The opercle has three spines—one, rather stout, along the upper margin of that bone, and two small ones towards its inferior margin, and directed obliquely downwards. Finally, the posterior extremity of the interopercle exhibits the last and smallest spine of the opercular apparatus. The isthmus is rather large, being equal to about the third of the distance between its angle and the extremity of the lower jaw. The branchiostegals are six in number, all well developed.

The origin of the first dorsal corresponds to a vertical line drawn immediately behind the upper portion of the insertion of the pectorals, and, consequently, at a very short distance from the occiput. It is composed of eight rather slender spines, the fourth and fifth of which being the highest; the fin itself is lower than the second dorsal, and its upper outline sub-convex. It is separated by a narrow space from the second dorsal, which is composed of twelve rays inserted upon a base one-third longer than that of the first. The caudal, which constitutes about the sixth of the entire length, is posteriorly sub-truncated, composed of nine bifurcated and two undivided rays, with several rudimentary ones above and below. The origin of the anal is situated opposite the fourth ray of the second dorsal, and does not extend as far back as the latter, although the tips of the last rays may be even, owing to the greater length of the posterior rays of the anal. The fin itself is not quite so deep as the second dorsal; the membrane between the rays is deeply emarginated. The insertion of the ventrals is nearly opposite the middle of the base of the pectorals; they are elongated, but do not reach the vent, which is situated a

little in advance of the anal fin. These fins are proportionally more developed than in its congener of the seas of northern Europe, *A. bubalis*. The insertion of the pectorals is very long, extending almost to the inferior surface, along the branchial aperture, towards the isthmus. These fins are composed of sixteen or seventeen rays, very thick and short inferiorly, with the interradiar membrane emarginated. The tips of the longest rays extend posteriorly to a vertical line drawn across the insertion of the second ray of the second dorsal.

Br. VI: VI; D VIII, 12; C 4, 1, 4, 5, 1, 5; V I, 3; P 17.

The course of the lateral line is occupied by a series of oblong and vertically elongated bony plates, from thirty to thirty-three in number, diminishing gradually in size posteriorly. Anteriorly, the series is contiguous to the humerus, and for the distance occupied by the anterior dorsal it lies upon the dorsal region; further behind it falls a little towards the flanks, but remains throughout nearer the dorsal outline. The skin otherwise is perfectly smooth.

The ground color of the upper regions is dark olive, or brown, dotted, blotched or mottled with jet black. The inferior regions are dull yellow or olive, with crowded meandric, dark streaks under the head, throat, lower part of the flanks, and tail. The ventrals, and generally the anal, are unicolor, like the inferior abdominal region. The anal, however, is sometimes blackish upon its periphery. The ground color of the other fins is yellow or olive, upon which are spread black spots and blotches similar to those distributed over the body.

Reference to the figure.—Plate XV, fig. 1, represents, somewhat reduced, *Aspicottus bison*, from the bay of San Francisco, California.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|--------------------------------|-------------------|----------------------|-------------------|
| 322 | 1 | Fort Steilacoom, Puget's Sound | Gov. Stevens | Alcoholic | Dr. Suckley |
| 323 | 1 | Fort Point, Cal. | Lient. Trowbridge | do | Lient. Trowbridge |
| 324 | 1 | San Francisco, Cal. | Lient. Williamson | do | Dr. Heermann |
| 325 | 1 | Tomales bay, Cal. | E. Samuels | do | E. Samuels |

HEMILEPIDOTUS, Cuv.

GEN. CHAR.—Head rough and prickly, with membranous flaps on various parts; opercular apparatus spinous. Mouth moderately cleft; jaws equal. Teeth upon the premaxillaries, dentaries, front of vomer, and palatines. Gill openings separated beneath by an isthmus; branchiostegals, six on either side. Dorsal fins contiguous. Caudal rounded or sub-truncated posteriorly. Insertion of ventrals opposite the base of pectorals. Longitudinal bands of scales alternating with smooth or naked areas; scales themselves finely denticulated.

SYN.—*Hemilepidotus*, Cuv. Règn. Anim. 2d ed. II, 1829.—Cuv. & Val. Hist. nat. Poiss. IV, 1829, 275.—Storer, Synops. 1846, 59.—Grd. in Proc. Acad. Nat. Sc. I, Philad. VIII, 1856, 134.

Calycilepidotus (in part), Ayres, Proc. Cal. Acad. Nat. Sc. I, 1855, 76.

The genus *Hemilepidotus* was established by Cuvier upon the very characters which we have just endeavored to diagnosticate, and as such it has been adopted by the subsequent writers.

HEMILEPIDOTUS SPINOSUS, Ayres.

SPEC CHAR.—Upper surface and sides of head provided with membranous flaps. Eye quite large. Posterior free extremity of maxillary extending to a vertical line drawn across the posterior rim of the pupil. Dorsal band of scales composed of six rows or series; lateral band, of seven, five below and two above the lateral line. Ground color dark reddish brown, with darker transverse bands and blotches.

SYN.—*Hemilepidotus spinosus*, AYRES, MSS.—GRD. Proc. Acad. Nat. Sc. Philad. VIII, 1856, 134.

Calycepidotus spinosus, AYRES, Proc. Cal. Acad. Nat. Sc. I, 1855, 76.

The head in this species constitutes the third of the whole length, not including the caudal. It is depressed, broader than deep, grooved between the orbits, slightly depressed upon the skull, and covered with small spinous processes and membranous flaps. A fringed pair of the latter (one on each side) may be observed upon the occipitals, the upper and posterior rim of the orbit, the upper angle of the opercle, and upon the cheeks. A similar, but not fringed, flap is seen at the posterior free extremity of the maxillary. A narrow and rather elongated pair exist upon the chin near the symphysis of the dentaries. The eyes are large, sub circular, and slightly turned upwards; their longitudinal diameter enters about three times and a half in the length of the sides of the head, and not quite once in advance of their anterior rim. The interocular space is narrow. The anterior nostril is tubular and nearer to the eye than the extremity of the upper jaw. The turbinals are conspicuously spinous; the snout blunt and rounded. The posterior extremity of the maxillaries extend backwards to a vertical line drawn posteriorly to the pupil. The limb of the preopercle is provided with four spines; the two uppermost being the largest and more close together than the remaining two, which occupy the inferior branch of that bone. The preopercle exhibits two spines—an elongated one, buried in its upper margin, and another rather short, at the inferior angle of the same bone. The branchial apertures are separated under the throat by an isthmus, the width of which is contained about five times in the distance, comprised between its edge and the extremity of the lower jaw. The branchiostegals are six on either side, the inferior one being rather small and slender.

The body, anteriorly, is almost as wide as deep; it becomes, however, soon compressed posteriorly, so as to be deeper than broad. The profile is sub-fusiform in specimens of medium size.

The origin of the anterior dorsal fin is situated in advance of a vertical line intersecting the base of the pectorals. It is composed of eleven spinous rays distributed over a space somewhat less than the half of the base of the second dorsal. The three first rays are nearly equal and shorter than the fourth and all the succeeding ones, except the two last; it results from this structure that the outline of the fin is depressed between the third and fourth rays. The second dorsal is contiguous to the first at their bases; it is composed of twenty articulated but undivided rays, constituting a fin higher than the anterior, and extending to very nearly the base of the caudal, for, the tips of the terminal rays overlap slightly the insertion of the caudal rays. The caudal itself is rather small, rounded, or sub-convex upon its posterior margin, and contained six times and a half in the total length; it is composed of nine bifurcated and two undivided rays and rudiments of rays. The origin of the anal is situated opposite the fifth ray of the second dorsal; it is not quite so deep as the latter is high, and does not extend quite so far posteriorly. The sixteen rays of which it is composed are all undivided, the interradiation membrane being deeply emarginated. The insertion of the ventrals takes place immediately opposite the upper portion of the base of the pectorals; they are elongated and slender, composed of four soft and one spinous rays, the extremities of which do not reach the vent. The

pectorals are broad, composed of fifteen rays; the extremity of the middle and longest reaching a vertical line which would intersect the anus and the fourth ray of the second dorsal. The interradiial membrane is emarginated between all, but more deeply below than above.

Br. VI: VI; D XI, 20; A 16; C 4, 1, 5, 4, 1, 3; V I, 4; P 15.

The dorsal band of scales is composed anteriorly of six, tapering posteriorly into two longitudinal rows or series. The band of either side meets its fellow in advance of the dorsal fin. The scales themselves are concave or funnel-shaped, with their free margin finely denticulated or serrated; they are directed obliquely upwards, largest upon the inferior row, and diminishing gradually to the upper row; the sixth is quite irregular, existing only upon a short distance. The scales of the lateral band have the same general structure as those just referred to, though generally larger; we observe one row above and two below the lateral line, upon the distance covered by the pectorals; upon the middle of the flanks successively five, four, three, and two, as we proceed towards the peduncle of the tail, below the lateral line and one above it, to half-way along the tail. The series constituting the lateral line itself is the largest of the whole set, and continuous from the head to the base of the caudal. Elsewhere the skin is perfectly smooth.

The ground color is dark reddish brown, with darker or blackish blotches, assuming sometimes the shape of transverse bands upon the upper region of the body, the head, and the fins. The inferior surface is unicolor, but the anal is barred or blotched like the other fins, and the ventrals are greyish.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|-------------------|----------------------------|--------------------|------------------|----------------------|--------------------|
| 326 | 6 | San Francisco, California. | Lieut. Williamson. | | Alcoholic. | Dr. Newberry. |
| 327 | 2 | Humboldt bay, Cal. | Lieut. Trowbridge. | | do. | Lieut. Trowbridge. |
| 365 | 1 | San Francisco, California. | Dr. Ayres. | 33 | do. | Dr. Ayres. |

ARTEDIUS, Girard.

GEN. CUAR.—Head rough, with supraorbital membranous flaps. Spines upon the preopercle only. Mouth moderately cleft; lower jaw slightly overlapped by the upper. Teeth upon the premaxillaries, dentaries, front of the vomer, and palatines. Gill openings continuous under the throat; branchiostegals five on either side. Dorsal fins separated. Caudal sub-truncated posteriorly. Insertion of ventrals opposite the base of the pectorals. A dorsal band of pectinated scales.

SYN.—*Artedius*, GIRD. Proc. Acad. Nat. Sc. Philad. VIII, 1856, 134.

Calycilepidotus (in part), AYRES, Proc. Cal. Acad. Nat. Sc. 1, 1855, 76.

The genus which we here inscribe to the memory of an ichthyologist whose works prepared the road towards a clear and concise zoölogical nomenclature, is intermediate between *Aspicottus* and *Hemilepidotus*. It differs from the former by the presence of teeth on the palatine bones, the absence of spines upon the opercle, and the existence along its dorsal region of a band of small denticulated scales, disposed upon several series. The fact that there are five branchiostegals instead of six may also be taken into consideration. From *Hemilepidotus* it is distin-

guished by the absence also of spines upon the opercle and membranous flaps upon the head; by the lower jaw being overlapped by the upper; by the existence of an isthmus separating the gill openings; by the presence of five branchiostegals instead of six; by the separation of the dorsal fins; and, finally, by the fact that there is but one longitudinal band of denticulated scales along the dorsal region.

Its affinities with *Scorpenichthys* are much closer than apparent. The membranous flaps above the orbits, the continuity of the gill openings under the throat, the presence of spines upon the preopercle only, are sufficient proofs of it. Indeed, it can be distinguished from *Scorpenichthys* simply by the presence of its dorsal band of scales, its five branchiostegals instead of six, its anterior dorsal lower than the second, the insertion of the ventrals under the pectorals, and which are composed of three soft rays, instead of five.

The external aspect of *Artedius* will remind the fresh water bullheads to the most superficial observers. The head is large, depressed, and broader than deep, as also the anterior portion of the body, whilst posteriorly it is compressed, and very much tapering towards the caudal fin.

1. ARTEDIUS LATERALIS, GRD.

PLATE XXII *a*, FIGS. 5 & 6.

SPEC. CHAR.—Surface of head smooth. Preopercle armed with a flat bicuspid spine. Band of dorsal scales narrow, originating at the thoracic arch and extending to near the terminus of the base of second dorsal. Anterior margin of first dorsal situated in advance of the thoracic arch. Deep chestnut brown above, maculated with yellowish; beneath yellowish.

SYN.—*Scorpenichthys lateralis*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 145.

Hemilepidotus nebulosus, AYRES, MSS.

Calyculpidotus lateralis, AYRES, Proc. Cal. Acad. Nat. Sc. I, 1855, 77.

Artedius lateralis, GRD. Proc. Acad. Nat. Sc. Philad. VIII, 1856, 134.

The head of the specimen before us enters about three times in the length, excluding the caudal fin. The occipital region is flattened; the interocular space, which is quite narrow, is convex, and the rostral distance declivous. The mouth is broad; the posterior extremity of the maxillary extends to a vertical line drawn posterior to the pupil. The eye is well developed, sub-circular in shape, and situated towards the summit of the head; its horizontal diameter is contained a little over four times in the length of the side of the head; about once in advance of the anterior margin of the orbit. The anterior nostril is a little nearer the orbit than the extremity of the snout, whilst the posterior is situated posteriorly and inwardly of the latter, in a little depression behind a small and acerated spine, terminating the turbinal bones. A short and flat bicuspid process may be observed upon the convexity of the preopercle, the spines being slightly bent upwards. The rest of the opercular apparatus is perfectly smooth.

The first dorsal is much longer than high, and its anterior margin is situated anterior to the upper part of the insertion of the pectorals, being almost even with a line passing through the suprascapular bone; in advance, therefore, of the posterior and membranous flap of the opercle. It is composed of nine slender rays. The second dorsal, which is higher than the first, extends from a little distance of the latter to near the insertion of the caudal, the extremities of the posterior rays at least reaching almost to the base of that fin. Its rays, seventeen in number, are articulated but undivided. The caudal fin, posteriorly sub-convex, composed of nine bifurcated and two simple rays, with several rudiments. The fin itself is contained about five times and a half in the total length. The origin of the anal is situated opposite the fourth ray of the second dorsal, and does not extend quite as far posteriorly; it is composed of eleven slender and undivided rays

somewhat shorter than in the opposite fin. The insertion of the ventrals takes place in advance of a line intersecting the middle of the base of the pectorals. These fins are rather slender, their tips not reaching the vent. They are composed of a spine and three articulated but undivided rays. The base of the pectorals is quite oblique, sub-crescentic, and following the outline of the gill apertures, so that its inferior portion reaches the inferior surface of the head. The fins themselves are broad, the inferior rays much stouter than the rest, and the middle ones considerably longer than the upper and lower; their extremities extending somewhat beyond a line intersecting the anterior margin of the anal. The rays, fifteen in number, are all undivided, though articulated.

Br. V: V; D IX, 17; A 11; C 3, 1, 5, 4, 1, 2; V I, 3; P 15.

The upper surface and sides of the head are perfectly smooth; a small membranous flap is to be seen above the superior and posterior rim of the orbit. The body is smooth, also, save a narrow band of ciliated scales extending along the dorsal region from the upper portion of the thoracic arch to near the terminus of the second dorsal fin, where it approximates that fin, hence diverges from it anteriorly. The area thus covered by the scales is broader anteriorly than posteriorly; the scales are disposed upon transverse oblique series of eight scales each anteriorly, and reduced to less than half that number posteriorly. The lateral line is conspicuous, undergoing a slight inflection downwards upon the middle of the flanks.

The ground color of the upper region is deep chestnut brown, maculated with yellowish. The lower part of the sides below the lateral line is ocellated with yellowish roundish spots of various sizes. The inferior region is unicolor, as well as the anal and ventrals. The other fins are spotted or barred with blackish. The chin is maculated with greyish.

References to the figures.—Plate XXIIa, fig. 5, represents *Artedius lateralis*, from San Francisco, California, and size of life. Fig. 6, a dorsal scale-like shield, magnified.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|-------------------|----------------------------|-------------------------|------------------|----------------------|-----------------------|
| 328 | 1 | San Luis Obispo, Cal. | Lieut. Trowbridge | | Alcoholic. | Lieut. Trowbridge.... |
| 366 | 1 | San Francisco, Cal. | Dr. Ayres | 36 | do. | Dr. Ayres |

2. ARTEDIUS NOTOSPILOTUS, G R D.

PLATE XXII b, FIGS. 5 & 6.

SPEC. CHAR.—Surface of head sub-tuberculous and scaly. Preopercle armed with a flat tricuspid spine. Anterior margin of first dorsal situated in advance of the beginning of the dorsal band of scales, which is broad, and extends from the thoracic arch to near the terminus of the base of the second dorsal. Olivaceous, with a series of saddle-like black patches. Abdomen dull yellow or white.

SYN.—*Artedius notospilotus*, GRD. Proc. Acad. Nat. Sci. Philad. VIII, 1856, 134; & in Bost. Jour. Nat. Hist. VI, 1857; Pl. xxiv, figs. 5 and 6.

Calycilepilotus lateralis, AYRES, Proc. Cal. Acad. Nat. Sci. I, 1855, 77.

The specimen which we propose to describe, somewhat smaller than the preceding, measures

about three inches and a quarter in total length, the head constituting also the third of it, the caudal fin excluded. The occipital region is depressed, and the interocular region, which is broader than in the preceding species, instead of being convex, is groove-like. The rostral distance is gently sloping towards the extremity of the snout, exhibiting two stout and conspicuous nasal spines, behind which is a depression for a tubular posterior nostril, the anterior nostril being, as usual, on the side of the snout nearer the orbit than the extremity of the rostrum. The posterior extremity of the maxillary extending to a vertical line passing rather posterior to the middle of the pupil. The eye is large, sub-circular, placed towards the upper surface of the head; its horizontal diameter is contained four times in the length of the sides of the head, not quite once in advance of the anterior rim of the orbit. A short and flattened tricuspid process may be observed upon the convexity of the preopercle, two of the spines pointing upwards, the third downwards. Upon the inferior branch of the same bone there are two minute spines, whilst a third one, directed forwards, is inserted upon the interopercle.

The general disposition and structure of the fins is the same as in the preceding species; the origin of the anal, however, is opposite the third ray of the second dorsal, and not as deep as the latter is high, and the insertion of the ventrals situated upon a vertical line intersecting the middle of the base of the pectorals.

Br. V: V; D IX, 15; A 10; C 3, 1, 5, 4, 1, 2; V I, 3; P 17.

A membranous flap may be seen upon the posterior superior rim of the orbit. The occipital region is provided with small spines and tubercles, symmetrically disposed, whilst the entire surface is spread over with small scales, similar to those of the dorsal region, with the only difference that the ciliated edge is less conspicuous. These scales extend over the temporal region, opercular apparatus, and between the orbits. The dorsal band has the same disposition as in the preceding species, but it is broader, though composed of a smaller number of scales; the latter are more apart and their edge more strongly ciliated, or rather spinous. The lateral line is very conspicuous, and its curve depressed upon the middle of the flanks.

The ground color is olivaceous, darker above than beneath. A series of four black, saddle-like spots, may be observed along the back—the first one across the anterior dorsal, the second and third over the second dorsal, and the fourth upon the peduncle of the tail, between the two fins. The lower half of the sides, below the lateral line, is ocellated with dull white or yellow. The inferior surface is unicolor. The fins are unicolor, of the general hue of the region to which they respectively belong.

References to the figures.—Plate XXII *b*, fig. 5, represents *Artedius notospilotus*, from San Francisco, California, and size of life. Fig. 6, a dorsal scale-like shield, magnified.

List of specimens.

| Catalogue number. | Corresponding No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|---------------------------------|--------------|--------------------------|-----------------|--------------------|------------------|----------------------|----------------|
| 329 | ----- | 1 Yg. | Tomales bay, Cal ----- | 1856--- | E. Samuels..... | ----- | Alcoholic.. | E. Samuels.... |
| 367 | ----- | 1 Adt. | San Francisco, Cal ----- | 1857--- | Dr. Ayres..... | 36 | do..... | Dr Ayres..... |
| 513 | ----- | 1 Yg. | Ft Townsend, Puget's S'd | July, 1856 | Capt. Murden ----- | ----- | do..... | Capt. Murden. |

ZANIOLEPIS, Girard.

GEN. CHAR.—Upper surface of head spineless. Preopercle spinous. Mouth moderate, with its gape horizontal and the jaws sub-equal. Card-like teeth upon the premaxillaries, dentaries, front of vomer, and palatines. Gill openings continuous under the throat; branchiostegals six on either side. Dorsal fins contiguous; anterior one longer than the second. Caudal posteriorly sub-crescentic. Insertion of ventrals situated posteriorly to the base of pectorals. Dermic productions comb-like.

SYN.—*Zaniodermis*, GRD. in Proc. Acad. Nat. Sci. Philad. November, 1857, 202.

A very peculiar genus, and related to *Blepsias* and *Trachidermis*. The prickles of the skin, however, assume a compound character in the shape of comb-like scales. It may, furthermore, be distinguished from *Blepsias* by a much larger anterior dorsal fin; by the structure of its pectorals, the outer inferior margin of which is not scalloped; by the presence of an isthmus under the throat, and five branchiostegals instead of six, and by the upper surface of the head, which is spineless.

ZANIOLEPIS LATIPINNIS, GRD.

PLATE XVII, FIGS. 5 & 6.

SPEC. CHAR.—Three small spines upon the convexity of the preopercle. First dorsal much longer than the second, with its two anterior rays protracted beyond the others. Anal fin longer than the soft dorsal and provided with three spinous rays. Upper surface and sides of head prickly and rough like the surface of the body. Color, yellowish brown; fins spotted or barred with black.

SYN.—*Zaniolepis latipinnis*, GRD. in Proc. Acad. Nat. Sc. Philad. November, 1857, 202.

The greatest depth of the body corresponds to the thoracic region; hence it is tapering considerably towards the peduncle of the tail. The thickness is somewhat more than half the depth. The total length of the specimen described is nine inches.

The head constitutes about the fifth of the total length; its upper surface is very declivous towards a sub-conical snout. The jaws are sub-equal, the mouth moderate in size, with its gape quite horizontal. The posterior extremity of the maxillary extends to a vertical line intersecting the pupil. The eye is large, sub-elliptical, its horizontal diameter entering about three times and a half, or a little more, in the length of the side of the head, and exactly once in advance of the anterior rim of the orbit. Three small spines may be observed upon the convexity of the preopercle, two of which directed upwards, the third downwards. The other bones of the opercular apparatus are deprived of either spines or serratures. The supra-scapular exhibits a minute spine. The branchial fissures are continuous under the throat; there are six branchiostegals on either side.

The fins are conspicuously developed. The origin of the dorsal is situated in advance of the insertion of the pectorals near the occipital region. It is highest anteriorly, and diminishes gradually from the first to the last spine, with the exception of the second, which is protracted beyond the rest of them. The first and second rays are but slightly connected by the inter-radial membrane. The soft dorsal is contiguous to the former; its anterior margin raises abruptly above the last spine of the first dorsal, diminishing also gradually backwards. The anal fin is much longer than the soft dorsal; its origin is situated somewhat posteriorly to the middle of the spinous dorsal, but does not extend quite so far back as the soft dorsal. It is composed anteriorly of three slender spines, shorter than the rest of the rays, which increase gradually in depth to the penultimate, which is shorter than the ante-penultimate. The last ray alone is smaller than the anterior spines. The caudal, which is sub-crescentic upon its

posterior margin, constitutes about the seventh of the total length. The origin of the ventrals takes place on a line immediately behind the base of the pectorals. Their extremities extend beyond the origin of the anal fin, consequently overlapping the vent. The second articulated ray is longer than the rest. The extremity of the pectorals corresponds to a line intersecting the origin of the anal fin.

Br. VI: VI; D XXI, 13; A III, 17; C 3, 1, 6, 5, 1, 2; V I, 5; P 14.

The scales are very small, firmly imbedded in a tough skin. Their structure is very simple: neither concentric lines nor radiating furrows; a uniform granular appearance of the entire scale is exhibited under the microscope. The comb-like posterior margin is provided with a variable number (from four to eleven) of processes, too large to be called cilia; these are the only parts protruding from the skin, giving the body a shagreened appearance, and quite rough to the touch. The lateral line is concurrent with the dorsal outline, but is not composed of any particular scales. The upper surface and sides of the head are covered with minute scales similar in structure to those of the body. The snout alone is smooth. There are no scales on the base of the fins.

The head and body are of a soiled yellowish-brown hue, darker above than beneath. The base of the dorsal fins is maculated with black; the caudal and pectorals, barred with the same; and the anal and ventrals are uniformly black upon their external half, the edge of the fins alone being whitish.

References to the figures.—Plate XVII, fig. 5, represents *Zaniolepis latipinnis*, reduced from a specimen nine inches long. Fig. 6 is a scale from the middle of the flanks, considerably magnified.

List of specimens.

| Catalogue number. | Corresponding No. of | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimen. |
|-------------------|----------------------|-------------------|--------------|--------------------------------|-----------------|-------------------|------------------|---------------------|
| 274 | ----- | 1 | Adult | Fort Steilacoom, Puget's Sound | 1856 | Dr. Snekeley----- | ----- | Alcoholic. |

NAUTICHTHYS, Girard.

GEN. CHAR.—Upper surface of head and opercular apparatus spinous. Mouth moderate, with its gape nearly horizontal; the jaws being sub-equal. Velvet-like teeth upon the premaxillaries, dentaries, front of vomer, and palatines. Gill apertures separated under the throat by an isthmus; branchiostegal rays, five on either side. Dorsal fins contiguous upon their base; first one shorter than the second. Caudal fin posteriorly rounded. Ventrals slender and elongated, inserted under the base of the pectorals, which are large and broad, with the inferior rays projecting beyond the interradial membrane. Skin studded with minute prickles.

This genus, like the preceding, is related to *Blepsias* and *Trachidermis*, by its prickly skin. From the former it differs by the absence of membranous or filiform appendages, recalling to mind *Scorpana*; by its anterior dorsal, which is higher than the second; by the depth of the anal, which is less deep than the second dorsal is high; by the branchial apertures, which are separated by a wide isthmus; and by its ventrals, which are longer and more slender. Its true affinities with *Trachidermis* we are not prepared to trace, since no specimens of the latter are at our command.

NAUTICHTHYS OCULO-FASCIATUS, Grd.

SPEC. CHAR.—Posterior extremity of the maxillary extending to a vertical line drawn across the anterior rim of the pupil. First dorsal anteriorly filiform. Extremities of posterior rays of both the dorsal and anal projecting beyond the insertion of the caudal. Anal fin shorter than the second dorsal, and not as deep as the latter is high. Ground color of a uniform rusty red. A black band crosses the eye, through the pupil, and extends across the cheeks.

SYN.—*Blepsias oculo-fasciatus*, GRD. in Proc. Acad. Nat. Sc. Philad. November, 1857, 202.

The body is elongated, rather slender and compressed; its greatest depth upon the thoracic region being about the fifth of the total length; hence it gradually diminishes towards the peduncle of the tail, which is about the third of the greatest depth. The specimen before us is four inches and a quarter in total length, in which the head enters four times, the caudal fin excluded; the latter being a little shorter than the head. The upper surface of the head has quite an uneven appearance, caused, in the first place, by the elevation of the upper rim of the orbit, which not only raises above the surface of the head but is provided with small conical processes. Thus we have a very narrow and deeply grooved interocular region. The occipital region, which is depressed, exhibits, right and left, two conical spine-like processes. Again, upon the snout, are two more spines, one right and one left, the projection of the turbinal bones. The snout, otherwise, is declivous and sub-conical. The eye is large and subcircular; its diameter entering about three times in the length of the side of the head, and less than once in advance of its anterior rim. The mouth is moderately cleft, with its gape nearly horizontal, and the posterior extremity of the maxillary bone extending to a vertical line which would intersect the anterior rim of the pupil. The teeth are very minute and velvet-like. Four small conical processes may be observed upon the convexity of the preopercle; two directed upwards and backwards, and the other two downwards and forwards. The preopercle is spineless, whilst the suprascapular exhibits two conical processes resembling those upon the occiput. The gill apertures do not communicate together, but are separated under the throat by a very wide isthmus; the branchiostegal rays are five on either side, all tolerably well developed.

The origin of the anterior dorsal takes place at the occiput, and thus anteriorly to the base of the pectorals. The three anterior rays are long and filiform, and inclined forwards; the remaining rays diminish rapidly in height, and although both dorsals are contiguous upon their base, a very wide gap exists between them. The second dorsal is well developed, extending as far as the insertion of the caudal, beyond which its posterior rays project. Anteriorly it is about equal in height to the two-thirds of the depth of the body upon the same region, but posteriorly it is much higher than the body is deep. The rays are dichotomised, and so are the rays of the caudal. The latter fin, as already stated, is shorter than the head, and rounded upon its posterior margin. The origin of the anal is situated a little nearer the extremity of the snout than the base of the caudal fin. It is less deep than the second dorsal is high, and does not extend so far posteriorly, though the tips of its posterior rays reach the insertion of the caudal. All the rays of the anal are soft or articulated, but the posterior ones alone are dichotomised. The ventrals are elongated and slender, inserted under the base of the pectorals, and projecting beyond the vent; the latter being placed quite in advance of the anterior margin of the anal, which is not reached by those fins. Their rays are simple. The pectorals are broad, inserted upon an oblique base, and when brought backwards alongside the body, their longest rays are made to project beyond the origin of the anal; the upper rays alone being dichotomised.

Br. V: V; D IX, 27; A 19; C 2, 1, 5, 4, 1, 2; V I, 3; P 14.

Instead of scales, the skin is studded all over with minute prickles, extending somewhat along the rays of the fins.

The ground color is of a uniform rusty red, with a black band through the middle region of the orbit, and directed obliquely downwards and backwards across the cheeks. The anterior portion of the dorsal being blackish; the dorsal, caudal, and pectorals obsolete barred with black; the anal blackish also; and, the ventrals preserving the hue of the ground color.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|--------------------------------|-----------------|----------------------------|----------------------|---------------|
| 512 | 1 | Fort Steilacoom, Puget's Sound | Nov. 1854 | Dr. Geo. Suckley, U. S. A. | Alcoholic..... | Dr. Suckley. |

Family SCORPAENIDAE, Swains.

The body is always covered with scales ctenoid in structure, and the dorsal fin unique, the spinous portion combining closely with the soft portion. The head is large, and more or less spinous, a trait most developed in cottoids; and, the genus *Scorpaena*, in addition to spines, exhibits membranous or cutaneous flaps or appendages, which give to it a very unprepossessing appearance. Similar, though less numerous appendages, we have observed in some heterolevids and cottoids also. Another feature, peculiar to the genus *Sebastes*, it is true, results from the fact that small scales extend all over the head to its upper surface, as well as the sides, to the very tip of the snout and along the jaws. There are seven branchial rays in all, and the branchial apertures or gill openings, whichever called, are continuous under the throat. The gills themselves are three and a half on either side, the fourth having but one branchial comb developed. The last branchial split, consequently, does not exist.

The fishes of this family are all marine.

The species of *Sebastes* are marketable fishes, and are sold at San Francisco under the names of rock-fish and rock-cod. Some of them reach a considerable size, weighing from one to four pounds, and quite esteemed as an article of food, hence one of the great resources on the coast of California.

SCORPAENA, Art.

GEN. CHAR.—Surface of head spinous, scaleless, covered with a soft and spongy skin, and provided also with cutaneous flaps. Mouth large, though moderately cleft; jaws sub-equal; lower one slightly projecting. Teeth upon the premaxillaries, dentaries, front of the vomer, and along the palatines. Gill openings continuous under the throat; branchiostegal rays seven on either side. One dorsal fin; anterior portion spinous. Caudal fin rounded off posteriorly. Ventrals inserted somewhat behind the base of the pectorals. Body covered with pectinated scales. Lateral line concurrent with the dorsal outline.

SYN.—*Scorpaena*, ARTEDI, Gen. Pisc. 1738; edit. Walbaum, 1792, 374.—LINN. Syst. Nat. ed. VI^a 1748; &, ed. XI^a, 1758, 266.—Cuv. & VAL. Hist. nat. Poiss. IV, 1829, 286.—STORER. Synops. 1846, 59.

SCORPAENA GUTTATA, G r d.

PLATE XVII, FIGS. 1—4.

SPEC. CHAR.—Posterior extremity of maxillary reaching a vertical line intersecting the posterior rim of the orbit. Soft portion of dorsal fin nearly as high as the spinous portion. Posterior extremities of dorsal and anal fins terminating evenly. Above, reddish brown; beneath, yellowish brown. Black patches and spots disseminate over the upper regions of head and body.

SYN.—*Scorpaena guttata*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 145.

The body is about eleven inches in total length, the head forming the third of it. The head has a pretty rough appearance: in the first place, the orbits seem as if upheaved from the upper part of the skull, the middle line of which exhibits an excavated groove. Three spines are observed along the upper edge of the orbit, behind which three more may be seen on either side of the occipital region and nape. Several supra-tympanic spines, though small; two diverging ones upon the opercle, and four upon the limb of the preopercle, the uppermost of which being much the stoutest and longest. Next we see four other spines irradiating downwards from the sub-orbitals, and finally the nasal bones terminate into a sharp and acute point, directed upwards and slightly backwards. Intermingled with these numerous spines there are but two pairs of small membranous and arborescent flaps—we were going to say—adorning the head, but in reality contributing to render it still more repulsive to an eye uninitiated to scientific pursuits: the first pair is situated above the posterior part of the orbit, whilst the second occupies the inner upper edge of the anterior nostril. The eye is large and elliptical, its horizontal diameter being comprised nearly five times in the length of the side of the head. The posterior extremity of the upper maxillary reaches a vertical line which would intersect the posterior rim of the orbit. The soft portion of the dorsal has nearly the same height as the spinous portion. The caudal is sub-rounded posteriorly. The tips of the posterior rays of the anal are even with those of the soft dorsal. The insertion of the ventrals is under the base of the pectorals; they are elongated. The pectorals are broad and very much developed, their posterior extremity extending considerably beyond that of the ventrals.

Br. VII: VII; D XII, 10; A III, 5; C 5, 1, 6, 5, 1, 3; V I, 5; P 18.

The scales of the body are of medium size, and very small upon the occipital region and the head. The opercular apparatus is naked; scales being observed upon the posterior flap of the opercle only.

The ground color is deep reddish brown above, yellowish brown beneath. The anterior portion of the back and head is almost black. Cloud-like patches of blackish, here and there, with numerous small black spots, more defined on the head than on the body, and much larger on the fins. The belly is of a dull white; the throat yellowish; the inferior surface of the head whitish and brownish.

References to the figures.—Plate XVII, fig. 1, represents *Scorpaena guttata*, somewhat reduced in size. Fig. 2 is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the middle of the abdomen.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|-------------------|-------------------|---------------------------|-----------------|----------------------------|---------------------|-----------------|
| 350 | 1 | Monterey, California..... | 1853 | Lieutenant Trowbridge..... | Alcoholic..... | Lt. Trowbridge. |

SEBASTES, Cuv.

GEN. CHAR.—Body rather short and contracted. Head largely developed; upper surface with or without spines. Mouth large; inferior jaw the longest; velvet or card-like teeth upon the premaxillaries, dentaries, the front of the vomer, and the palatines. Surface of the tongue smooth. Spines upon the preopercle and opercle. Gill openings continuous under the throat; branchiostegals seven on either side. Dorsal fins united at their base. Caudal posteriorly sub-emarginate or concave. Insertion of ventrals posterior to the pectorals. Body covered with well developed pectinated scales, which extend over the head, opercular apparatus, cheeks and jaws, and also over a portion of the fins.

SYN.—*Sebastes*, Cuv. Règn. anim. (2d ed.) II, 1829.—Cuv. & Val. Hist. nat. Poiss. IV, 1829, 326.—Storer, Synops. 1846, 60.

Three of the species described below, *S. rosaceus*, *fasciatus*, and *melanops*, present the remarkable peculiarity of small elongated and slender scales, situated in the interstices of the scales of the ordinary type. The same small scales are observed upon the cheeks and opercular apparatus, though fewer than elsewhere.

1. SEBASTES ROSACEUS, Grd.

PLATE XXI.

SPEC. CHAR.—Upper surface of head provided with horizontal and acute ridges. Posterior extremity of maxillary extending to a vertical line intersecting the pupil. Origin of dorsal fin situated in advance of the base of the pectorals. Uniform reddish, lighter beneath than above.

SYN.—*Sebastes rosaceus*, Grd. Proc. Acad. Nat. Sc. Philad. VII, 1854, 146.

Sebastes ruber, Ayres, Proc. Cal. Acad. Nat. Sc. I, 1854, 7; and, Proc. Bost. Soc. Nat. Hist. V, 1855, 97.

The general form of this species might at first be suggestive of *S. norvegicus*, were the central rays of the first dorsal not so much higher than in the latter species, giving to the upper margin of the fin alluded to, a decided convexity.

The fish is rather stout than elongated, though much compressed, the greatest depth of the body being equal to the third of the entire length, which is about fourteen inches, and nearly equal to the length of the head.

The upper surface of the head exhibits but two pairs of small and horizontal spines, whilst the preopercle is provided with five of them, rather stout and conspicuous. We observe, likewise, two spines upon the edge of the opercle, the uppermost of which being the largest. Two more spines may be seen upon the supra-scapular region. The eye is large and sub-circular, the orbit being even with the upper surface of the head. Its horizontal diameter is contained four times in the length of the side of the head, once in advance of the anterior rim of the orbit, and twice posteriorly to the entire orbit. The mouth is broad; but the posterior extremity of the maxillary does not extend beyond a vertical line drawn through the centre of the pupil.

The second dorsal, or rather the soft portion of the dorsal fin, is scarcely higher than the first or spinous portion. The posterior margin of the caudal is sub-concave, a feature which the figure fails to represent. The anterior spine of the anal is more developed than in *S. melanops*, though the shortest of the three which precede the articulated rays of that fin; the tips of the posterior soft rays extend somewhat further back than those of the dorsal, but do not reach the base or insertion of the caudal. The insertion of the ventrals is situated immediately posterior to the base pectorals; the pectorals, themselves, being elongated, their tips extending beyond those of the ventrals, and reaching a vertical line which would fall between the two portions of the dorsal.

Br. VII: VII; D XIII, 13; A III, 7; C 5, 1, 5, 5, 1, 6; V I, 5; P 17.

The scales which cover the body are of medium size, those upon the head, cheeks, opercular apparatus, and throat being quite small. The accessory scales are very numerous. The course of the lateral line is parallel to the outline of the back. The normal scales are deeper than long; the accessory ones are lanceolated and much longer than deep.

The color is of a uniform reddish or crimson tint, lighter beneath than above. The upper region of the opercle exhibits a large elongated spot of a much deeper hue.

References to the figures.—PLATE XXI, fig. 1, represents *Sebastes rosaceus*, somewhat reduced in size. Fig. 2 exhibits a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the middle of abdomen. Figs. 5 and 6 being accessory scales.

Figs. 2—6 are magnified.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | Whence obtained. | When collected. | Nature of specimens. | Collected by— |
|-------------------|-------------------|-------------------------|------------------------|-----------------|----------------------|------------------|
| 343 | 1 | San Diego, Cal | Lieut. Trowbridge..... | 1853 | Alcoholic..... | A. Cassidy |
| 344 | 1 | San Francisco, Cal..... | Lieut. Williamson..... | 1856 |do..... | Dr. Newberry.. |

2. SEBASTES FASCIATUS, Grd.

PLATE XXII.

SPEC. CHAR.—Upper surface of head provided with large spinous ridges. Posterior extremity of maxillary extending beyond the pupil. Origin of dorsal fin situated in advance of the base of the pectorals. Ground color greenish yellow or sulphur yellow, clouded with dark patches, spotted with whitish; a dorsal fasciole of the ground color extends from the third or fourth dorsal spine to the base of the caudal.

SYN.—*Sebastes fasciatus*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 146.

Sebastes nebulosus, AYRES, Proc. Cal. Acad. Nat. Sc. I, 1854, 5; & Proc. Bost. Soc. Nat. Hist. V, 1854, 96.

The body, anteriorly, is very stout and deep, the head being more rounded, with its upper surface, from the occiput to the snout, more inclined than in the preceding species. The total length of the fish here described and figured is about eleven inches, of which the head forms more than the third. The greatest depth is equal to the length of the head. The upper surface of the latter exhibits spiny ridges, or processes, very acute posteriorly: one prenasal pair, two supra-orbital pairs, and an occipital one, by far the most elongated. Five triangular spines

occupy the limb of the preopercle, and two the upper and posterior edge of the opercle. The supra-scapular region exhibits likewise three such spines. The posterior extremity of the maxillary reaches a vertical line drawn behind the pupil. The lower jaw is a little longer than the upper. The outline of the spinous portion of the dorsal fin is convex, the highest spines being higher than any of the soft rays. The caudal is rounded off upon its posterior margin. The tips of the posterior rays of the anal are even with those of the posterior rays of the caudal, both fins approximating the base of the caudal. The anterior spiny ray of the anal is situated upon the right side of the second ray, and thus not exhibited upon the accompanying plate; it is, as usual, the shortest. The ventrals are elongated, inserted immediately behind the base of the pectorals, and reaching the vent with the tip of the longest rays. The pectorals are broad and well developed, since their posterior extremity extends a little further back than the ventrals. The ten inferior rays are stout and undivided, with the interradiial membrane deeply indented.

Br. VII: VII; D XII, 13; A III, 7; C 2, 1, 6, 5, 1, 3; V I, 5; P 18.

The scales are rather above the middle size, those on the head and opercular apparatus being comparatively more developed than in the preceding species. They are quite regular in shape, a little longer than deep, posteriorly ciliated, with diverging grooves upon the anterior section only. The accessory scales are quite numerous. The lateral line is parallel with the outline of the back. The ground color is greenish sulphur yellow; purplish black patches over the head, sides of body, and fins, in the midst of which patches appear crowded whitish spots. An area of ground color may be traced from the third and fourth dorsal spines obliquely downwards and backwards, towards the base of the caudal, in an oblique direction from the dorsal fin to the lateral line; then along the course of lateral line to the base of caudal fin. The throat is deep sulphur yellow; the inferior surface of the head and belly is spread all over with a duller tint.

References to the figures.—Plate XXII, fig. 1, represents *Sebastes faciatus*, somewhat reduced in size. Fig. 2, a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region. Fig. 5, an accessory scale. Figs. 2—5, are magnified.

List of specimens.

| Catalogue number. | Corresponding No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|---------------------------------|--------------|--------------------|-----------------|-------------------|------------------|----------------------|--------------------|
| 315 | 2 | adt. | Presidio, Cal | 1853 | Lieut. Trowbridge | | Alcoholic. | Lieut. Trowbridge. |
| 346 | 1 | yg. | San Francisco, Cal | 1856 | Lieut. Williamson | | do | Dr. Newberry |

3. SEBASTES AURICULATUS, Grd.

SPEC. CHAR.—Upper surface of head provided with small horizontal and acute spines. Posterior extremity of maxillary reaching to a vertical line drawn posteriorly to the orbit. Origin of dorsal fin situated in advance of the base of the pectorals. Blackish brown above, lighter beneath. A black spot upon the upper part of the opercle.

SEN.—*Sebastes auriculatus*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 131 and 146.

This species is allied to *S. inermis*, of the Japanese seas, in the structure of the upper surface

of the head, the spines of which, instead of being raised, are reduced to mere horizontal ridges, terminating posteriorly into acute points.

The largest specimens which we have seen measure about eight inches in total length, the head forming a little more than the fourth of it. The greatest depth, which corresponds to the thoracic region, is equal to the length of the head. The general aspect of the body is rather elongated than compact. The upper surface of the head exhibits the following pairs of spines or spiny ridges: an internasal or prenasal; an anterior and a posterior supra-orbital; a tympanic; a post-parieto-frontal, and an occipital; in all six pairs. The supra-scapular region is provided with three spines, the opercle with two, and the preopercle with five. The most developed may be seen upon the convexity of the preopercle. The mouth is large, for, the posterior extremity of the maxillary reaches a vertical line drawn a little beyond the posterior rim of the orbit. The lower jaw protrudes beyond the upper. The eye is circular; its diameter enters four times in the length of the side of the head.

The spinous portion of the dorsal is about the height of the soft portion; its outline is regularly convex. The posterior extremities of the articulated rays extend further back than those of the anal fin. The second anal spine is much stouter than the other two, and deeper also. The posterior margin of the caudal is sub-truncated; the entire fin is contained about four times and a half in the total length of the fish. The ventrals are inserted at a small distance from the base of the pectorals. The latter are broadly developed, and their extremity extends as far as, perhaps farther than, the tip of the ventrals which reach the vent. There are seven branchiostegal rays.

Br. VII: VII; D XIII, 14; A III, 7; C 4, 1, 6, 5, 1, 3; V I, 5; P 18.

The scales are of moderate development, a little longer than deep, and, as usual, ciliated upon their posterior margin. The lateral line follows the curve of the back, to which it is parallel.

The color is reddish brown above, as also on the sides, becoming lighter and somewhat yellowish towards the abdomen. The back is clouded with blackish. A large black spot covers the upper region of the opercle. Two narrow bands of the same hue extend obliquely from the orbit to the edge of the gill cover, more conspicuously, however, in the young than in the adult.

List of specimens.

| Catalogue number. | Corresponding No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|---------------------------------|--------------|--------------------|-----------------|-------------------|------------------|----------------------|--------------------|
| 347 | 6 | Adt. | Presidio, Cal | 1853 | Lieut. Trowbridge | | Alcoholic. | Lieut. Trowbridge. |
| 348 | 2 | | San Francisco, Cal | 1853 | Lieut. Williamson | | do | Dr. Heermann |
| 349 | 2 | | do | 1856 | do | | do | Dr. Newberry |

4. SEBASTES MELANOPS, Grd.

SPEC. CHAR.—Upper surface of head generally spineless. Posterior extremity of maxillary reaching a vertical line drawn anteriorly to the posterior rim of the orbit. Origin of dorsal fin opposite to, or slightly in advance of, the base of pectorals. Upper regions blackish brown; sides brownish, spotted with black; beneath greyish brown.

SYN.—*Sebastes melanops*, GRD. Proc. Acad. Nat. Sc. Philad. VIII, 1856, 135.

Sebastes variabilis, AYRES (non Cuvier), Proc. Cal. Acad. Nat. Sc. I, 1854, 7; and, Proc. Bost. Soc. Nat. Hist. V, 1855, 9.

We have seen specimens of this species measuring from eighteen to twenty inches in total length. We take the former as basis to our description.

The greatest depth, which corresponds to the thoracic region, enters a little more than three times and a half in the total length; hence the body tapers rather rapidly towards the peduncle of the tail. The head constitutes about the two-sevenths of the total length; its upper surface is spineless and covered with minute scales. A small spine upon the supra-scapular bone, two others upon the edge of the opercle, and from five to seven upon the limb of the preopercle, are all that is observed upon the side of the head, and since they are diminutive in size, the entire head assumes quite an unarmed appearance. The largest are those upon the convexity of the preopercle. The opercular apparatus is covered with scales a good deal larger than upon the cheeks and sides of the snout. The sub-orbital bone, which extends over the cheek, is rather small and inconspicuous. The eye is large and circular, its diameter entering about four times and a half in the length of the side of the head. Both nostrils are situated nearer the anterior rim of the orbit than the edge of the upper jaw. The lower jaw is very prominent, projecting considerably beyond the upper; the gape of the mouth is oblique upwards; the posterior extremity of the maxillary, very much dilated, extends to a vertical line drawn inwardly to the posterior rim of the orbit.

The origin of the dorsal fin is situated opposite, or else slightly in advance of a line drawn in front of the base of the pectoral fins. Its spinous portion, although occupying a greater extent of the base than the soft portion, is lower than the latter. It is composed of thirteen spiny rays, the anterior one of which is the smallest; they increase in height to the sixth and seventh, hence diminish to the twelfth; the last spine is again higher, though but half the height of the anterior articulated ray. Of the latter kind we observe fifteen which diminish in height posteriorly. The caudal fin enters a little more than five times and a half in the total length; its posterior margin is concave or semilunar. Three spiny rays (the first one quite small, the other two, stout) and nine articulated ones compose the anal fin. Its anterior margin is situated posteriorly to the anterior margin of the soft portion of the dorsal. The posterior extremity of the ventrals does not extend to the vent. The pectorals are broad; the ten lower rays are simple, and stouter than the remaining upper ones; the tip of these fins extends almost as far as the tip of the ventrals.

Br. VII: VII; D XIII, 15; A III, 8; C 4, 1, 6, 6, 1, 3; VI, 5; P 19.

A smaller specimen than the one from which the above formula was taken, and likewise from Astoria, exhibits thirteen soft and articulated rays to the dorsal fin. The rudimentary rays of the caudal are also more numerous. In the two specimens from Cape Flattery we find in one fifteen, and in the other sixteen, articulated rays in the dorsal fin. The scales are large and very much imbricated, since two-thirds of each scale is covered by its neighbor. The small accessory scales seem to be less numerous than in the foregoing species.

The upper surface of the head and the dorsal region above the lateral line are almost black, or else of a purplish black. The side of the body is yellowish, with an irregular purplish black spot upon nearly all the scales. The side of the head is of a lighter purplish black. The inferior region is of a soiled yellow, though of a metallic hue. The fins are unicolor, of a dark purple tint.

List of specimens.

| Catalogue number. | Corresponding No. of | No. of specimens. | Age and sex. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|----------------------|-------------------|--------------|---------------------------|-----------------|-------------------------|------------------|----------------------|--------------------|
| 341 | ----- | 2 | Adt. | Cape Flattery, W. T. | 1853 | Lieut. Trowbridge ----- | ----- | Alcoholic.. | Lieut. Trowbridgs. |
| 342 | ----- | 2 | .do. | Astoria, Oregon..... | 1854 | -----do----- | ----- | -----do----- | -----do----- |

5. SEBASTES PAUCISPINIS, Ayr es.

PLATE XXIIa, FIGS. 1—4.

SPEC. CHAR.—Head and body very much compressed; former, wedge shape; tip of lower jaw very prominent. Spines of the upper surface of skull inconspicuous. Posterior extremity of maxillary extending to a vertical line drawn posteriorly to the orbit. Opercle and preopercle spinous. Origin of dorsal a little in advance of the base of the pectorals. Reddish brown above, lighter beneath.

SYN.—*Sebastes paucispinis*, AYRES, Proc. Cal. Acad. Nat. Sc. I, 1854, 6; & Proc. Bost. Soc. Nat. Hist. V, 1854, 94.

An authentic specimen of this species now before us measures thirteen inches and a half from the extremity of the lower jaw to the end of the caudal fin. The general aspect of the fish is elongated, the head and body being very much compressed; the former constituting nearly the third of the entire length. The outline from the origin of the dorsal is regularly sloping towards the snout; it is nearly straight along the base of the spinous dorsal, hence descending towards the peduncle of the tail. The mouth is deeply cleft, the lower jaw projecting considerably beyond the upper, and provided with a conspicuous knob upon its symphysis. The posterior extremity of the maxillary is quite dilated, its margin sloping inwardly downwards, being itself even with a vertical line which would be drawn somewhat posteriorly to the orbit. Card-like teeth upon the premaxillaries, dentaries, front of the vomer and palatines. The eye is large and sub-circular; its diameter entering five times and a half in the absolute length of the side of the head. The nostrils are situated towards the upper surface of the snout, a good deal nearer the orbit than the edge of the upper jaw. The upper surface of the head presents but two horizontal, very small, acerated occipital spines at the posterior extremity of the occipital ridges. Upon the limb of the preopercle we observe five flattened, sometimes bifurcated, spinous processes, largest at the convexity. The subopercle is spineless, but the posterior edge of the opercle exhibits two flattened and diverging spines. The suprascapular bone terminates likewise into an inconspicuous spine.

The anterior dorsal is regularly arched in its outline, and simply contiguous to the second, between which and the former there is a much greater depression than usual. The caudal fin enters a little short of six times in the total length. Its posterior margin is sub-crescentic. The anal is as deep as the soft dorsal is high, but shorter upon its base; the tips of its rays extending likewise further back. The origin of the ventrals takes place almost opposite the base of the pectorals, and, although well developed and elongated, their extremities are far away from the vent. The pectorals are elongated, sub-lanceolated; their extremities extending somewhat beyond those of the ventrals.

Br. VII: VII; D XIII, 14; A III, 9; C 5, 1, 6, 6, 1, 4; V I, 5; P 14.

The scales on the body are small, longer than deep; as usual, pectinated posteriorly and grooved upon their anterior section. Those under the throat, on the opercular apparatus and cheeks, are still smaller, and upon the head, snout, jaws, very small indeed. The base of the pectorals, second dorsal, and caudal, exhibit some very exiguous scales.

The color is of a uniform reddish brown above, along the dorsal region, a good deal lighter beneath the lateral line. The upper surface of the head being much darker than the back. The inferior surface of the head exhibits a silvery hue, whilst the belly is dull yellow or whitish.

References to the figures.—PLATE XXIIa, fig. 1, represents *Sebastes paucispinis*, somewhat reduced in size. Fig. 2, a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catalogue number. | Corresponding No. of specimens. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimen. | Collected by-- |
|-------------------|---------------------------------|-------------------|--------------|-----------------------------|-----------------|----------------------|------------------|---------------------|----------------|
| 487 | ----- | 1 | Adt. | San Francisco, California.. | 1856 | Dr. W. O. Ayres..... | 4 | Alcoholic. | Dr. Ayres..... |

Family GASTEROSTEIDAE, Bonap.

The spinous rays of the dorsal region, instead of being united together by a membrane into an anterior fin, are isolated from one another. Each spine has a very small membrane at the posterior edge of its base. The spines are variable in number, transversally flattened upon their base, and acerated upon their extremities; either smooth upon their edges or denticulated. They can be brought backwards in an horizontal position, and lie upon the back. The ventral fins, situated about the middle of the abdomen, are composed almost exclusively, to a few exceptions, of one stout spine. The pelvic bones are external, and united to the thoracic belt. There are but three branchiostegal rays, the gill openings being separated beneath by an isthmus.

The gills, four in number on each side, are complete; that is, composed of two perfect branchial combs. The last gill opening, situated between the fourth gill and the inferior pharyngeal bones, is also fully developed.

There are no scales, properly so called; the body is sometimes naked, at others plated in part or entirely.

Being of a diminutive size, these fishes do not appear on our tables. If brought to the market, it is more as an object of curiosity than otherwise. They are, however, well known to the people on account of their common occurrence in pools, marshes, ponds, and rivulets. Congregating in their habits, there are seasons in the year when they may be seen by myriads together.

The Indians of California are said to catch these fishes during the summer season, and to store them up for winter food; being scooped out of the water by means of baskets made for that purpose, afterwards simply exposed to the sun and allowed to dry.

GASTEROSTEUS, *Ar t e d i*

GEN. CHAR.—Upper surface of head plane, either smooth or corrugated. Opercular apparatus without any spines. Mouth rather small, oblique; posterior extremity of maxillary not extending as far as a vertical line drawn in advance of the anterior rim of the orbit. Minute velvet-like teeth upon the dentaries and premaxillaries; none on either the vomer or the palatines. Gill openings separated beneath by a narrow isthmus; branchiostegals three on either side. First dorsal represented by a series of isolated spines, varying in number. Belly shielded. Caudal fin sub-truncated or sub-crescentic posteriorly. Insertion of ventrals situated opposite the second dorsal spine, therefore abdominal. Body either covered with a smooth skin, or partly or totally covered with transversally elongated plates. Lateral line very obsolete.

SYN.—*Gasterosteus*, ARTEDI, Gen. Pisc. 1738.—LINN. Syst. Nat. ed. VI, 1748.—CUV. & VAL. Hist. nat. des Poiss. IV, 1829, 479.—STORER, Synops, 1846, 62.

The genus *Gasterosteus* is met with in most of the fresh waters of the cold region of the boreal temperate zone of both hemispheres. Although amongst the smallest fishes inhabiting the fresh waters, they have not passed unnoticed in any country. They attract the attention of the people partly on account of their great multitudes at certain periods, and partly owing to the fact of their being provided with spines more or less numerous, which, added to their small size, render them unfit for the table. The popular appellation of sticklebacks is most characteristic. Besides the dorsal spines, which vary in number from three to eighteen, the ventrals are almost exclusively composed, each, of strong and acute spines, which may be brought at right angles with the body. Fishes thus armed, though small, have but few enemies; for, it is only necessary for these little creatures to straighten their spines to defy the voracity of most of the tyrants of the fresh waters. From the rivers, these fishes extend to the brackish estuaries, and even to the genuine salt waters of the bays. In many instances, however, the species inhabiting the salt waters are different from those occurring in the rivers.

The inferior surface of the abdomen exhibits a bony shield formed partly by the *ossa innominata*, and partly by the bones of the thoracic arch, the latter diverging from the isthmus to the insertion of the ventrals, which are abdominal, so as to leave a middle naked area, the former extending from behind the base of the ventrals, posteriorly, in the shape of a spear, more or less pointed.

In some, the body is covered with a perfectly smooth skin; in others, a series of transversely elongated plates may be observed from the thoracic arch to the base of the caudal, diminishing in size posteriorly, and reduced to a narrow keel upon the peduncle of the tail. In others still, these plates are restricted to the anterior part of the body, from the opercular apparatus to about the second dorsal spine. It would be an interesting point to ascertain how far the presence or absence of these plates are specific. In many instances no tangible difference is observed between specimens entirely smooth and others plated all over, beyond the fact just referred to, in which, when plates are present, the peduncle of the tail is keeled, whilst it is smooth and plane when the plates are either entirely absent, or exist upon the anterior part of the body alone. The habits of each group ought to be carefully investigated, the growth of the young watched, and broods kept isolated until they have reached their full development. One fact already must appear evident to the most superficial observer: the species with a complete series of plates, or scutellæ, are much less numerous than the others.

So far, all the species of the western coast of North America which have come to our knowledge, belong to the type represented by *G. biaculeatus*, provided with two distinct dorsal spines, more or less developed, and a small and inconspicuous one at the anterior margin of the second dorsal fin. The types of *G. apettes* and *G. occidentalis* have, so far at least, not been noticed there.

The anterior dorsal spine is situated either in advance of the base of the pectorals or behind it, according to the species. The anterior margin of the anal is always provided with a small spine, similar to the one in advance of the second dorsal. The ventrals, which are abdominal, are composed of a stout, more or less serrated, spine, and a small soft ray, scarcely perceptible.

The body is always very much compressed and sub-fusiform in its profile. The head constitutes sometimes the fourth, and sometimes the two-sevenths of the entire length. The upper surface is either smooth or corrugated; the sides of the head are always smooth, no spines being ever extant upon the opercular apparatus. As to the sub-orbitals, they are sometimes entirely concealed under the skin. A narrow isthmus exists under the throat, separating the gill openings; the branchiostegal rays are well developed, and three in number on either side.

The investigator into the habits of these fishes will bear in mind the astonishing fact that a European species of this genus constructs a genuine nest into which the spawn is deposited and watched. It is related that the male is the sole architect in the construction of the nest; there are two openings to it, an entrance and an exit. At the breeding season the male compels the female to enter the nest, there to deposit her spawn, when, so soon as done, he drives her away, to come back afterwards and keep a constant watch over the progeny, which otherwise would be eaten by the female.

1. GASTEROSTEUS PLEBEIUS, Grd.

SPEC. CHAR.—Body partly plated; peduncle of tail not keeled. Dorsal spines three; of moderate development, and strongly serrated upon their edges, insertion of anterior one taking place immediately behind the base of the pectorals. Insertion of ventrals placed slightly in advance of the second dorsal spine; ventral spine serrated on both edges, and its extremity not reaching the tips of the *ossa innominata*. Posterior margin of caudal fin sub-crescentic.

SYN.—*Gasterosteus plebeius*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 147.

The largest of the numerous specimens of this species which we have examined measured about two inches, the head forming the two-seventh, or a little more, of that length. The upper surface of the head is corrugated, but apparently smooth as long as the slime rests upon it; its sides exhibit diverging minute granular ridges upon the opercular and sub-orbital bones. The lower jaw is slightly longer than the upper one, since it protrudes beyond it when the mouth is shut. The posterior extremity of the maxillary does not extend to a vertical line drawn across the anterior rim of the orbit. The teeth are exceedingly minute. The nostrils are nearer the orbit than the extremity of the snout. The eyes, circular and well developed, enter four times in the length of the side of the head by their diameter; the distance between their anterior rim and the extremity of the snout is greater than one of their diameter.

The greatest depth of the body, which corresponds to a vertical line drawn from the middle of the space between the first and second dorsal spines, enters about five times in the total length. The insertion of the first dorsal spine takes place immediately behind a vertical line drawn posteriorly to the base of the pectorals. When placed horizontally, its extremity stretches beyond the insertion of the second spine. The latter is larger than the first; both are of but moderate development, conspicuously serrated, or rather prickly, upon both edges. The second spine, when brought horizontally backwards, does not reach the third and very small spines at the anterior margin of the second dorsal; the distance, therefore, between the third and second spines is much greater than between the second and the first. The origin of the soft dorsal is nearly opposite the tips of the *ossa innominata*. The latter fin is sub-triangular, highest anteriorly, and diminishing gradually backwards; it is composed of eleven, sometimes of thirteen, rays, the middle ones being bifurcated upon their extremity. The caudal fin, which constitutes about

the seventh of the total length, is composed of ten bifurcated and two undivided rays, together with several rudiments above and below. The anal has the same general outline as the second dorsal, but is much shorter, since its origin is opposite the fifth ray of the fin just mentioned, and extends no further posteriorly; the posterior rays of both being perfectly even. Composed of nine or ten rays, the middle ones are likewise bifurcated upon their extremity. It is preceded anteriorly by a small spine, similar to that at the anterior margin of the second dorsal. The insertion of the ventral spine is situated in advance of a vertical line drawn anteriorly to the second dorsal spine; it is acerated, conspicuously serrated, or prickly upon both edges, and, when bent backwards, its extremity does not extend as far as the tips of the *ossa innominata*. A minute, soft, and undivided ray, may be observed within the membrane at the inner surface of the spine. The base of the pectorals, with reference to the first dorsal spine, has already been alluded to. These fins are broad, rather short and rounded exteriorly; they are composed of ten undivided rays, with an interradiial membrane even with their tips.

Br. III: III; D I, I, I, 13; A I, 10; C 3, 1, 5, 5, 1, 2; V I, 1; P 10.

The anterior portion of the body, from the scapular region to the second dorsal spine—that is, the thoracic region—is covered with bony plates, or scutellæ, transversely elongated. The three anterior, or supra-scapulars, are quite reduced, but the four succeeding ones occupy all the space between the dorsal plates and the ventral shields; the last of the four just referred to, situated posteriorly to the second dorsal spine, does not reach the ventral line; the cubital process, ascending from the *ossa innominata*, overlaps the extremities of the three remaining ones. The rest of the body is covered by a smooth skin.

The ground color of the upper region is light brown, and silvery white beneath, sometimes of a dull appearance when the slimy mucous is still adherent. The upper surface and part of the sides of the head is maculated with blackish or brownish. The back and sides are likewise blotched, sometimes irregularly, oftentimes disposed in transverse bands or fasciæ, which, upon a minute examination, are found to consist of crowded dots. The fins are all unicolor, yellowish or olivaceous brown.

Specimens were obtained from the salt marshes about Presidio, near San Francisco, California, by Lieutenant W. P. Trowbridge and Dr. John S. Newberry.

We have observed other specimens, a little stouter than the preceding, with the serratures of both the ventral and dorsal spines less conspicuously developed, and occasionally with one thoracic plate less, and which were procured at San José, California, by A. G. Grayson, Esq., and at Petaluma, Sonoma county, California, by E. Samuels.

List of specimens.

| Catalogue number. | Corresponding No. of | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|----------------------|-------------------|--------------|--------------------------|-----------------|--------------------|------------------|----------------------|--------------------|
| 330 | --- | 1 | adt. | San Francisco, Cal.----- | 1853 | Trowbridge ----- | --- | Alcoholic. | Trowbridge ----- |
| 331 | ----- | 4 | do. | -----do----- | 1853 | Williamson ----- | ----- | do | Dr. Newberry ----- |
| 332 | ----- | 24 | do. | San Jose, Cal.----- | 1854 | A. G. Grayson----- | ----- | do | A. G. Grayson----- |
| 333 | ----- | 11 | do. | Petaluma, Cal.----- | 1855 | E. Samuels----- | ----- | do | E. Samuels----- |

2. GASTEROSTEUS SERRATUS, Ayres.

SPEC. CHAR.—Body entirely plated; peduncle of tail keeled. Dorsal spines three, high and slender, conspicuously serrated upon their edges; anterior one inserted a little in advance of the base of the pectorals. Insertion of ventrals situated somewhat in advance of the second dorsal spine, their own spines being serrated upon both edges, more conspicuously above than below, and extending beyond the tips of the *ossa innominata*. Posterior margin of caudal fin concave.

SYN — *Gasterosteus serratus*, AYRES, Proc. Cal. Acad. Nat. Sc. I, 1855, 47.

Closely allied to the preceding is *G. serratus*; indeed, the only striking characteristic consists in the presence of bony scutellae along the whole length of the flanks. The few specimens before us measure a little more than two inches, the head forming the fourth of the entire length. The upper surface of the head, the opercular and sub-orbital bones, are finely granular. The nostrils are situated midway between the anterior rim of the orbit and the extremity of the snout. The eyes are large and circular, their diameter entering three times and a half in the length of the sides of the head, exactly once in advance of their anterior rim. The dorsal spines are slender, and higher than in the preceding species; the second is a little larger than the first, and both are conspicuously serrated upon their edges. The first spine, when bent horizontally backwards, extends a little beyond the second, whilst the latter, in a similar position, reaches the base of the third and very small spine at the anterior margin of the second dorsal fin. The first dorsal spine is situated above the base of the pectorals. The origin of the second dorsal takes place anteriorly to a vertical line met by the tips of the *ossa innominata*; it is composed of eleven rays, the middle ones of which, bifurcated. The origin of the anal takes place under the fifth of the second dorsal, and terminates evenly with the latter at a short distance from the base of the caudal. The rays, nine in number, besides the anterior spine, have the same structure as those of the second dorsal. The caudal is posteriorly sub-crescentic, or concave, constitutes about the seventh of the total length, and composed of ten bifurcated and two undivided rays, together with many rudimentary ones. The insertion of the ventral spine is situated entirely in advance of a vertical line passing before the second dorsal spine; it is elongated, slender, acerated, projecting beyond the tips of the *ossa innominata*, and reaching the vent. The serratures or prickles of its upper edge are much more developed than upon the lower. The pectoral rays are slender, but all well developed, though undivided, constituting a broad fin, exteriorly sub-convex.

Br. III: III; D I, I, I, 11; A I, 9; C 5, 1, 5, 5, 1, 4; V I, 1; P 10.

As already stated, the sides of the body are provided with a series of thirty-two to thirty-three plates, or scutellae, extending from the supra-scapular region to the base of the caudal fin. The three anterior are supra-scapular altogether, small and irregular; the next twenty-five are transversely elongated, occupying the middle of the flanks, whilst the four or five remaining ones constitute a sharp ridge along the peduncle of the tail. The surface of these scutellae is granular, in diverging lines from a central point on each plate. There is an abdominal and a dorsal area, which are not covered by the extremities of the lateral plates or shields.

Ground color, greyish brown above, with numerous minute blackish dots; dorsal region darker than the sides; abdominal region lighter; a blackish band along the keel on the peduncle of the tail.

A specimen of this species from the marshes of the bay of San Francisco, labelled by Dr. Ayres himself, leaves no doubt as to its identity; it was brought home by Dr. John S. New-

berry. Others from Shoalwater Bay, Washington Territory, collected by Dr. J. G. Cooper, exhibit no difference in structure from the one just alluded to.

List of specimens.

| Catalogue number. | Corresponding No. of | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens. | Collected by— |
|-------------------|----------------------|-------------------|--------------|----------------------------|-----------------|----------------------------|------------------|----------------------|--------------------|
| 334 | ----- | 1 | Adt. | Bay of San Francisco..... | 1856 | Lt. R. S. Williamson | ----- | Alcoholic. | Dr. Newberry |
| 335 | ----- | 4 | do. | Shoalwater Bay, W. T. | 1853 | Gov. I. I. Stevens..... | ----- | do..... | Dr. Cooper..... |

3. GASTEROSTEUS INTERMEDIUS, Grd.

SPEC. CHAR.—Body plated all over; peduncle of the tail keeled. Dorsal spines three, moderate in development and inconspicuously serrated upon their edges; anterior one inserted immediately behind the base of pectorals. Insertion of ventrals under the second dorsal spine, their own spine being serrated upon both edges, more conspicuously above than below, and their extremities not extending as far as the tips of the *ossa innominata*. Posterior margin of caudal fin concave.

SYN.—*Gasterosteus intermedius*, GRD. Proc. Acad. Nat. Sc. Philad. VIII, 1856, 135.

But we have received from Cape Flattery specimens of this genus which bear, mayhap, a still closer affinity towards *G. plebeius* than even *G. serratus*. With the latter it agrees in having the sides of the body plated all over, whilst it differs by the proportional size of the head, the eye, and the spines, both dorsal and ventral.

Their size is a little over two inches, agreeing in that respect with *G. serratus*, but the head is contained three times and a half only in the total length, in other words, constituting the two-sevenths of the latter, and thus resembling more *G. plebeius*. The upper surface of the head is corrugated or granular, and the opercular, as well as the sub-orbital bones, exhibit conspicuous series of granulated ridges. The nostrils are nearer the anterior rim of the orbit than to the extremity of the snout. The eyes are circular and well developed, their diameter entering four times in the length of the sides of the head, and a little more than once in advance of their anterior rim.

The dorsal spines are intermediate in development between those of *G. plebeius* and *G. serratus*; their edges are rather inconspicuously serrated. The anterior one is inserted on a vertical line passing immediately behind the base of the pectorals, and when bent horizontally backwards it reaches the base of the second spine. The latter, when in a similar position, will not extend to the third and small spine in advance of the soft fin. The origin of the latter or second dorsal takes place in advance of the *ossa innominata*; its structure, as well as that of the anal, presents nothing peculiarly distinct from the same fins in *G. serratus*, except that the middle rays are not quite as deeply bifurcated. The caudal constitutes nearly the eighth of the total length; it is posteriorly concave, and constructed as in the preceding species. The ventrals are inserted under the second dorsal spine, and when bent backwards their extremities do not extend as far as the tips of the *ossa innominata*.

The formula of the rays does not differ from that of *G. serratus*.

D I, I, I, 11; A I, 9; C 5, 1, 5, 5, 1, 4; V I, 1; P 10.

As regard to the plates on the sides of the body, their number and arrangement is the same as in the preceding species.

The ground color of the dorsal region is greyish, rendered almost black by crowded dots of the latter hue; the sides are lighter and silvery. The base of the caudal fin is marked by a transverse jet black band, sometimes reduced to two patches, one to either lobe.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|---------------------------|-----------------|----------------------|----------------------|----------------------|
| 336 | 4 | Cape Flattery, W. T. | 1854 | Lt. Trowbridge | Alcoholic..... | Lt. Trowbridge |

4. GASTEROSTEUS INOPINATUS, Grd.

SPEC. CHAR.—Body partly plated; peduncle of tail consequently not keeled. Dorsal spines three, slender, and slightly serrated upon their edges, insertion of the anterior one taking place above the base of the pectorals. Insertion of ventrals placed immediately in advance of the second dorsal spine; ventral spine serrated on both edges, but less conspicuously below than above, and its extremity terminating about evenly with the tips of the *ossa innominata*. Posterior margin of caudal fin sub-crescentic.

SYN.—*Gasterosteus inopinatus*, GRD. Proc. Acad. Nat. Sci. Philad. VII, 1854, 147.

In many respects this species might be considered more closely allied to *G. plebeius* than either *G. serratus* or *G. intermedius*. In the first place, the anterior or thoracic region alone is plated; the insertion of the ventrals in advance of the second dorsal spine is another similarity between it and *G. plebeius*.

The general aspect is slender, elongated, considerably tapering from the origin of the anal backwards; the peduncle of the tail especially is long and slender. The greatest depth of the body, measured across the origin of the ventrals, is contained five times in the entire length. The head itself constitutes the fourth of the same length. The eyes are large and circular, and their diameter is contained three times and a half in the length of the sides of the head, exactly once in advance of their anterior rim. The mouth is somewhat smaller than in *G. plebeius*, equally oblique, but the lower jaw is less protruding beyond the upper.

The anterior dorsal spine, which is inserted immediately above the base of the pectorals, does simply reach the base of the second spine when brought horizontally backwards. Furthermore, there are instances in which it does not extend even so far. The tip of the second spine leaves quite a space between it and the third spine. The spines themselves are very slender and acute, and not, or but slightly, serrated upon their edges. The origin of the second dorsal takes place quite posteriorly to a vertical line intersecting the tips of the *ossa innominata*. The beginning of the anal is situated opposite the fifth or sixth soft ray of the second dorsal, the middle rays of both of these fins being bifurcated. The posterior rays terminate evenly, at a considerable distance from the base of the caudal fin. The anal spine is very exiguous. The caudal fin, which constitutes the seventh of the total length, is concave posteriorly, composed of ten bifurcated and two undivided rays, with rudimentary ones above and below. The insertion of the ventral spine takes place immediately in advance of the second dorsal spine; it is minutely serrated on

both edges, more conspicuously above than below, acerated upon its extremity, which either reaches the tips of the ossa innominata or falls a little short of them. The formula of the fins' rays has nothing peculiarly striking.

D I, I, I, 12; A I, 9; C 4, 1, 5, 5, 1, 3; V I, 1; P 10.

The upper surface of the head is corrugated; the opercular, supra-scapular, and sub-orbital bones exhibit radiating, sub-granular ridges. There are but three well developed plates, extending from the dorsal spines to the cubital process; a rather small one may be observed anterior to these, and occasionally another, quite rudimentary. Their surface is minutely granular, the granules being disposed upon irradiating series, from a sub-central point corresponding to the lateral line, which is not traceable beyond the plates. The skin covering the rest of the body is perfectly smooth.

The ground color is yellowish brown above; the abdomen is silvery; innumerable blackish dots are scattered all over the head and body, more densely upon the upper regions, where cloud-like spots may occasionally be seen, the result of the aggregation of those dots.

All the specimens observed fall short of two inches, with the exception of one, which measures two inches and four-tenths. They were collected in a fresh water lagoon, about one mile back of Presidio on the bay of San Francisco.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|----------------------------|-----------------|---------------------|----------------------|-----------------------|
| 337 | 24 | Presidio, California | 1853 | Lt. Trowbridge..... | Alcoholic. | Lieut. Trowbridge.... |

5. GASTEROSTEUS MICROCEPHALUS, Grd.

SPEC. CHAR.—Body partly plated; peduncle of tail not keeled. Dorsal spines three, stoutish, slightly serrated upon their edges; insertion of anterior one situated opposite the upper part of the base of the pectorals. Insertion of ventrals in advance of second dorsal spine, their own spine being very large, serrated upon its upper edge, and extending beyond the tips of the *ossa innominata*. Posterior margin of caudal sub-crescentic.

SYN.—*Gasterosteus microcephalus*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 133.

In the fresh waters of the Tulare basin there is a species whose general aspect is entirely different from any of those hitherto described from either California or Oregon. To those acquainted with the eastern representatives of the genus, it will remind them of *G. quadracus*, or *apeltes*, better than any others. It has the same sub-fusiform outline, great development of the middle region of the body, tapering tail and diminutive head. The dorsal spines, the thoracic plates, and the conformation of the *ossa innominata*, however, with other minor differences, will be sufficient to distinguish the two species.

The head is sub-quadrangularly sub-pyramidal, pointing forwards, and contained about four times in the total length. Its upper surface is apparently smooth, but a magnifying glass shows it to be finely granular. The eyes are large and circular; their diameter being contained three times and a half in the length of the side of the head, exactly once in advance of the anterior

rim of the orbit. The mouth is oblique, and the lower jaw protruding beyond the upper. The greatest depth of the body, taken under the second dorsal spine, is equal to the length of the head. The peduncle of the tail is very narrow. The dorsal spines are well developed, accrated, and quite inconspicuously serrated upon their edges. The anterior one is inserted opposite the upper edge of the base of the pectorals; it is smaller than the second, and, when bent horizontally backwards, its extremity is made to extend beyond the base of the latter, which, in its turn, barely reaches the insertion of the third, when in a similar position. The second dorsal is composed of ten deeply bifurcated rays; the origin of that fin is situated posteriorly to the tips of the ossa innominata. The caudal, which enters seven times and a half in the total length, is emarginated posteriorly, and composed, as usual, of ten bifurcated, two simple rays, and several rudiments. The anal spine is of the same size as the third dorsal; it is followed by six or seven articulated or soft rays, the posterior extremities of which falling evenly with those of the opposite fin, the central ones being slightly bifurcated. The ventral spine is the largest of all, accrated, serrated upon its upper edge, and its extremity projecting considerably beyond the tips of the ossa innominata, reaching a vertical line dropped from the origin of the soft dorsal fin. The insertion of the ventrals is situated in advance of the second dorsal spine. The pectorals are exteriorly rounded or sub-truncated, and composed of ten undivided rays.

D I, I, I, 9; A I, 6; C 3, 1, 5, 5, 1, 2; V I, 1; P 10.

There are seven plates upon the thoracic region; the three anterior are very small, and situated above the suprascapular; the two next are the most developed, extending under the cubital process, whilst the remaining two are somewhat shorter, and placed posteriorly to that same process. The surface of the plates themselves is minutely granular.

The ground color is yellowish brown, spotted or else transversally banded with greyish black, the spots or bands being the result of crowded dots. The dorsal region is darker than the sides, and so also the upper portion of the head. Beneath, dull yellow, occasionally dotted.

Specimens, the largest of which measures one inch and three quarters, were taken in Ka-wee-ya river, sometimes known as the Four creeks, and is a tributary of the northernmost of the Tulare lakes.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|---------------------------------|-----------------|---------------------------|----------------------|--------------------|
| 338 | 12 | Four creeks, Tulare Valley..... | 1853 | Lt. R. S. Williamson..... | Alcoholic. | Dr. Heermann |

6. GASTEROSTEUS PUGETTI, Grd.

SPEC. CHAR.—Body partly plated; peduncle of tail not keeled. Dorsal spines three, slender, not serrated upon their edges; anterior inserted immediately behind the base of pectorals. Insertion of ventrals in advance of the second dorsal spine, their own spine being slender, serrated upon its edges, and extending beyond the tips of the ossa innominata. Posterior margin of caudal slightly emarginated.

SYN.—*Gasterosteus pugetti*, GRD. Proc. Acad. Nat. Sc. Philad. VIII, 1856, 135.

The species here introduced is, so far, the smallest of all the species observed in California and

Oregon. In its general appearance it resembles *G. microcephalus* most, and what has just been stated in regard to the latter, with reference to *G. quadracus*, applies equally to it.

It is much to our regret that the state of keeping of the specimens will not permit a thorough description of the soft fins. The species differs from *G. microcephalus* by a larger head, much smaller spines, and fewer plates upon the thoracic region. The head enters three times and a half in the total length; the eyes are circular and very large, since their diameter enters but a little over three times in the length of the sides of the head, and not quite once in advance of the anterior rim of the orbit. The dorsal spines are slender, acute, and smooth upon their edges; the anterior one is inserted immediately behind a vertical line drawn across the base of the pectorals. In being brought horizontally backwards, its extremity would hardly reach the second dorsal spine; the latter, at any rate, remains considerably behind the third in that respect. The origin of the second dorsal is even with a vertical line passing by the extremity of the ossa innominata. The insertion of the ventrals is entirely in advance of the second dorsal spine; their spine exhibits a very slight serrature upon its edges, and its extremity extends beyond the tips of the ossa innominata.

The plates or shields are but four in number, occupying the space between the first and second dorsal spines. The three longest converge towards the vertical process of the ossa innominata.

The ground color is brownish, rather dark along the dorsal region; the sides are transversely barred with black, the bars or bands being composed of crowded dots. The belly is unicolor.

The largest specimens measure an inch and a quarter.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|--------------------------------|-----------------|--------------------------|----------------------|-------------------|
| 339 | 6 | Fort Steilacoom, Puget's Sound | 1853 | Gov. I. I. Stevens | Alcoholic. | Dr. Suckley |

7. GASTEROSTEUS WILLIAMSONI, Grd.

SPEC. CHAR.—Body smooth all over; peduncle of tail not keeled. Dorsal spines three, exiguous and slender, and not serrated; insertion of anterior one situated above the base of the pectorals. Insertion of ventrals slightly in advance of the second dorsal spine; their own spines are serrated upon both edges, and their extremities do not reach the tips of the *ossa innominata*. Posterior margin of caudal fin sub-crescentic.

SYN.—*Gasterosteus williamsoni*, GRD. Proc. Acad. Nat. Sc. Philad. VII, 1854, 133.

This is the most slender, and, consequently, the most elongated and graceful of all the species of the genus above described. The body is sub-fusiform in profile, and, as usual, compressed. The greatest depth, taken across the base of the pectorals, is a little more than the fifth of the total length. The upper surface and the sides of the head are corrugated, the head itself forming the third of the total length, the caudal fin excluded. The eyes are large and circular, and their diameter is contained three times and a half in the length of the sides of the head. The mouth is slightly oblique and the lower jaw longer than the upper, the free extremity of the maxillary extending to a vertical line intersecting the nostril.

The dorsal spines are slender, exiguous, and smooth upon their edges; the anterior one is inserted immediately above the base of the pectorals, and when bent horizontally backwards, it does not quite reach the base of the second. The same is true of the second with reference to the third. The origin of the second dorsal is a little nearer to the extremity of the caudal than the tip of the snout; it is also placed somewhat posteriorly to a vertical line reached by the tips of the ossa innominata. The fin itself is composed of eleven articulated rays, the central ones being slightly bifurcated. The caudal, which enters six times and a half in the total length, is posteriorly sub-erescentic; it is composed of the usual number of rays. The origin of the anal fin is opposite the fifth or sixth ray of the second dorsal; it is composed of seven articulated rays, the central ones being but very slightly bifurcated. The anal spine is inconspicuous and somewhat smaller than the third dorsal at the anterior margin of the soft fin. The ventral spine is of moderate development, serrated upon both edges, more conspicuously above and near its base than below. Its origin or insertion is a little in advance of the second dorsal spine, and its extremity does not extend as far as the tips of the ossa innominata. The pectoral fins are well developed, broadly sub-truncated upon their periphery, and composed of ten undivided rays. The ossa innominata constitutes beneath a rather small spear-shaped shield, the extremity of which does not reach the vent; the vertical process is narrow and slender. The cubital expansion is well developed.

D I, I, I, 11; A I, 7; C 3, 1, 5, 5, 1, 2; V I, 1; P 10.

The surface of the body is perfectly smooth; in that respect *G. williamsoni* may at once be distinguished from the foregoing species, which are either entirely or partially protected with bony shields. The lateral line follows the middle of the flanks from the origin of the second dorsal fin posteriorly; anteriorly it is somewhat nearer the back than the belly.

The ground color is olivaceous brown, darker on the dorsal region than along the sides, which are spotted with black; beneath, of a soiled yellow.

Specimens of this species were collected at Williamson's Pass, California. The waters from this place reach the Pacific during the rainy season. In the dry season the waters remain in isolated pools.

List of specimens.

| Catalogue number. | No. of specimens. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|------------------------------|-----------------|-----------------------------------|----------------------|------------------------|
| 340 | 8 | Williamson's Pass, Cal. | 1853 | Lieut. R. S. Williamson | Alcoholic. | Dr. Heermann |

Family SCIAENIDAE, Bonap.

The sciaenoids present mostly a general external appearance, not unlike that of the percoids. Their body is protected with pectinated else ctenoid scales, which extend likewise over the head, and along a portion of the fins also. There are either one or two dorsal fins, presenting the same general modifications of forms and of combinations, as in the percoids. The head has a peculiar physiognomy, owing to the convexity of its upper surface, and especially to the convexity or bluntness of the snout; the bones of the head and skull being cavernous, and otherwise provided with crests or ridges. The suborbital bones do not extend across the cheeks, as in the cataphracti, from which the sciaenoids are thus at once distinguished. The mouth is but little protractile; barbels are sometimes observed under the lower jaw about the mouth. The palatines and vomer are toothless, a character by which sciaenoids can always be easily distinguished from the percoids. The maxillary teeth are various. The opercular apparatus exhibits either spines or serratures upon the edge of its bony pieces; the preopercle being, however, occasionally smooth. The swimming bladder is peculiar, by the horn-like processes it exhibits.

SYN.—*Sciaenidae*, BONAP. Sagg. distr. anim. vertebr. 1831, 104.—STORER, Synops. 1846, 65.—HOLBR. Ichth. of So. Ca. 1856, 112.

Sciaenoides, CUV. Règn. anim., 2d ed. II, 1829; & ed. illustr. Poiss. 77.—CUV. & VAL. Hist. nat. Poiss. V, 1830, 1.
Sciaenoidae, RICHARDS. Faun. Bor. Amer. III, 1836, 61.

Most of the sciaenoids are esculent fishes, some of which being of exquisite taste. The king fish (*Umbrina*), weak fish (*Otolithus*), drum fish (*Pogonias*), and others, speak for themselves. They live both in seas and rivers; the marine species being, however, much more numerous than those of the fresh waters. The majority of the genera, moreover, are exclusively of marine habits. There is no genus exclusively limited to the fresh waters, at least, in the actual state of the method, the fresh water species belonging to the genera *Ambledon* and *Johnius*.

Species of the genera *Otolithus*, *Umbrina*, *Johnius*, *Micropogon*, *Homoprion*, and *Pogonias* will be found annexed to the Report of the United States and Mexican Boundary Survey.

AMBLONDON, Rafin.

GEN. CHAR.—Body rather short and deep, more or less subfusiform in profile. Head of medium size; snout thickish, and protruding beyond the lower jaw. Mouth moderate; velvet-like teeth upon the jaws, with the external row conspicuously larger than the rest. Palate toothless. Edge of preopercle slightly denticulated; opercular apparatus otherwise smooth. Branchial apertures continuous under the throat. Two dorsal fins contiguous upon their base; anterior one spinous. Anal fin provided anteriorly with one, two, or three spines. Posterior margin of caudal fin convex or linear. Insertion of ventrals situated posteriorly to the base of the pectorals. Upper surface of head, cheeks, and opercular apparatus covered with scales, which are well developed all over the body. Smaller scales may be seen at the base of most of the fins.

SYN.—*Ambledon*, RAFIN. Ichthyol. Ohiens. 1820, 24.

Corvina, CUV. Règn. anim. (2d edit.), II, 1829.—CUV. & VAL. Hist. nat. Poiss. V, 1830, 86.—STORER, Synops. 1846, 67.

The genus *Ambledon* was first denominated *Aplodinotus* by Rafinesque himself, who states that the latter name had been framed upon an erroneous opinion of his, which brought him to change it to its present appellation.

The species of this genus inhabit both the fresh and salt waters. The fresh water representatives occurring as far north as the great lakes of Canada, whilst the marine ones belong to a more southern latitude, for, *Corvina argyroleuca*, De Kay, as will be seen further on, does not come under this heading.

Now, *A. richardsoni* (*Corvina richardsonii*, Cuv. & Val. Hist. nat. des Poiss. V, 1830, 100.—RICHARDS. Faun. Bor. Amer. III, 1836, 64. Plate LXXVII.—DE KAY, New Y. Fauna, IV, 1842, 76.—STORER, Synops. 1846, 72), appears to be peculiar to Lake Huron, at least has, so far, not been met with anywhere else. Still, further researches into the ichthyology of the British possessions in North America may bring to light other localities where the same species may also occur.

A. grunniens, figured in the present work, is known to exist in the Lakes Ontario and Erie, also in the hydrographic basins of the Ohio and Mississippi rivers.

Closely allied to the latter is *A. concinnus*, from the brackish waters of the Rio Grande del Norte (Rio Bravo), a specimen of which having been secured by the United States and Mexican Boundary Commission.

Finally, the Smithsonian Institution has just received a very characteristic species collected in the bay of San Diego, California, a brief description of which is annexed further on.

There are yet various species recorded in the method under the head of *Corvina*, the generical affinities of which have not yet been critically determined. We refer to those occurring in the seas and rivers of the East Indies, as well as those of the western coast of the Atlantic ocean. Those in which the second anal spine is slender and much shorter than the following soft and articulated rays of the same fin have been placed in the genus which Schneider, the commentator of Bloch, has long since named *Johnius*, the latter appearing to be synonymous with *Bola* of Buchanan: *Corvina ocellata*, of our southern Atlantic coast, belonging to it.

Again, there are some in which the limb of the preopercular bone, instead of being slightly serrated, exhibits spines of greater or lesser development: these may finally come under the head of *Homoprion*, a genus recently framed by Dr. Holbrook, to include analogous species observed on the coast of South Carolina.

The genera just alluded to, however, require a more thorough examination before the classification of all these species can be attempted.

1. AMBLODON GRUNNIENS, Rafin.

Buffalo Perch, Grunting Perch, &c.

PLATE XXIII.

SPEC. CHAR.—Profile of the head depressed on the nape. Snout thick, blunt, and short. Posterior extremity of maxillary extending to a vertical line intersecting the anterior rim of the pupil. Extremities of pectorals almost even with the tips of ventrals, or else projecting slightly beyond them. First anal spine diminutive; second one stout and well developed. Caudal fin posteriorly convex. Color bluish-grey, lighter beneath than above. Fins greyish-olive; anal maculated.

SYN.—*Ambiodon grunniens*, RAFIN. Ichthyol. Ohions. 1820, 24.

Sciaena oscula, LESU. in Journ. Acad. Nat. Sc. Philad. II, 1822, 252. Plate XIII.—KIRTL. Rep. Zool. Ohio. 163, 192.

Sciaena grisea, LESU. in Journ. Acad. Nat. Sc. Philad. II, 1822, 254.

Corvina oscula, CUV. & VAL. Hist. nat. des Poiss. V, 1830, 98.—RICHARDS. Faun. Bor. Amer. III, 1836, 68.—DE KAY, New Y. Faun. IV, 1842, 73. Plate XXI, fig. 63.—STORER, Synops. 1846, 67.

Corvina grisea, DEKAY, New Y. Faun. IV, 1842, 76.

White perch of the Ohio, lake sheepshead, buffalo perch, grunting perch, &c., VERNACULAR.

Though elongated, the general aspect of this fish is anything but slender. Its dorsal outline is quite arched, and the profile of the head very sloping. The greatest depth, measured under the first dorsal fin, constitutes a little less than the third of the total length, in which it is not contained quite three times and a half. The body is very much compressed, particularly the dorsal and caudal regions; from the lateral line upwards the thickness tapers away towards the insertion of the dorsal fin. The peduncle of the tail is comparatively slender. The head enters about four times in the total length. Its external aspect is rounded off, the snout being very blunt, rather thick, and projecting beyond the lower jaw. The profile, over the interocular region, is slightly depressed, though the surface preserves its convexity. The mouth is rather above than below the moderate size. The teeth are of the velvet-like type, the outer premaxillary row alone being rather large, conical, and canine-like. The eye is well developed, subcircular in shape, its diameter entering a little over five times in the length of the side of the head. The nostrils are much nearer the anterior rim of the orbit than the extremity of the snout. The limb of the preopercle is prominently convex and subcrenated; the opercular apparatus is otherwise spineless. The branchial apertures are continuous under the throat, and the branchiostegals number seven on either side.

The anterior dorsal fin is subtriangular and higher than the second. The first spine is very small and inconspicuous; the second and third spines are the highest. Nine spines compose that fin; a tenth spine belongs to the second fin, the base of which is nearly double that of the first. A vertical line dropped from the origin of the anterior dorsal would intersect the origin of the ventrals, and pass immediately behind the base of the pectorals. The second dorsal fin is higher posteriorly than anteriorly. The caudal fin constitutes nearly the fifth of the total length; its posterior margin is subtruncated or convex. The anal fin is comparatively small, provided anteriorly with two spiny rays, the first of which being quite diminutive and rudimentary, whilst the second is very stout, though not so long as the adjoining soft rays. The spine at the external margin of the ventrals is of moderate development; the tips of the latter fins are far from reaching the vent, which itself is situated at a short distance in advance of the anterior margin of the anal fin. The pectorals are quite elongated and sublancoelated.

Br. VII: VII; D IX, I, 33; A II, 7; C 3, 1, 8, 7, 1, 2; V I, 5; P 17 or 18.

The scales are of medium size, deeper than long; posteriorly pectinated, and provided with radiating furrows upon their anterior section only. The lateral line is nearly parallel with the dorsal outline, follows the middle of the peduncle of the tail, and extends to the very margin of the caudal fin.

The color is of a silvery bluish grey appearance, darker along the dorsal region and upper surface of the head than beneath. The fins are greyish olive; and in the specimen before us the anal is maculated.

References to the figures.—Plate XXIII, fig. 1, represents *Ambledon grunniens*, somewhat reduced in size. Fig. 2 is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.



List of specimens.

| Catalogue number. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|--------------|-----------------------------|-----------------|---------------------------|----------------------|------------------|
| 483 | 1 | Adult.... | St. Louis, Missouri..... | 1852 | Dr. George Engelmann... | Alcoholic... | Dr. Engelmann . |
| 621 | 1 | Young ... | Ark. river, near Ft. Smith. | 1853 | Lient. A. W. Whipple..... | do..... | Dr. Shumard.... |
| 624 | 1 | do..... | Near mouth of Potcau river | 1853 | do..... | do..... | do..... |
| 625 | 1 | do..... | Milk river, Missouri..... | 1853 | Gov. I. I. Stevens | do..... | Dr. Suckley..... |

2. AMBLODON SATURNUS, Grd.

SPEC. CHAR.—Profile of the head slightly depressed at the ocular region. Snout thick and rounded. Posterior extremity of maxillary even with a vertical line intersecting the pupil. Extremities of pectorals not extending as far as the tips of the ventrals, which do not reach the vent. Caudal fin posteriorly rectilinear. Ground color of upper regions purplish brown; of the inferior regions, greyish or yellowish, each scale bearing a dark purplish spot upon its middle; which spots are sometimes confluent, so as to constitute narrow streaks, corresponding somewhat to the rows of scales. An opercular patch. An obsolete, light fascia may also be observed across the middle of the body. Fins rather dark. Belly and throat sometimes unicolor, golden yellow.

The general appearance of this species is proportionally shorter and deeper than either *A. grunniens* or *A. concinnus*. According to all appearances, it is a species of rather small dimensions. The specimens now before us are but six inches in total length, the head constituting the fourth of it. The back is very much arched, compressed, thin along the dorsal line, as in the other species of the genus with which we are acquainted. The greatest depth of the body, taken under the first dorsal fin, is very nearly equal to the third of the total length.

The origin of the first dorsal fin is situated somewhat in advance of the base of the pectorals. It is composed of more slender rays than in *A. grunniens* and *A. concinnus*. Its outline is more of a subtriangular shape, since the second and third rays are shorter than the fourth, which is the highest; the others diminish again gradually, the first ray being, as usual, reduced to a small conical spine. The shape of the second dorsal does not differ from that of the other species. The caudal enters a little over five times and a half in the total length; its posterior margin is nearly rectilinear, instead of being convex, as in *A. grunniens* and *A. concinnus*. The origin of the anal is situated opposite the middle of the second dorsal; its first spine is exiguous; the second is very stout, and nearly as deep as the second articulated ray. The tip of the first ray extends beyond a vertical line, which would intersect the terminus of the base of the second dorsal. The ventrals and pectorals are but moderately developed. A considerable space is left between the extremities of the ventrals and the vent, which is situated somewhat in advance of the anterior margin of the anal.

Br. V: V; D X, I, 28; A II, 7; C 5, 1, 8, 7, 1, 4; V I, 5; P 18.

The ground color of the upper regions, as exhibited upon specimens preserved in alcohol, is purplish brown, whilst the inferior regions are greyish or yellowish. On the centre of each scale exists a dark purplish spot, which, being sometimes confluent with the adjoining spots of the same row of scales, may constitute narrow streaks, corresponding to the series of scales.

The upper surface of the head is almost uniform purplish brown; the posterior edge of the opercular apparatus being provided with a dark patch, not unlike what is observed in *Pomotis* and allied genera. An obscure or hazy light fascia extends from the origin of the second dorsal to the lower part of the abdomen, where it is lost in the uniform yellowish tint which predominates over the belly. The fins assume the dark hue of the body, even the ventrals; the pectorals alone being of a greyish olive.

List of specimens.

| Catalogue number. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|--------------|----------------------------|-----------------|---------------------------|----------------------|-----------------|
| 638 | 3 | Adult.... | San Diego, California | 1857 | A. Cassidy, U. S. A. | Alcoholic... | A. Cassidy..... |

LEIOSTOMUS, L a c e p .

GEN. CHAR.—Body elongated, more or less subfusiform. Head moderate, anteriorly rounded; snout thickish, and protruding beyond the lower jaw. Mouth large, inconspicuous, velvet-like teeth upon the jaws. Palate toothless. Opercular apparatus smooth; edge of preopercle slightly denticulated, if at all. Branchial apertures continuous under the throat. Two dorsal fins, contiguous at their base; anterior one spinous. Anal fin provided with two small spines. Posterior margin of caudal fin concave or subconcave. Insertion of ventrals situated posteriorly to the base of the pectorals. Upper surface of the head cheeks, and opercular apparatus scaly. Scales of body of moderate size.

SYN.—*Leiostomus*, LACEP. Hist. nat. des Poiss. IV, 1819, 269.—CUV. & VAL. Hist. nat. des Poiss. V, 1830, 140.—DEKAY, New Y. Fauna, IV, 1842, 69.—STORER, Synops. 1846, 69.

This genus is very closely allied to *Amblodon*, from which it chiefly differs by the inconspicuousness of its maxillary teeth, and which are likewise more uniform. The small anal spines constitute another not less important feature. The shape of the caudal fin we consider also quite valuable in the diagnoses of these two genera.

LEIOSTOMUS LINEATUS, A y r e s .

The Little Bass, or Cognard.

PLATE XXII C, FIGS 1—4.

SPEC. CHAR.—Mouth large; posterior extremity of maxillary extending to a vertical line intersecting the posterior rim of the pupil. Superior and posterior edge of the opercle terminating into two flat spines. Extremities of pectorals nearly even with the tips of the ventrals. Scales large. Greyish brown above; greyish silvery beneath, with oblique waving lines of umber brown.

SYN.—*Leiostomus lineatus*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 25.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 135.

The head constitutes a little less than the fourth of the total length. The mouth is large, for, the posterior extremity of the maxillary extends to a vertical line which would intersect the posterior rim of the pupil. The snout itself is thickish and rounded, and projects beyond the lower jaw; the gape of the mouth being nearly horizontal. The eye is subcircular, its horizontal diameter entering about five times and a half in the length of the side of the head. The

edge of the preopercle is finely denticulated, whilst two flattened and tapering spines may be observed upon the upper and posterior margin of the opercle imbedded in the integuments. The scales covering the upper surface and sides of the head are well developed, and as large upon the cheeks as on the opercle. The branchial apertures are continuous under the throat, the branchial rays being seven in number on either side.

The anterior dorsal fin is subtriangular, composed of eleven rays, properly speaking, the fourth being the highest; the third and fifth are equal and a little shorter than the fourth; the eleventh is the smallest of all. Two other small spines may be observed, one immediately at the anterior margin of the second dorsal, whilst the other is intermediate between the two fins. The second dorsal itself is highest anteriorly, diminishing gradually posteriorly. The anal fin is subtrapezoid, nearly as long as deep anteriorly, and slightly concave exteriorly. It does not extend as far posteriorly as the dorsal. A rudimentary and an exiguous spine exist anteriorly. The caudal is subcrescentic posteriorly, constituting about the sixth of the total length. The insertion of the ventrals corresponds to a vertical line drawn immediately behind the base of the pectorals, and a little in advance of the anterior margin of the first dorsal. The spiny ray is long and slender, whilst the tips of the soft rays are far from reaching the vent. The pectorals are slender and sublanceolated; their extremities extending as far, if not further, than the tips of the ventrals.

Br. VII: VII; D XIII, 22; A II, 12; C 4, 1, 8, 7, 1, 3; V I, 5; P 16.

The scales are large, finely pectinated, oblong in shape, deeper than long, with radiating grooves upon the anterior section only. The base of the caudal alone is provided with small scales; the lateral line may be traced to near the edge of the latter fin.

The color is greyish brown above and greyish silvery beneath, the dorsal region being occasionally dark clouded. Oblique waving lines of umber brown are quite conspicuous along the dorsal region above the lateral line, resulting from a spot on each scale: the scales being disposed upon oblique series cause the obliquity of the above lines. The base of the pectorals is black interiorly.

The largest specimens observed are said to have measured eleven inches.

References to the figures.—Plate XXII C, fig. 1, represents *Leiostomus lineatus*, size of life. Fig. 2 is a dorsal scale. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catalogue number. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Original number. | Nature of specimens | Collected by— |
|-------------------|-------------------|--------------|---------------------------|-----------------|---------------------------|------------------|---------------------|-----------------|
| 368 | 2 | Adult.... | San Francisco, California | 1857 | Dr. O. W. Ayres | 5 | Alcoholic... | Dr. Ayres |
| 369 | 2 | ..... | .....do..... | 1856 | Lieut. R. S. Williamson.. | ..... | .....do..... | Dr. Newberry... |

UMBRINA, Cuv.

GEN. CHAR.—Body elongated and fusiform. Head moderate, subconical; snout thickish, protruding over the lower jaw, at the symphysis of which a barbel may be seen. Mouth small; teeth velvet-like, exiguous. Palate toothless. Opercular apparatus smooth. Branchial apertures continuous under the throat. Two dorsal fins contiguous at their base; anterior one spinous. Anal fin provided anteriorly with one or two small spines. Posterior margin of caudal fin subtruncated. Insertion of ventrals situated posteriorly to the base of pectorals. Upper surface of head, cheeks, and opercular apparatus scaly. Scales of body of moderate size.

SYN.—*Umbрина*, Cuv. R \acute{e} gn. anim. II, 1817; 2d ed. II, 1829; & ed. illustr. Poiss 82.—Cuv. & Val. Hist. nat. des Poiss. V, 1830, 171.—DE KAY, New Y. Fauna, IV, 1842, 78.—STORER, Synops. 1846, 71.

The "king fish" of the New Yorkers and the "whiting" of the South Carolinians belong to the present genus. Several other species inhabit the Gulf of Mexico, one of which is figured in the report to the United States and Mexican boundary commission.

UMBRINA UNDULATA, Grd.

SPEC. CHAR.—Mouth small; posterior extremity of maxillary extending to a vertical line drawn midway between the anterior rim of the orbit and the pupil. Origin of ventrals situated opposite the anterior margin of the first dorsal. Extremities of pectorals not extending as far as the tips of ventrals, which do not reach the vent. Anal fin small and narrow. Scales moderate. Color ash-grey, silvery above, each scale bearing a small greyish-brown spot, giving rise to oblique and undulating lines. Beneath, metallic yellow, unicolor.

SYN.—*Umbрина undulata*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 148.

The greatest length of the specimen described is six inches, the head being comprised in it four times and a half. It is more than probable that the species attains a larger size. The body is much compressed, especially the dorsal region, properly so-called. The upper surface of the head is rounded; the snout prominent and subconical, protruding considerably beyond the lower jaw. The mouth is rather small, and the posterior extremity of the maxillary extends to a vertical line, which would be drawn midway between the anterior rim of the orbit and the pupil. The eye is subelliptical, its horizontal diameter being contained about five times in the length of the side of the head. The first dorsal fin is subtriangular; its anterior margin is situated a little posteriorly to the base of the pectorals. The first spine is a mere rudiment; the second spine is nearly as high as the third, which is the highest; the fourth is nearly equal to the second. A small spine is placed between the two dorsal fins, and a similar one at the anterior margin of the second dorsal, which is higher anteriorly than posteriorly, and twice and a half as long as the first. The caudal is posteriorly subtruncated, constituting about the sixth of the total length. The anal is about one third deeper than long; upon its base as deep as the first dorsal is high. The posterior extremities of the pectorals extend to a vertical line, which would intersect the anterior margin of the second dorsal. The tips of the pectorals extend beyond the extremities of the ventrals, without, however, reaching the vent.

Br. IV: IV; D XI, 25; A I, 9; C 3, 1, 7, 7, 1, 2; V I, 5; P 20.

The scales are of medium size, finely ciliated posteriorly, with radiating furrows upon their anterior section only. Their general form is obliquely subquadrangular or rhomboid, deeper than long. The lateral line is slightly arched under the first dorsal fin, otherwise parallel to the dorsal outline.

The upper regions are ash-grey, silvery above, with a small greyish-brown spot upon each scale, constituting oblique and undulating lines. Beneath, the color is of a uniform metallic yellow.

List of specimens.

| Catalogue number. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens | Collected by— |
|-------------------|-------------------|--------------|---------------------------|-----------------|--------------------------|---------------------|-----------------|
| 370 | 1 | Young... | San Diego, California.... | 1853 | Lieut. W. P. Trowbridge. | Alcoholic... | A. Cassidy..... |

Family *ATHERINIDAE*, Bonap.

The upper arcade of the mouth is formed by the premaxillaries, and the maxillaries, which are situated behind, are tapering towards its free or posterior extremity, instead of being dilated, as in all the other families, that of *Mugilidae* excepted. The upper jaw is very protractile, and the premaxillary and maxillary teeth and others, whenever extant, are generally so small as to require to be magnified, in order to become visible. The branchiostegal rays are six on either side. There are four gills on either side, but no pseudo-branchiae. The branchial apertures are continuous under the throat.

The body is covered with cycloid scales, and provided laterally with a silvery band, whilst the line of mucous pores is wanting. There are two dorsal fins, widely separated, the ventrals being abdominal. The stomach is a simple membranous pouch, without cul-de-sac; the pyloric appendages are likewise wanting. The swimming bladder, however, is extant.

SYN.—*Atherinidae*, BONAP. Syn. Vert. Syst. 1837.—GRD. in Gilliss' U. S. N. Astron. Exped. to S. Hemisph. II, 1855, 237.

The large species of this family are much esteemed as an article of food by all the sea coast people. The small ones are equally delicate, although not made an article of commerce, for the very simple reason that it is not remunerative.

ATHERINOPSIS, Girard.

GEN. CHAR.—Palate toothless. Gape of the mouth directed obliquely upwards; jaws even at their extremities; snout rounded or obtuse.

SYN.—*Atherinopsis*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 134 & in Gilliss' U. S. N. Astr. Exp. to South. Hemisph. II, 1855, 237.

This genus has all the characters of *Atherina*, except that the palate is toothless. The structure of the mouth is after the fashion of *Mugil*: the premaxillaries (intermaxillaries) constituting its upper arcade at the exclusion of the maxillaries, which are situated behind the latter. The lower jaw is even with the upper; the gape of the mouth is directed more or less obliquely upwards. The latter feature will at once distinguish the present genus from that of *Basilichthys*, in which the upper jaw projects beyond the lower.

ATHERINOPSIS CALIFORNIENSIS, Grd.

California "Smelt."

PLATE XXII c.

SPEC. CHAR.—Head small and subquadrangularly pyramidal, constituting the sixth of the entire length. Base of anal fin much longer than that of the second dorsal. Greyish brown above; light brown or silvery beneath. Fins olivaceous, unicolor.

SYN.—*Atherinopsis californiensis*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 134, 141, & 151; &, in Journ. Bost. Soc. Nat. Hist. VI, 1857. Plate xxiv, figs. 1—4.

Atherina storeri, AYRES, MS.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 136.
The "Smelt" of the California settlers.

We have had an opportunity of examining a great number of specimens of this species, measuring from five to seventeen inches in total length, the head constituting precisely the sixth part of it. The body is very much compressed, rather slender in general appearance, and gracefully subfusiform. The dorsal line is but slightly arched in the adult fish; in the young it is less so yet, passing gradually to the upper surface of the head without transition. The same is true of the ventral outline: more convex in the adult than in the young. The back anterior to the fins is generally rounded off. The greatest depth of the body, taken immediately in advance of the origin of the ventral fins, is contained about seven times in the total length; the least depth, on the peduncle of the tail, is about the half of the greatest.

The head is proportionally small, slightly convex above, and subquadrangularly pyramidal, though the sides slope inwardly downwards, thus rendering the inferior plane much narrower than the upper. The snout itself is subconical in its retracted condition. Protractile to a certain degree, the mouth, which is of moderate size, preserves, nevertheless, its horizontal gape. It is the only portion of the head, the preorbital region included, which is deprived of scales, and hence perfectly smooth. The teeth are very exiguous, of the velvet-like type. The tongue is narrow, anteriorly rounded, and perfectly smooth. The anterior nostril is situated midway between the anterior rim of the orbit and the extremity of the snout. The eye is subcircular and of moderate size; its horizontal diameter enters about four times and a half, or a little more, in the length of the side of the head. The branchial fissures are continuous under the throat, and prolonged towards the hyoid apparatus. The branchiostegal rays are five on either side and quite slender. The inter- and subopercle are well developed.

The origin of the anterior dorsal fin is equidistant between the extremity of the snout and the fork of the caudal; the fin itself is composed of seven spiny rays, the first of which being the highest. The second dorsal is situated opposite the anal; and since its base is a good deal shorter than that of the latter, the posterior extremities and the anterior margins of these two fins do not coincide with the same vertical lines. The rays are thirteen in number, diminishing less abruptly in height than in the anterior dorsal, thus giving the upper margin of that fin a more gradual slope. The caudal fin is deeply forked, and contained in the total length about six times, the same as the head. The anal is as deep anteriorly as the second dorsal is high, diminishing, however, very rapidly backwards. The origin of the ventrals is nearer the terminus of the anal than the extremity of the snout; they are composed of five well developed

and dichotomised rays, and a rudimentary, undivided one upon their external edge. The pectorals are well developed, posteriorly falciform, and terminating into a point.

Br. VI: VI; D VII, 13; A I, 27; C 5, 1, 8, 7, 1, 7; V I, 5; P 15.

The scales are large, constituting but thirteen longitudinal series upon the line of greatest depth of the body. Longer than deep on the dorsal region, and deeper than long on the abdominal region, they are rounded off upon their posterior margin, and truncated upon their anterior margin. Radiating grooves may be seen upon the posterior section of the scale only.

The cheeks, opercular apparatus, and the upper surface of the head, are covered with large and imbricated scales, similar to the scales of the body, except that their outline is subjected to infinite variations.

The dorsal region above the silver band is greyish brown, as also the upper surface of the head; the silver band is margined with bluish black. The flanks, sides of head, and belly are light brown in the young and silvery in the adult. The fins are olivaceous and unicolor.

References to the figures.—Plate XXII c, fig. 1, represents, size of life, *Atherinopsis californiensis*, from San Francisco. Fig. 2, an outline of the fish seen from above. Fig. 3, an outline of the head from beneath. Fig. 4, a section of the body taken across its middle. Fig. 5 is a scale from the dorsal region. Fig. 6, a scale from the abdominal region.

List of specimens.

| Catalogue number. | No. of specimens. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-------------------|-------------------|--------------|-------------------------------|-----------------|-------------------------------|----------------------|-------------------|
| 351 | 5 | Adult.... | San Francisco, California ... | 1853 | Lieut. R. S. Williamson | Alcoholic... | Dr. Heermann .. |
| 352 | 2 | ...do.... |do..... | 1853 |do..... | ...do..... | Dr. Newberry... |
| 353 | 1 | Young |do..... | 1853 | Lieut. A. W. Whipple..... | ...do..... | Dr. Kennerly ... |
| 354 | 6 | ..... | Presidio, California | 1853 | Lieut. W. P. Trowbridge..... | ...do..... | Lieut. Trowbridge |
| 355 | 1 | ..... | San Diego, California..... | 1854 | Major W. Emory | ...do..... | A. Schott..... |
| 356 | 2 | ..... | .....do..... | 1853 | Lieut. W. P. Trowbridge..... | ...do..... | A. Cassidy..... |
| 357 | 5 | ..... | .....do..... | 1853 |do..... | ...do..... |do..... |
| 358 | 2 | Adult.... | Tumales bay, California ... | 1856 | E. Samuels | ...do..... | E. Samuels |
| 359 | 6 | ..... | .....do..... | 1856 |do..... | ...do..... |do..... |

Family SCOMBRIDAE, Bonap.

The fishes of this family are exceedingly diversified in their external form and aspect, according to the genera and species. Their body is covered with scales generally speaking minute or diminutive, and which, by their unobtrusiveness, leave the skin the appearance as though it were perfectly smooth. In some species the scales themselves exhibit both the cycloid and ctenoid structures. Many of them are provided, on the sides of the tail, with a crest or ridge oftentimes protected by a series of keeled, bony, scale-like shields. The dorsal, caudal, and anal fins are scaleless, and their structure undergoes a series of considerable modifications, according to the species. The sides of the head are smooth, the opercular apparatus presenting neither spines nor serratures. There are numerous pyloric appendages to the intestine, but the swimming or air bladder is wanting.

SYN.—*Scombridae*, BONAP. Sagg. distr. anim. vertebr. 1831, 107.—DEKAY, New Y. Faun. IV, 1842, 101.—STORER, Synops. 1846, 89.

Scomberoides, CUV. Règn. anim. II, 1817, 311; 2d. ed. II, 1829; &, ed. illustr. Poiss. 115.—CUV. & VAL. Hist. nat. Poiss. VIII, 1831, 1.

Scomberoideae, RICHARDS. Faun. Bor. Amer. III, 1836, 76.

Scomberidae, YARR. Hist. Brit. Fish. I, 1836; &, 2d ed. I, 1841, 137.

This is one of the most interesting family of the order of Acanthopterians, and one the representatives of which are very numerous. Whether they are really scarce along the coast of California and Oregon, or whether not caught or observed as yet, we are not prepared to tell from the distance at which we are now writing. One fact is certain, that, up to the present year 1858, we have been made acquainted with but four species of this family; one, a mackerel, procured at San Diego, and which we have never seen; another, a bonito, also from San Diego; and, finally, two trachuri, one from the harbor of San Francisco; the other from San Diego.

The scomberoids are fishes most useful to man; the pleasant and agreeable taste of their flesh, the size reached by some species, and especially their incalculable number, constitute them a source of trade and wealth. Indeed, the herrings alone can be compared to them in this respect.

The mackerel above referred to, and of which no specimens have so far come under our observations, has been described under the name of

SCOMBER DIEGO, Ayres,

in the Proceedings of the California Academy of Natural Sciences, I, 1857, 92—where our readers may find whatever has been said respecting it.

PELAMYS, Cuv. & Val.

GEN. CHAR.—Two dorsal fins approximated; numerous finlets behind the latter and the anal. Peduncle of tail keeled on either side. Scales small, inconspicuous; thoracic corselet of moderate development. Maxillar teeth elongated, compressed, sharp, and acute. Teeth on the palatines bones; none on the vomer. Branchial apertures continuous under the throat. Opercular apparatus smooth.

SYN.—*Pelamys*, CUV. & VAL. Hist. nat. des Poiss. 1831, 149.—DEKAY, New Y. Fauna. IV, 1842, 106.—STORER, Synops. 1846, 90.

A genus allied to the mackerels (*Scomber*) from which it differs by the approximation of the dorsal fins. Also, by its pointed, sharp, and compressed maxillar teeth; the third one on

either side of the lower jaw being larger than the rest and situated more inwardly; and by the presence of teeth on the palatine bones, which do not exist in the mackerels.

PELAMYS LINEOLATA, G r d .

SPEC. CHAR.—Head sub-conical; gape of mouth somewhat oblique; jaws nearly even; posterior extremity of maxillaries extending to a vertical line drawn within the posterior rim of the orbit. Origin of anterior dorsal situated slightly in advance of the base of the pectorals. Anterior margin of anal placed opposite the posterior margin of the second dorsal. Eight finlets above the tail, and seven under it. Bluish black above, with longitudinal blackish streaks; silvery on the sides, and yellowish beneath.

The only specimen of this species which has come under our observation as these sheets were passing through the press, measures about eleven inches in total length. The body is most gracefully elongated, rather slender, very much compressed, and sub-fusiform in its profile. The greatest depth, taken at the insertion of the ventral fins, is contained six times in the total length; the greatest thickness, at the same region, being about the half of the depth just alluded to.

The head constitutes about the half of the total length; the gape of the mouth is somewhat oblique upwards, the snout being sub-conical, and the jaws nearly even; the lower one having a tendency to project very slightly beyond the upper. The posterior extremity of the maxillary bone, which is rounded, falls evenly with a vertical line drawn inwards of the posterior rim of the orbit. The teeth are rather distant and more slender on the upper jaw than on the lower, towards the apex of which two canine-like ones may be observed, one on either side, and somewhat larger than the rest. The eye is moderate sized, sub-circular, its horizontal diameter entering about six times in the length of the side of the head; twice in advance of its anterior rim. The anterior nostril is very minute, situated midway between the apex of the rostrum and the centre of the pupil; whilst the posterior one, an elongated, vertical, sub-crescentic split, is placed somewhat in advance of the orbit, its sub-concave side towards the eye. The edge of the opercular apparatus constitutes an even curve.

The origin of the first dorsal fin takes place upon a vertical line which would pass somewhat in advance of the base of the pectorals. It is highest anteriorly, diminishing gradually in depth backwards. It is somewhat longer than the head, hence its length is a little more than the fourth of the total length. A space of three-eighths of an inch exists between the two dorsal fins. The second dorsal is sub-triangular, a little longer than high, and is followed by eight finlets, the tip of the last of which reaching the base of the caudal fin. The anal, somewhat smaller than the second dorsal, is sub-triangular also, its anterior margin being situated nearly opposite the posterior margin of the latter mentioned fin. Seven finlets a little larger than the dorsal ones may be seen under the peduncle of the tail. The caudal is slender, its posterior margin having the shape of a very open crescent. The ventrals are moderate sized, their anterior margin corresponding to a vertical line drawn immediately behind the base of the pectorals. The pectorals themselves are rather short, sub-falciform and broad at the base.

Br. VII: VII; D XVIII, 13; A 12; C 11, 1, 9, 8, 1, 12; V 1, 5; P 27.

The scales, as already observed, are quite small and inconspicuous; even those constituting the thoracic corselet require something more than a superficial glance before their presence is made obvious. The lateral line is somewhat undulated, although following a direct course from the upper region of the thoracic arch to the peduncle of the tail. It is nearer the dorsal outline

at its onset than further back. The caudal keel or ridge begins almost evenly with the antepenultimate finlets, and extends to the base of the caudal fin, being more developed upon its middle than at its extremities. The accessory keels at the base of the caudal fin may easily be observed, although much less developed than the one just referred to.

The upper surface of the head, and occipital region to the first dorsal are bluish black. The dorsal region is rather lighter, though bluish still, with three longitudinal and somewhat oblique blackish streaks, starting from various points on the lateral line and running towards the dorsal line, parallel to one another. The rest of the flanks and sides of the head are silvery, whilst the abdominal region, properly so called, is yellowish golden. The dorsal and caudal fins are bluish black also, the anterior dorsal being a good deal darker than the others; the pectorals are greyish above and yellowish beneath, whilst the ventrals and the anal are of a pure lemon hue.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. |
|------------|--------------|--------------|----------------------|-----------------|------------------|----------------------|
| 688 | 1 | Adult.. | San Diego, Cal | 1857 | A. Cassidy..... | Alcoholic..... |

TRACHURUS, Rafin.

GEN. CHAR.—Body elongated, compressed, sub-fusiform in its profile. Head well developed, compressed also. Mouth moderate; lower jaw longest. Small teeth on the jaws; velvet-like teeth upon the vomer and palatine bones. Opercular apparatus smooth. Branchial apertures continuous under the throat. Two dorsal fins distinct. Two free spines in advance of the anal fin. Caudal furcated. Scales moderate in size. Lateral line composed of narrow and vertical scutellae, keeled upon their middle and acerated posteriorly.

SYN.—*Trachurus*, RAFIN. Caratt. nuovi Generi e nuove specie di Animali, &c. della Sicilia, &c. 1810.—Cuv. & VAL. Hist. nat. des Poiss. IX, 1836, 6.

OBSERV.—This genus may be distinguished from *Caranx* proper by the structure of its lateral line, which is composed of vertical, scale-like scutellae throughout its whole length, whilst in *Caranx* the same scutellae are observed upon the posterior portion of the body only. The general shape of *Trachurus* appears to be more elongated also than in *Caranx*. In both, however, we observe a small, nearly horizontal spine, at the anterior margin of the first dorsal and directed forwards.

1. TRACHURUS SYMMETRICUS, Grd.

SPEC. CHAR.—Head forming the fourth of the total length. Posterior extremity of maxillary extending to the anterior rim of the orbit. Scutellae of lateral line smallest upon its bent, under the anterior third of the second dorsal. "Greenish brown above, lighter on the sides, silvery beneath. Sides silvery. A brownish black blotch at the superior and posterior angle of the opercle. Dorsals somewhat clouded; other fins nearly colorless."

SYN.—*Caranx symmetricus*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 62.

The specimen which we describe is but five inches and a quarter in total length, whilst the one first observed by Dr. Ayres measured seventeen inches, and since we have to deal with an immature specimen we will briefly state a few of its most prominent features.

The body is compressed and sub-fusiform in its profile, the head forming about the fourth of

the total length, in which the caudal fin itself enters about five times and a half. The gape of the mouth is oblique upwards, the lower jaw being the longest, and the posterior extremity of the maxillary, which is quite dilated, extending to a vertical line drawn in advance of the orbit.

The origin of the anterior dorsal fin takes place posteriorly to the insertion of the ventrals, and is somewhat higher than the second. The origin of the anal is situated a little posterior to that of the second dorsal, and terminates almost evenly with the latter. The terminal ray of both of these fins, though united to them, resembles more an isolated finlet than an ordinary ray. It is larger than those preceding it, and hence quite conspicuous; its tip reaches the rudimentary rays of the caudal above as well as below. The caudal fin is deeply furcated.

Br. VII: VII; D VIII, 40;? A II, 1, 28; C 6, 1, 9, 8, 1, 6; V I, 5; P 1, 22.

The scales of the body are not preserved upon our specimens; a few scattered ones exhibit a pectinated or rather spiny posterior edge, numerous and fine concentric striae, but no radiating furrows. The lateral line, from the upper edge of the opercle, extends nearly parallel with the back to the beginning of the second dorsal, where a gracefully open curve brings it along the middle of the tail, hence runs straightway to the caudal. The scale-like scutellae of which it is composed are vertically elongated and quite narrow, largest upon the middle of the tail and smallest upon the bent, except near the base of the caudal, where they taper off into exiguous plates. Their middle region is keeled, inconspicuously anteriorly, prominently along the tail, the keel increasing towards the caudal fin.

The specimen before us being somewhat discolored, we have nothing to add touching its various tints, having quoted in the specific diagnosis the coloration as observed by Dr. Ayres on a fresher specimen.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimens. |
|------------|--------------|--------------|--------------------------|-----------------|-----------------------|-----------|----------------------|
| 488 | 1 | Young | San Francisco, Cal. | 1856 | Dr. W. O. Ayres | 26 | Alcoholic |

2. TRACHURUS BOOPS, Grd.

SPEC. CHAR.—Head contained a little over four times and a half in the total length. Posterior extremity of maxillary extending to a vertical line intersecting the anterior rim of the pupil. Curve of lateral line situated in advance of the second dorsal fin. Pectoral fins very long, slender, and falcate. Greyish olive above; yellowish beneath. A black patch at the posterior edge of the opercle. Fins unicolor.

As the specimen upon which this species is established may be considered of mature growth, its characters will better compare with those of the preceding one, and especially with the description of the latter by Dr. Ayres.

Its total length measures twelve inches, the head being contained in it a little over four times and a half, and exactly four times to the fork of the caudal fin. The body is elongated, very much compressed, subfusiform in its profile, and of great symmetrical beauty. The greatest depth which corresponds to the origin of the second dorsal enters about four times in the total length. The upper surface of the head is sub-convex, and gently declivous forwards, the snout being rounded and rather obtuse, the lower jaw projecting slightly beyond the upper, owing to the obliquity upwards of the gape of the mouth. The maxillar bone is quite dilated posteriorly

and subtruncated, its upper angle corresponding to a vertical line which would intersect the anterior rim of the pupil. The eye itself is well developed sub-circular, its longitudinal diameter entering about five times in the length of the side of the head.

The first dorsal is sub-triangular, and nearly as high as the second; it is preceded anteriorly by a small spine; the third and fourth rays are the highest, the fifth being a good deal shorter than the first (properly so called), and the sixth and seventh the shortest and more widely apart than the rest. This fin, therefore, is composed of eight rays, if the anterior spine may be counted as one. The anal spines are sub-equal, equi-distant between the anterior margin of the anal fin and the vent, and situated opposite the anterior margin of the second dorsal; the vent itself being equi-distant between these same anal spines and the tips of the ventral fins. The caudal fin is slender and very deeply forked; the peduncle of the tail being broader than deep, owing to the prominence of the lateral keel upon that region. The ventral fins are rather short, and inserted upon a vertical line passing somewhat in advance of the postero-inferior edge of the base of the pectorals. The pectorals themselves are falciform, broad at their base, elongated and slender towards their extremity, which extends posteriorly to a vertical line drawn beyond the middle of the triangular portion of the anal fin.

Br. VII: VII; D VIII, 24; A II, 21; C 5, 1, 8, 8, 1, 5; V 1, 5; P 1, 24.

The scales are of moderate development, deeper than long, sub-ellipsoid in shape, existing on the upper part of the opercular apparatus as well as on the cheek. The lateral line, from the upper part of the gill aperture, takes a straight and somewhat upward course until opposite the base of the first dorsal fin, where an open and regular curve brings it down to the middle of the flanks, hence extending straightway to the base of the fin. The armature, peculiar to this genus, commences immediately below the curve just alluded to, opposite the anterior margin of the second dorsal fin; the scutellae increasing gradually in size backwards as well as the spinous keel observed upon their middle region.

The upper surface of the head and body from the lateral line upwards is greyish olive, somewhat darker on the former region, whilst the flanks and the abdomen are yellowish, with a metallic reflect. The posterior margin of the opercle exhibits a conspicuous black patch. The dorsal and caudal fins are of a darker hue than the dorsal region, whilst the anal, pectorals, and ventrals exhibit nearly the same tint as the regions where they are inserted.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. |
|------------|--------------|--------------|----------------------|-----------------|------------------|----------------------|
| 689 | 1 | Adult. | San Diego, Cal | 1857 | A. Cassidy | Alcoholic |

Family SQUAMIPENNES, Müll.

The structural peculiarities of this family, as far as investigated, are but few in number, and one of them, viz: the presence of scales over nearly the whole extent of the vertical fins, the spinous portion of the dorsal excepted, is met with, to a certain degree, in *Sciaenoids*, but the cavernous structure of the skull in the latter will always assist in detecting the true affinities of the various genera and species referable to either of these two families.

The body of the *Squamipennes* is very compressed, and generally deep and short, protected with ctenoid or pectinated scales. The spinous portion of the dorsal being either continuous with the soft portion, else separated. The preopercle is spineless in the majority of cases, and somewhat spinous in others. The maxillar teeth assume various shape and structure: brush or bristle like, trenchant or cutting, and tri-lobed or serrated upon their edge, velvet-like, and even card-like, according to the genera. The palate being either toothed or toothless.

SYN.—*Squamipennes*, Cuv. R \acute{e} gn. Anim. II, 1817, 332; 2d ed. II, 1829; &, ed. Illustr. Poiss. 104.—Cuv. & Val. Hist. nat. Poiss. VII, 1831, 1.

Squamipennae, RICHARDS. Faun. Bor. Amer. III, 1836, 73.

Squamipennes, MULL. in Wieg. Archiv. f. Naturg. I, 1845, 136.

Chaetodontidae, BONAP. Sagg. Distr. Anim. Vert. 1831, 106.

Chaetodontoideae, RICHARDS. Faun. Bor. Amer. III, 1836, 73.

Chetodontidae, DEKAY, New Y. Faun. IV, 1842, 97.—STORER, Synops. 1846, 85.

The appellation of *Squamipennes*, expressing the family trait more generally than *Chaetodontidae*, is here adopted on that sole ground, although it has likewise priority of publication.

EPHIPPIUS, Cuv.

GEN. CHAR.—Body sub-elliptical or sub-circular, provided with two contiguous dorsal fins; the spinous or anterior one is scaleless, very much depressed at its junction with the soft, and capable of being folded into a dorsal groove. Anal fin preceded by three spiny rays. Pectoral fins sub-elliptical. Branchial apertures separated underneath by a very wide isthmus. Scales moderate sized.

SYN.—*Ephippus*, Cuv. R \acute{e} gn. Anim. II, 1817, 335; 2d ed. II, 1829, 191; &, ed. Illustr. Poiss. 108.—Cuv. & Val. Hist. nat. Poiss. VII, 1831, 112.—DEKAY, New Y. Faun. IV, 1842, 97.—STORER, Synops. 1846, 86.

The genus *Ephippus* belong to that tribe of the family in which there are no teeth to the palate, but on the other hand provided with brush-like teeth to either jaw; in which, furthermore, the preopercle is smooth or spineless, and the anterior dorsal separated from the second by a wide depression in its outline, although both fins are continuous at their base.

EPHIPPIUS ZONATUS, Grd.

SPEC. CHAR.—Head small; snout very short, abruptly declivous; mouth quite small, posterior extremity of maxillary not extending quite to a vertical line which would be drawn across the anterior rim of the orbit. Eyes moderate sized. Branchial isthmus very wide. Extremity of first soft ray of ventrals filiform, and reaching the vent. Second anal spine much stouter than the first and third. Anal and soft dorsal sub-similar in shape or outline. Olivaceous grey above, yellowish beneath, transversely banded with black.

The largest of the two specimens which we have had an opportunity to examine is not quite six inches in total length. The body, which is sub-circular in its profile, is very much compressed; the greatest depth being equal to the length, the head and caudal fin excluded; the

peduncle of the tail is rather short and slender. The head is small and constitutes a little less than the fourth of the total length; the snout being round and abruptly declivous. The pre-nasal aperture, which is small and circular, is situated at the anterior aspect of the rostrum, somewhat nearer the orbit than the margin of the upper lip, while the post-nasal one is well developed, in the shape of a compressed ellipsis, obliquely situated in advance of the orbit. The mouth is rather small, its gape nearly horizontal, the posterior extremity of the maxillary extending to a vertical line drawn between the post-nasal aperture and the anterior rim of the orbit. The eye is of moderate size, circular in shape, its diameter entering about three times and a half in the length of the side of the head.

The branchial apertures do not extend much below the opercular bone, thus giving rise to a very wide isthmus; the branchiostegals, four on either side, are but moderately developed.

The origin of the spinous dorsal fin corresponds to a vertical line which would pass immediately behind the base of the pectorals. The two first spines are very small and inconspicuous; the third is the largest of all; the rest diminish gradually to the last. The anterior margin of the soft dorsal is inclined backwards; its upper margin is somewhat undulated; its posterior extremity, which is somewhat rounded, does not quite reach the insertion of the caudal fin. The anal is shorter than the dorsal, but proportionally as deep as the latter is high. In shape or outline both of these fins are alike; the posterior extremity of the one under consideration is nearly even with the dorsal, and at the same distance from the insertion of the caudal as the latter. Of the three spines at its anterior margin, the second or middle one is the stoutest and deepest, the first and third being sub-equal and small. The caudal is dove-tail like, slightly undulated upon its posterior margin which otherwise assumes a truncated appearance; it constitutes about the sixth of the total length. The anterior or external margin of the insertion of the ventrals is situated somewhat in advance of the pectorals and posterior edge of the opercle; these fins are sub-triangular, the first articulated ray being filiform upon its extremity, which extends as far as the vent, placed somewhat in advance of the anterior margin of the anal fin. The spiny ray is slender and acute, sub-equal with the fourth articulated one. The pectorals are rather small, exteriorly rounded and sub-conical in their outline; their posterior extremity not extending as far as the tips of the ventrals.

Br. IV: IV; D VIII, I, 22; A III, 19; C 2, 1, 8, 7, 1, 3; V I, 5; P 16.

The scales are of moderate size, deeper than long, and finely pectinated posteriorly, whilst the anterior section exhibits distant furrows. The lateral line constitutes a curve, convex upwards, nearly parallel to the dorsal outline, reaching the middle of the caudal peduncle near the terminus of both the dorsal and anal fins.

The ground color of the upper region is olivaceous grey, that of the inferior region yellowish; the middle of the flank exhibiting an intermediate hue between the two tints just alluded to. A black band, slightly convex forwards, extends from the occiput across the eye, to the throat in advance of the branchial aperture and a little beyond it. A second similar band, broader and more convex still, has its initial point immediately in advance of the spiny dorsal, extending to the abdominal region at a level with the insertion of the ventrals, passing immediately behind the pectorals and encroaching somewhat upon the posterior edge of the opercle. Like the former, it does not meet underneath with its fellow. The third and narrowest band, from the fourth and fifth dorsal spine, extends to about the middle of the distance between the lateral line and the vent, being likewise slightly convex forwards. The fourth band, which is nearly as broad as the second, stretches obliquely backwards from the anterior margin of the soft portion of the

dorsal to the anterior margin of the soft portion of the anal ; it tapers somewhat downwards and meets its fellow of the opposite side. A fifth band, slightly convex posteriorly, may be observed under the posterior half of the soft dorsal and covering the posterior region of the body, properly so called. Finally, a sixth band occupies the caudal region near the insertion of the caudal fin. The fins are of a dark greyish hue, the anal and ventrals being rather blackish, and the caudal and pectorals olivaceous.

This species is closely allied to *E. faber* of our Atlantic coast, from which it may be distinguished by the outline of the vertical fins chiefly.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. |
|------------|--------------|--------------|-------------------------|-----------------|------------------|----------------------|
| 690 | 2 | Adult.. | Off San Diego, Cal..... | 1857 | A. Cassidy..... | Alcoholic..... |

Family BLENNIDAE, Bonap.

The family of Blennioids, as it now stands in the system, offers a great variety of forms or outline in their body, from a rounded and sub-fusiform shape to an elongated, taenioid, and very much compressed one. The body is scaly in some genera ; scaleless in others. The scales, when they exist, are either cycloid or etenoid in structure. The fins present, likewise, a great diversity of structure and aspects adapted to the various forms which the body assumes.

The ventrals, when present, are separated from one another, and situated in advance of the base of the pectorals. In some genera these fins are quite rudimentary, whilst in others they are altogether wanting. The pseudobranchiae are gill-like and conspicuous. There are no pyloric appendages to the intestine, and but few genera exhibit a swimming or air bladder, which is absent in the great majority. Many, also, are provided with a *papilla genitalis*, which, however, may be observed in other families, such as the Gobioids, Gadoids, and Cyprinodonts.

SYN.—*Blennidia*, RAFIN. Anal. of Nat. 1815.

Blennioides, RISSO, Hist. nat. Europ. mérid. III, 1826, 229.

Blennidae, BONAP. Syn. Vert. Syst. 1837.

The family now under consideration is composed of fishes of small and even of diminutive size to but few exceptions, the most striking of which is the wolf fish, *Anarrhichas lupus*, which is the largest of the group.

But, whether large or small, they are never made an object of trade, since neither of them are esculent fishes. On the contrary, they are generally repulsive to fishermen and people at large, owing, undoubtedly, to the quantity of mucous with which their body is usually covered. Some of them are provided with cutaneous flaps or tufts about the orbits, and when the skin is scaleless it has quite a flabby appearance.

BLENNIUS, Art.

GEN. CHAR.—Body elongated, compressed, covered by a soft and scaleless skin. Head short and obtuse anteriorly, provided above with membranous flaps or tentacles. Teeth long, uniform, and closely set together upon one row on both jaws; often-times a canino tooth at the posterior extremity of that row. Palat toothless. Dorsal fin occupying almost the whole dorsal region. Caudal posteriorly rounded. Anal elongated. Ventrals exiguous, inserted under the throat, in advance of the base of the pectorals. Pectorals large and fan-like.

SYN.—*Blennius*, ARTED. Gen. Pisc. ed. Walb. 1792, 163; &, Syn. Pisc. ed. II, 1793, 44.—Cuv. R \acute{e} gn. Anim. II, 1817, 249; 2d ed. II, 1829; &, ed. illust. Poiss. 170.—Cuv. & VAL. Hist. nat. des Poiss. XI, 1836, 197.—DEKAY, New Y. Fauna IV, 1842, 148.—STORER, Synops. 1846, 117.

We cannot help thinking that the genus *Blennius*, as admitted by our predecessors, embraces too great a variety of species, and we offer the above diagnosis with a view of restricting somewhat the limits of that genus. Further researches into the natural history of these fishes are, nevertheless, necessary before anything satisfactory can be written on that subject.

BLENNIUS GENTILIS, Grd.

PLATE XXVa, Fig. 4.

SPEC. CHAR.—A small canine on either side of the upper jaw. A supraorbital membranous flap. A slight depression between the spinous and the soft portion of the dorsal fin. Lateral line terminating under the eleventh spiny ray. Ground color yellowish brown, maculated with purple.

SYN.—*Blennius gentilis*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 149.

DESCR.—The body has an elongated appearance, is very much compressed, tapering towards the peduncle of the tail, and, when viewed in profile, sub-fusiform in its outline. The thoracic region is the deepest, and equal to the head in length, which constitutes a little more than the fifth of the entire length. The snout, as usual in the genus, is very abbreviated and rounded. The mouth is but moderately cleft; the posterior extremity of the maxillary extending to a vertical line intersecting the pupil. The teeth constitute, upon the margin of the jaws, a uniform and dense serie, diminishing slightly in height posteriorly. At the extremity of the serie of the upper jaw may be seen, on either side, a small canine. The lips are thin and well developed. The eye is large and circular, and its diameter is contained about four times in the length of the side of the head. A slender membranous flap is inserted within the upper rim of the orbit upon the upper surface of the globe of the eye. The branchial aperture of either side terminates about evenly with the inferior edge of the base of the pectoral fin, so that a wide isthmus exists between them under the throat. The branchiostegal rays are five in number on either side.

The origin of the dorsal takes place in advance of the base of the pectoral, and almost at the occiput. The spinous portion is slightly arched upon its middle, and separated from the soft portion by a very slight depression in the upper outline of the fin. The soft rays posteriorly are a little higher than the spinous; their tips when bent backwards project beyond the insertion of the caudal. The origin of the anal is placed nearly opposite the beginning of the soft portion of the dorsal, but does not extend quite as far posteriorly, and is much lower; it is preceded anteriorly by two post-anal flaps. The tips of its posterior rays reach the base of the caudal. The caudal itself enters a little short of six times and a half in the total length.

The ventrals, long and filiform, are inserted nearly opposite the anterior margin of the dorsal; their tips do not reach the vent. The pectorals are broad and fan-like; their extremities extend posteriorly to a line intersecting the vent.

Br. V: V; D XII, 17; A 19; C 6, 1, 5, 4, 1, 5; V I, 2; P 12.

The lateral line, from the upper edge of the branchial fissure, bends slightly upwards, and terminates abruptly under the eleventh dorsal ray.

The ground color is yellowish brown or olivaceous, maculated with purple, the blotches or maculae upon the sides of the head and abdomen being rather sub-quadrangular. The fins are maculated also, the base and external margin of anal being yellowish. Upper part of head, snout, and ventrals, uniform deep purple. Belly olivaceous, unicolor.

References to the figures.—Plate XXVa, fig. 4, represents *Blennius gentilis*, size of life.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. |
|------------|--------------|--------------|--------------------|-----------------|-----------------------------|----------------------|
| 489 | 1 | Adult.. | Monterey, Cal..... | 1853 | Lieut. W. P. Trowbridge ... | Alcoholic..... |

NEOCLINUS, Girard.

GEN. CHAR.—Body elongated and much compressed, covered with rather small scales, cycloid in structure. The head is of moderate size, anteriorly obtuse, provided above with membranous flaps or tentacles. Teeth upon the premaxillaries, dentaries, front of vomer, and palatines; a double row upon the anterior extremity of the jaws; a single but conspicuous row along the palatine bones. Branchial apertures continuous under the throat; branchiostegals six on either side. One continuous dorsal fin. Caudal posteriorly rounded. Anal elongated. Ventrals, composed of three articulated rays and a rudimentary spine, inserted under the pectorals, or slightly in advance of them. Pectorals broad and rounded off.

This genus is not without affinities with *Clinus*, but the latter contains yet too great a diversity of species to make it a natural genus. It bears also a general resemblance to *Opistognathus*, but the latter, besides the zoological characters peculiar to it, is furthermore provided with an air bladder, which is wanting in *Neoclinus*.

NEOCLINUS BLANCHARDI, Grd.

Blanchard's Blenny.

SPEC. CHAR.—Mouth very large; posterior extremity of maxillary extending to a vertical line drawn from the origin of the dorsal fin. Eyes sub-circular, well developed, upper region provided with two filiform tentacles. Origin of dorsal fin situated near the occiput and extending to near the caudal, with which it, however, does not unite. Anterior margin of the anal nearly equidistant between the extremity of the snout and the insertion of the caudal fin. Lateral line running from the upper portion of the opercle to about opposite the anal region. Color reddish brown, with darker fasciae, and two still darker ocellae upon the anterior portion of the dorsal fin.

The head constitutes about the fourth of the total length, which measures nearly six inches and a quarter. The gape of the mouth is somewhat oblique upwards, the lower jaw protruding beyond the upper, and the posterior membranous extremity of the maxillary bone extending to

a vertical line drawn at the origin of the dorsal fin. The maxillar teeth are well developed, especially upon the outer row; they are sub-conical, somewhat curved, canine-like in their aspect. Those of the inner row are of the same type and character, only smaller, forming rather a patch than a row at the symphyses of the jaws. The palatine and vomerine teeth are sub-conical also, more erect than the maxillary ones, and rather stouter than the outer row of the latter, especially the palatine ones. The eyes are large and sub-circular, their horizontal diameter entering about four times and a half in the length of the side of the head. The interocular space equaling the half of the ocular diameter. Two sub-equal filiform tentacles may be observed upon the upper posterior region of the eyeball, and a multifid membranous flap arising from the posterior rim of the anterior nostril. The branchial apertures are very wide, being continuous under the throat; the branchiostegals, six on either side, are conspicuously developed.

The dorsal fin originates at the occipital region and extends all along the back, without, however, uniting with the caudal. The anterior two-thirds of its length is composed of simple and inarticulated rays, the posterior third of simple and articulated ones. It is nearly of equal height throughout, being somewhat lower at the junction of the two kinds of rays just alluded to. The tips of the posterior rays extend to the rudimentary rays of the upper lobe of the caudal. The same is true with regard to the posterior rays of the anal and the inferior lobe of the caudal. The origin of the anal itself is situated opposite the space between the fourteenth and fifteenth dorsal rays, hence quite elongated. It is composed of two small inarticulated rays, situated at the anterior margin, and of simple and articulated ones, which increase slightly in depth backwards. The interradiation membrane is somewhat emarginated, and the depth of the fin a little less than the height of the dorsal. The caudal is rather slender, posteriorly rounded, and contained nearly nine times in the total length. The ventrals are slender, rather long, the middle articulated ray being the longest, and the posterior one shorter than the anterior, which conceals within its membrane the rudimentary spine. The pectorals are broad and rounded, composed of simple but articulated rays; the inferior ones somewhat stouter than the upper, and projecting beyond the interradiation membrane, which is emarginated or concave. Their posterior extremities do not extend as far back as the vent, which is situated immediately in advance of the anal fin.

Br. VI: VI; D XXIV, 17; A II, 29; C 3, 1, 6, 5, 1, 4; V I, 3; P 15.

The scales are small, apparently non-imbricated, longer than deep, sub-circular or sub-elliptical in their outline, cyloid in structure, with radiating furrows posteriorly.

The lateral line constitutes a curve convex upwards, extending from the scapular region to opposite the eleventh or twelfth dorsal ray, where it terminates without reaching the middle region of the abdomen or flanks.

The color, as preserved in the liquor, is of a reddish brown, with dark transverse bands or faciae, more apparent upon the posterior than on the anterior region of the body. The dorsal and anal fin are variegated with light and dark, but two very distinct black ocellae with light margins may be observed at the upper margin of the anterior portion of the dorsal—one between the first and second rays, the other between the seventh and eighth. The pectorals and ventrals being unicolor. The inferior edge of the maxillar bones is whitish; the lips are lighter than the sides of the head.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------|---------------------|-----------------|--------------------|----------------------|-------------------|
| 691 | 1 | Adult ♀ | Off San Diego, Cal. | 1849 | Dr. R. K. Stone... | Alcoholic..... | Dr.S.B Blanchard. |

GUNNELLUS, Cuv.

GEN. CHAR.—Body elongated and very much compressed. Head small and oblong, with an obtuse snout and a mouth but moderately cleft. The maxillar teeth are velvet or card-like, disposed upon one row on the lower jaw and upon a double on the upper jaw. Velvet-like teeth upon the front of the vomer. Palatine bones and tongue occasionally provided with a few prickles. Dorsal fin occupying nearly the whole length of the back, and composed exclusively of spiny rays. Anal fin long and low, provided anteriorly with two spines. Caudal fin slender, exteriorly rounded and contiguous to the dorsal and anal. Ventral fins rudimentary and inserted under the base of the pectorals. Scales very small; lateral line not perceptible.

SYN.—*Gunnellus*, Cuv. R \acute{e} gn. Anim. II, 1817, 252; 2d ed. II, 1829; &, ed. illustr. Poiss. 174.—Cuv. & Val. Hist. nat. des Poiss. XI, 1836, 418.—DEKAY, New Y. Faun. IV, 1842, 153.—STORER, Synops. 1846, 120.

The various species of Gunnells are distributed over a rather wide geographic range, occurring, as they do, on both sides of the Atlantic ocean as well as in the Pacific.

GUNNELLUS ORNATUS, Grd.

PLATE XXVb, Figs. 6 & 7.

SPEC. CHAR.—Dorsal and anal fins contiguous to the caudal. Anal spines, two. Ventrals reduced to two exceedingly small spines. Head quite small. An occipito ocular dark vitta continued vertically beneath the orbit to the hyoid apparatus. Ground color yellowish; about thirteen dorsal roundish spots of blackish brown, and about eighteen lateral, squarish ones of light brown.

SYN.—*Gunnellus ornatus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 149.

The body, which is very much compressed, preserves, however, its depth from the thoracic region to the origin of the anal fin, hence it gradually diminishes towards the base of the caudal. The head is quite small, superiorly convex, anteriorly obtuse, and contained about eight times and a half in the total length. The mouth is moderate, its gape slightly oblique upwards, and, when closed, the posterior extremity of the maxillary reaches a vertical line drawn in advance of the anterior rim of the orbit. The eye is of medium size, circular in shape; its diameter entering five times in the length of the side of the head. The branchial apertures are continuous under the throat, and therefore no isthmus is present; the branchios-tegals are five on either side, and the membrane not split under the hyoidian apparatus.

The dorsal and anal fins are very low and contiguous to the base of the caudal. The origin of the dorsal corresponds to a vertical line drawn immediately behind the base of the pectorals. The caudal is rounded posteriorly. The origin of the anal is equidistant between the base of the pectorals and the extremity of the caudal; its rays are articulated or soft, with the exception of two situated at its anterior margin. The ventrals are represented each by two small and rudimentary spines inserted a little in advance of the base of the pectorals. The latter are moderate and fan-shaped.

Br. V: V; D 76; A II, 35; C 2, 1, 8, 8, 1, 1; V II; P 12.

The scales are very minute, sub-elliptical or rather ovoid in their outline, cycloid in structure, with a few radiating furrows upon their posterior and lateral sections. No lateral line being discernible.

The ground color is yellowish brown; the dorsal region exhibiting twelve or thirteen saddle-like blotches of deep brown, margined with black, two of which being situated in advance of the dorsal fin. About eighteen vertically elongated, squarish blotches, of a light brown in their centre and darker upon their margins, may be observed along the flanks, and a vertical bar or a spot in the intervening space. An interoculo occipital black vitta, extending from the upper rim of the orbit to the occiput, and continued vertically downwards from beneath the orbit to the hyoidian apparatus. Sometimes, instead of a vitta, we observe a double black filet. The lips are blackish. The pectorals and anal yellowish, and the caudal greyish yellow.

References to the figures.—Plate XXVb, fig. 6, represents *Gunnellus ornatus*, size of life. Fig. 7, is an enlarged scale of the same.

List of specimens.

| Catal. No. | No. of specs. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|---------------|--------------|---------------------------|-----------------|-------------------------|----------------------|----------------------|
| 490 | 1 | ..... | Presidio, Cal. | 1853 | Lt. W. P. Trowbridge... | Alcoholic .. | Lt. Trowbridge..... |
| 491 | 4 | ..... | Shoalwater Bay, W. T.... | 1853 | Gov. I. I. Stevens..... |do..... | Dr. J. G. Cooper.... |
| 492 | 4 | Adult.. | Fort Steilacoom, W. T.... | 1855 |do..... |do..... | Dr. Geo. Suckley... |

APODICHTHYS, Girard.

GEN. CHAR.—Body very elongated and very much compressed. Head moderate and oblong; snout obtuse; mouth large. Small and conical teeth upon the jaws and front of vomer; maxillar teeth disposed upon a double row. Palatines toothless. Branchial apertures continuous under the throat. Dorsal and anal fins uniting with the caudal, which is exteriorly rounded. Dorsal composed exclusively of spiny rays and occupying most of the dorsal region. Anal provided anteriorly with a large, acutely triangular, and excavated spine. No ventral fins. Scales pectinated and very small; no lateral line perceptible.

SYN.—*Apodichthys*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 150.

This genus is closely allied to *Gunnellus*, from which it differs by the total absence of ventral fins, the presence, at the anterior margin of the anal fin, of a large, acutely triangular, and excavated spine; and, finally, by its dentition, which consists of small conical teeth instead of being card or velvet-like.

To it must be referred *Blennius gunnellus apos* of Tilesius, observed by the latter in the sea of Kamtschatka.

1. APODICHTHYS FLAVIDUS, Grd.

SPEC. CHAR.—Exterior row of maxillar teeth larger than the internal row, which is sometimes rudimentary. Mouth large; posterior extremity of maxillar bone extending to a vertical line drawn posteriorly to the orbit. Origin of dorsal fin situated opposite the base of the pectorals. Caudal fin small. Uniform greyish yellow. A black filet extending from the occiput to the upper rim of the orbit, and from beneath the orbit obliquely to the angle of the mouth.

SYN.—*Apodichthys flavidus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 150.

The specimen before us is between eleven and twelve inches long. Its head, which is rounded anteriorly, is contained about nine times in the total length. The snout is obtuse. The mouth

is quite large, its gape being obliquely directed upwards, and the posterior extremity of the maxillary extending to a vertical line drawn behind the orbit. The external row of teeth are large in proportion to those of the inner row, which are small and exiguous, and oftentimes obsolete. The vomerine teeth constitute a conspicuous patch. The eye is moderate, sub-circular; its diameter entering about seven times in the length of the side of the head. The branchios-tegal rays are well developed, flattened, and enclosed in a tough membrane; posteriorly even. There is no isthmus.

The origin of the dorsal fin is situated opposite the base of the pectorals, hence not far from the occiput, and extends all along the back to the caudal fin, to which it is united. It is quite low, though composed of stoutest spines. The depth of the anal is nearly equal to the height of the dorsal, and likewise united to the caudal. It is composed of articulated and bifurcated rays preceded anteriorly by a stylet-shaped bone much resembling a slender metallic pen, the insertion of which is situated a little nearer the extremity of the caudal fin than the base of the pectorals. The caudal itself is small and rounded upon its periphery, entering about eighteen times in the total length. The pectorals are moderate in development; rather short and rounded. The rays, as nearly as we could ascertain, number as follows:

Br. IV: IV; D LXXXVI-XC; A I, 40-43; C 4, 1, 11, 10, 1, 3; V 0; P 17.

The scales are exceedingly small, posteriorly pectinated, and without any lateral line apparently. The head, cheeks, and opercular apparatus, are scaleless.

The color is uniform greyish yellow throughout. A black filet may be traced from the occipital region to the superior rim of the orbit; also, from the inferior rim of the orbit obliquely, backwards and downwards, as far as the extremity of the maxillar bone.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimens. | Collected by— |
|------------|--------------|--------------|---|-----------------|---------------------------|-----------|----------------------|-------------------|
| 494 | 1 | Adult... | Presidio, Bay of San Francisco, California..... | 1853 | Lt. W. P. Trowbridge..... | | Alcoholic .. | Lt. Trowbridge... |
| 495 | 1 | ..... | San Francisco, Cal..... | 1856 | Dr. W. O. Ayres.... | 22 |do..... | Dr. Ayres..... |

2. APODICTHIYS VIRESCENS, Ayres.

SPEC. CHAR.—Exterior row of maxillar teeth larger than the internal row. Mouth moderate; posterior extremity of maxillar bone extending to a vertical line drawn within the posterior rim of the orbit. Origin of dorsal fin situated in advance of the base of the pectorals. Caudal fin moderate. Color, greenish olive, or bright pea green, maculated with black. A black filet from the occiput to the upper edge of the eye, and from beneath the eye obliquely backwards and downwards to the angle of the mouth.

SYN.—*Apodictihs virescens*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 55.

We are not altogether satisfied of the specific difference between this and the foregoing species. Out of three specimens sent by Dr. Ayres to the Smithsonian Institution, and labelled *A. virescens*, one we referred, without hesitation, to *A. flavidus*, though similar in coloring to the remaining two specimens which we record here under the appellation of *A. virescens*. Their length is from ten to eleven inches, just such as was desirable for comparison with our specimen of *A. flavidus*.

The chief differences observed are pointed out in the above diagnosis, which will bear com-

parison with that of *A. flavidus*. The head is contained nearly ten times in the total length, thus seemingly smaller than in *A. flavidus*, a feature also indicated by the fact that the mouth is smaller. The posterior extremity of the maxillar bone is said, by Dr. Ayres, to correspond to a vertical line which would intersect the pupil, whilst I find, upon the specimens now before me, that the said vertical line would have to be drawn rather more posteriorly. The origin of the dorsal is situated a little more forwards than in *A. flavidus*, the caudal fin being also somewhat larger. The structure of the fins is, otherwise, identical in both species.

There is no marked difference in the size of the scales, which are conspicuously pectinated, though so very small.

As to the coloration, Dr. Ayres tells us that it is "almost uniform greenish olive, in some instances bright pea green. A narrow, vertical, black vitta runs from the lower border of the eye downwards; another, of similar breadth, from the upper border inwards and backwards to the occiput." We observe, moreover, small blackish spots and dots irregularly dispersed over the sides of the body, and a double regular series of similar spots along the base and edge of the dorsal and anal fins.

List of specimens.

| Catal. No. | No. of specs. | Sex and age. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimens. | Collected by— |
|------------|---------------|--------------|-------------------------|-----------------|--------------------|-----------|----------------------|----------------|
| 496 | 2 | Adult.. | San Francisco, Cal..... | 1856 | Dr. W. O. Ayres... | 22 | Alcoholic... | Dr. Ayres..... |

XIPHIDION, Girard.

GEN. CHAR.—Body very much elongated and very much compressed. Head small and sub-ovoid. Mouth large. Canine teeth in front of the jaws; small and conical ones upon the branches of the premaxillaries (upper jaw) and dentaries (lower jaw), disposed upon a double row on the upper jaw and a single row on the lower jaw. Palatines and vomer toothless. Branchial apertures continuous under the throat. Dorsal fin spinous, and occupying nearly the whole length of the back, and contiguous to the caudal. Anal soft, without spinous rays anteriorly, and contiguous to the caudal also. Caudal small, exteriorly rounded. Ventral fins wanting. Pectorals very small. Scales, none; several mucous lines.

This genus resembles *Gunnellus* in its general appearance. The shape of the body and the structure of the dorsal fin are alike in every respect. The absence of spiny rays in advance of the anal is a feature peculiar, neither met with in *Gunnellus* nor in *Apodichthys*. It approximates the latter, however, by the non-existence of the ventral fins. The pectorals themselves are a good deal smaller than in the genera just mentioned. As regards the dentition, it resembles more that of *Apodichthys* than that of *Gunnellus*, but still differing from the former by the presence of canine upon the extremity of both jaws. The vomer and palatines, on the other hand, are toothless. The absence of scales, upon which we are left somewhat in doubt, would constitute another distinguishing feature.

XIPHIDION MUCOSUM, Grd.

SPEC. CHAR.—Three lateral and one abdominal mucous ducts. Head sub-conical; mouth large; posterior extremity of maxillary extending to a vertical line drawn across the posterior rim of the orbit. Ground color olivaceous, clouded or maculated with blackish brown. Two post-ocular dark vittae crossing the cheek.

The largest specimens before us measure seven inches in total length, and the smallest two inches, none of which being in a perfect state of preservation. Their number, however, has enabled us to form a correct idea of the general fascies of the present species.

The body, as already stated, resembles that of *Gunnellus* to a very high degree; it is very much compressed, deepest upon its anterior third, and diminishing gradually backwards. The thoracic region itself tapers towards the head, which is sub-conical and contained about seven times and a half in the total length. The mouth is proportionally large and its gape nearly horizontal. The posterior branch of the maxillary is curved rather abruptly downwards, its posterior extremity falling evenly with a vertical line intersecting the posterior rim of the eye. The teeth are conspicuous; upon the extremity of both jaws we notice sub-conical, nearly erect, teeth, much larger than the rest, and which we have designated as the canines. Two may be seen upon the upper jaw and four upon the lower, the outermost of which being much larger than the inner, and larger also than those of the upper jaw.

The branches of the jaws exhibit each one series of sub-conical teeth, largest upon the middle of the series. Upon the upper jaw (premaxillaries) we observe a second and inner series of much smaller, more numerous, and very slender teeth. The eye is sub-circular, its diameter entering nearly five times in the length of the side of the head. There are six slender branchiostegal rays on either side, and the branchial apertures being continuous under the throat without longitudinal splitting towards the hyoidian apparatus. The dorsal fin commences at a short distance from the occiput, is quite low and composed of spiny rays exclusively, and terminates at the base of the caudal to which it is contiguous. The anal, on the other hand, is composed exclusively of very slender, soft, and articulated rays, being likewise contiguous to the caudal. Its origin is situated a little nearer the end of the snout than the extremity of the caudal fin. The latter is moderately developed and rounded upon its periphery. The ventrals are wanting, and the pectorals quite diminutive.

We can detect no traces of scales; but we observe three lateral mucous ducts extending from the head to the base of the caudal fin; they are equidistant, though the upper and the lower approximate more the dorsal and ventral outlines than the middle one. A fourth duct may be seen extending from the base of the pectoral fin to the vent; it is connected to its neighbor of the sides by a common branch which, from under the pectorals, extends to the hyoidian apparatus. The two uppermost ducts are connected anteriorly by a thoracico-occipital bent, which from the middle of the occiput sends a branch to the origin of the dorsal fin. All these ducts have small alternating lateral branches, which correspond to the myocomms of the great lateral muscle. The main ducts themselves occupying the bents or curvatures of those very same *myocomma*. The opercular bones and jaws are very porous also.

The ground color is dark olive; dorsal region and posterior half of the body clouded, maculated or marmorated with brown or blackish brown. Abdomen unicolor. Two post-ocular blackish vittae may be seen crossing the check.

List of specimens.

| Catal. No. | No. of specs. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|---------------|--------------|-------------------------|-----------------|-----------------------|----------------------|--------------------|
| 493 | 17 | Ad't & y'g | S. Faralones, Cal. | 1856 | Lt. W. P. Trowbridge. | Alcoholic ... | Lt. Trowbridge.... |

CEBIDICHTHYS, Ayres.

GEN. CHAR.—Body very elongated and very much compressed. Head moderate and oblong; snout obtuse; mouth large. Conical maxillar teeth, disposed upon a double series. Velvet-like teeth upon the vomer and palatines. Tongue smooth. Branchial apertures continuous under the throat. Dorsal and anal fins contiguous to the caudal, which is exteriorly rounded. An anterior spiny dorsal fin lower than the soft, and continuous with it. Anal fin spineless. Ventral fins wanting. Scales very small; lateral line approximating the back.

SYN.—*Cebidichthys*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 59.

The absence of ventral fins in this genus will distinguish it from *Gunnellus*, and the structure of the dorsal fin from *Apodichthys*, to which it is otherwise related by the want of ventrals. The presence of teeth on the palatine bones and the spineless anal fin are other traits by which it may be distinguished from the latter.

It is yet doubtful whether *Blennius alectrolophus* of Pallas (*Zoogr. Rosso-Asiatica*, 111, 1831, 174), is specifically distinct from the species described further on. Should it prove identical, the name of *C. alectrolophus* must be restored to it, otherwise, stand as a second species in the present genus.

CEBIDICHTHYS VIOLACEUS, Grd.

PLATE XXV b, Figs. 4 and 5.

SPEC. CHAR.—Upper surface of head narrow, declivous laterally. A fleshy crest along the cranial ridge. Mouth large; posterior extremity of maxillaries extending to a line drawn across the posterior rim of the orbit. Origin of anal fin situated opposite the anterior margin of the soft dorsal. Ground color uniform brownish violet. An occipito-ocular vitta of deep purplish violet. Two other vittae of the same hue extend, one from the postero-inferior rim of the orbit, the other from the anterior rim, obliquely backwards across the cheeks and opercular apparatus.

SYN.—*Apodichthys violaceus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 150.

Cebidichthys cristagalli, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 58. Pl. I, figs. 1-3.

Since this species was first described we have had an opportunity of examining a specimen measuring fifteen inches, sent to the Smithsonian Institution by Dr. Ayres. The head constitutes the seventh or eighth of the total length, the seventh in the young, the eighth in the adult. Its upper surface is narrow and ridge-like, sloping sideways outwardly towards a rather broad inferior surface. A cutaneous or fleshy crest may be seen extending from the occiput to the extremity of the snout. The latter is so inconspicuous in the immature individuals that it escaped our notice when we first described the species. The gape of the mouth is slightly oblique upwards; the posterior extremity of the maxillary extending to a vertical line intersecting the posterior rim of the orbit. The teeth constituting the outer row are much larger than the rest, which are rather irregularly disposed, and upon the upper jaw assuming a more card-like appearance than anything else. Upon the vomer and palatines they are velvet-like altogether. The lips are fleshy. The eye is rather small and sub-circular, its diameter entering six or seven times in the length of the side of the head. The branchiostegal rays, six in number on either side, are rather stoutish and contained in a quite tough membrane. The branchial aperture is very wide, its external outline being quite emarginated under the hyoid apparatus.

The dorsal fin commences opposite or somewhat posterior to the base of the pectorals. It is composed of about twenty-five spiny rays extending to a line intersecting the origin of the anal, where the fin raises a little, and instead of spiny rays is composed of soft, articulated, and branched ones to its termination. The origin of the anal is nearer the extremity of the snout

than the insertion of the caudal ; the rays of which it is composed are all soft, articulated, and branched. It increases slightly in depth from its origin to its terminus. The caudal fin is slender, being enclosed for half its length by both the dorsal and anal fins. The pectorals are small and sub-ovoid in shape.

Br. VI: VI; D XXV, 42; A 42; C 2, 1, 7, 6, 1, 2; V 0; P 10.

The scales are very small, imbedded, not imbricated; they are elongated, narrowest anteriorly, exhibiting concentric striae, but no diverging grooves. The entire head is smooth and scaleless. The lateral line, from the upper and posterior angle of the opercle, ascends by a gradual curve, extends along the upper region of the back, nearer the base of the dorsal than the middle of the flanks, and terminates before it reaches the caudal fin. It is composed of two irregular parallel rows of pores in communication with a main tube. From the origin of the lateral line, near the thoracic belt, a series of pores proceeds along the temporal region, and when half way it bifurcates, one series going to the occiput, the other to the orbit, which it surrounds. Another series extends along the limb of the preopercle and dentar bone (lower jaw).

The anterior portion of body and head is of a uniform deep brownish violet; the posterior portion exhibits a somewhat more brownish hue, over which is spread a violaceous tint; the fins are all deep violet. A deep purplish violet crescent-shaped vitta extends from either eye to the occiput. Two oblique vittæ on the sides of head, margined with a white filet, start, one from the anterior rim, the other from the posterior half of the orbit to the branchiostegal apparatus.

References to the figures.—Plate XXVb, fig. 4, represents *Cebidichthys violaceus*, size of life, from Monterey, California. Fig. 5 is an enlarged view of a scale taken upon the middle of the flanks.

List of specimens.

| Catal. No. | No. of specs. | Sex and age. | Locality. | When collected. | Whence obtained. | Origin'l No. | Nature of specimens. | Collected by— |
|------------|---------------|--------------|-------------------------|-----------------|------------------------|--------------|----------------------|-------------------|
| 497 | 1 | Adult.. | San Francisco, Cal..... | 1856 | Dr. W. O. Ayres..... | 28 | Alcoholic. | Dr. Ayres |
| 498 | 2 | Young. | Monterey, Cal..... | 1855 | A. S. Taylor, Esq..... | ..... | .....do..... | A. S. Taylor..... |
| 499 | 1 | ...do... | San Luis Obispo, Cal... | 1853 | Lt. W. P. Trowbridge.. | ..... | .....do..... | Lt. Trowbridge.. |
| 500 | 2 | ...do... | Fort Steilacoom, W. T.. | 1854 | Gov. I. I. Stevens ... | ..... | .....do..... | Dr. G. Suckley.. |
| 501 | 1 | ...do... | Sands of Monterey beach | 1856 | A. S. Taylor, Esq..... | ..... | .....do..... | A. S. Taylor.... |

LUMPENUS, Reinh.

GEN. CHAR.—Body very elongated, compressed, or sub-cylindrical. Head moderate; snout sub-conical; mouth moderate. Canine and card-like teeth upon the jaws; card or velvet-like teeth upon the palatines. Vomer toothless. Tongue smooth. Branchial apertures continuous under the throat. Dorsal rays all spinous; anal rays all soft. Caudal lanceolated not contiguous to either the dorsal or anal. Ventral fins slender, inserted under the throat, in advance of the base of the pectorals. Pectorals large, fan-like. Scales quite small; lateral line inconspicuous.

SYN.—*Lumpenus*, REINH. in Overs. Vidensk. Selsk. Forh. 1835-'36.—ΚΑΡΟΥΕΑ, in Kong. Dansko Vidensk. Selsk. Naturw. og Mathem. Afhandl. VII, 1838, 194; & Danm. Fisko. I, 1840, 332.—NILSS. Skand. Faun. IV, 1852, 190.
Leptogunnellus, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 26.

Species of this genus are not uncommon in the northern seas. Many years ago a tolerably good figure was given of one of them by Walbaum in his edition of Artedi's "Genera of Fishes," under the name of *Blennius lampraetiformis* (*Blennius islandicus*, Mohr.). Several

other species have been referred to the genus *Clinus*, whence removed by Kroyer and placed in Reinhardt's genus.

Nilsson sub-divides still further the species heretofore referred to *Lumpenus*, proposing the genus *Otenodon* for *Clinus maculatus* of Fries, *Lumpenus aculeatus*, Reinh., and allied species.

LUMPENUS ANGUILLARIS, Grd.

PLATE XXVb, Fig. 1-3.

SPEC. CHAR.—Head slender, continuous with the outline of the body. Gape of mouth slightly oblique. Posterior extremity of maxillar bone extending to a vertical line drawn midway between the anterior rim of the orbit and the pupil. Origin of dorsal fin situated opposite the base of the pectorals. Pectorals and caudal spear-shaped; greenish olive, upper regions maculated. Caudal fin transversely barred.

SYN.—*Blennius anguillaris*, PALL. Zoogr. Ross. Asiat. III, 1831, 176.

Gunnellus anguillaris, CUV. & VAL. Hist. nat. Poiss. XI, 1836, 437.—STORER, Synops. 1846, 121.

Leptogunnellus gracilis, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 26.

The largest specimen before us is thirteen inches and a half in total length; it is the one which we have caused to be figured. Its body is very much compressed, a good deal more so, posteriorly to the origin of the anal fin, than anteriorly. The greatest depth is across the middle of the abdomen, and tapers gradually backwards. The thickness is about the two-thirds of the depth.

The head constitutes about the eighth or ninth of the entire length. Its upper surface is smooth and scaleless, slightly sloping towards the snout, which is sub-conical. The gape of the mouth is slightly oblique, the jaws being nearly even anteriorly (inferior one slightly shortest), and the posterior extremity of the maxillar bone extending to a vertical line drawn midway between the anterior rim of the orbit and the pupil. Exiguons, canine-like, or conical and slender teeth may be seen upon both jaws, constituting a double row upon the symphysis of the dentary (lower jaw). On the premaxillaries we observe but one external series of this type, though several internal series of card-like ones may be distinctly traced upon the body of these bones. The vomer is toothless, whilst the palatines are provided each with an elongated patch of velvet-like teeth. The eye is large, sub-elliptical in shape, approximating the upper surface of the head. Its horizontal diameter enters about five times and a half in the length of the side of the head, a little more than once in advance of their anterior rim. The cheeks are scaly; the opercular apparatus smooth and scaleless; the branchial apertures wide and continuous under the throat, being produced forwards to the base of the hyoid apparatus. The branchiostegal rays themselves are slender, well developed, and six on either side.

The dorsal fin is spinous throughout; its origin takes place immediately opposite the upper edge of the base of the pectorals. The first ray is quite small and exiguous, rather detached from the fin, since there is but a rudimentary membrane at its base. The second, third, and fourth spines increase slightly in height without being bound to the fin. From the fifth to the twelfth the rays still go on increasing slightly in height, and the interrational membrane now connects the two adjoining rays, although quite emarginated. This emargination of the interrational membrane of the dorsal fin is traceable to its entire length, although to a lesser degree. The fin itself terminates at a short distance from the base of the caudal fin. The anal fin is composed almost exclusively of articulated and dichotomised rays, there being but one rudimentary spine at its anterior margin, which is a good deal nearer the extremity of the snout than the base

of the caudal fin. It terminates almost evenly with the dorsal, though its posterior rays project a little further backwards. The depth of the anal is nearly equal to the height of the dorsal, with the interradiated membrane, mayhap, more deeply emarginated yet. The caudal fin is well developed, spear-shaped, and nearly equal to the head in length. The ventrals are slender and exiguous, inserted under the throat, in advance of the base of the pectorals. The pectorals themselves are broad, well developed, also spear-shaped and composed of dichotomised rays.

Br. VI: VI; D LXIX; A 1, 46; C 3, 1, 6, 5, 1, 3; V 1, 3; P. 15.

The scales are small, sub-elliptical, broadest anteriorly, cycloid in structure, exhibiting diverging grooves upon their anterior section only. The lateral line is made of a very inconspicuous series of mucous pores; from the thoracic arch it slightly descends until it reaches the middle of the flanks, hence runs straightway to the base of the caudal.

The ground color is greenish olive, the upper region of the head and body exhibiting longitudinally elongated small dark blotches resembling broken up bands. A series of small black spots may be observed along the middle of the dorsal fin, and another along its upper margin: the spots corresponding to the rays. The first series alluded to does not always extend to the whole length of the fin. The inferior region is lighter and unicolor, as well as the pectorals and ventral fins, whilst the caudal is transversely barred with black or dark brown.

References to the figures.—Plate XXVb, fig. 1, represents, size of life, *Lumpenus anguillaris*, from the Bay of San Francisco, California; fig. 2 is a vertical section of the body across the middle of the abdomen; fig. 3, a scale from the middle of the flanks.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Orig'nl No. | Nature of specimens. | Collected by— |
|------------|--------------|--------------|---------------------|-----------------|------------------------|-------------|----------------------|---------------|
| 507 | 1 | Adult | San Francisco, Cal. | 1855 | Lt. R. S. Williamson | ----- | Alcoholic | Dr. Newberry |
| 508 | 1 | do | do | 1856 | Dr. W. O. Ayres | 23 | do | Dr. Ayres |
| 509 | 1 | do | Bellingham Bay | 1856 | Dr. G. Suckley, U.S.A. | ----- | do | Dr. Suckley |

ANARRHICHTHYS, Ayres.

GEN. CHAR.—Body very elongated, very much compressed, taenioid and tapering. Head moderate and oblong; snout obtuse; mouth large. Canine teeth upon the premaxillaries and extremity of the dentary or lower jaw; pavement-like teeth upon the vomer, palatine, and branch of the lower jaw. Tongue soft and smooth. Branchial apertures separated under the throat by an isthmus. Dorsal and anal fins continuous with the caudal, which is lanceolated. Ventral fins absent. Scales minute; lateral line not perceptible.

SYN.—*Anarrhichthys*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 32.

This genus differs from *Anarrhichas*, to which it is closely related, chiefly by the taenioid form of its body and the continuity of the dorsal and anal fins with the caudal, as in *Zoarces*. The head, in shape and structure, is *Anarrhichas*-like. *Zoarces* has ventral fins, which are wanting in *Anarrhichas* and *Anarrhichthys*.

ANARRHICHTHYS FELIS, Grd.

PLATE XXVa, FIGS. 1—3.

SPEC. CHAR.—Profile of head uniformly convex; eye large and circular. Mouth deeply cleft; posterior extremity of maxillar bone extending to a vertical line drawn across the posterior rim of the orbit. Origin of the dorsal fin situated anteriorly to the base of the pectorals. Caudal fin lanceolated. Head and body mottled with light ashy grey and dark olive green, disposed in irregular circles, lines, and blotches, which extend also to the dorsal fin.

SYN.—*Anarrhichas felis*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 150.

Anarrhichthys ocellatus, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 31.

The Smithsonian Institution has received three specimens of this species from Dr. W. O. Ayres, of California, the largest of which, being figured, measures over twenty-two inches in total length. The head is compressed like the body and proportionally well developed, forming about the twelfth of the entire length. Its upper surface is regularly convex from occiput to extremity of snout. The mouth is deeply cleft; its gape being slightly oblique upwards, and the lower jaw somewhat projecting beyond the upper. The posterior extremity of the maxillar bone is even with a vertical line drawn across the posterior rim of the orbit. The lips are loose, flabby, and conspicuous, whilst the nostrils are quite small and placed nearer the eye than the extremity of the snout. The teeth are very strong, the number of canine varying according to the individuals; they occupy the extremity of both jaws, generally five or six upon each, disposed upon one row, and occasionally two or more in each jaw also inwardly of the former. The palatine teeth are much smaller than the vomerine ones. The eye is large, subcircular, approximating the upper surface of the head; their diameter is contained five times in the length of the side of the head. A rather wide isthmus is interposed between the gill apertures under the throat; the branchiostegal rays, seven on either side, are slender and imbedded in a thick branchiostegal membrane.

The body is taenioid, compressed, deepest upon the throacic region, hence diminishing gradually backwards until it terminates into a point at the extremity of the tail.

The dorsal fin originates anteriorly to the base of the pectorals; it increases gradually in height to about the fourth of its length, hence diminishing posteriorly to the base of the caudal. The anal assumes the same form as the dorsal, though much less deep than the latter is high. The pectorals are well developed, elongated, rounded, and slightly scalloped upon their margin.

The rays of the dorsal fin are slender and flexible undivided spines; those of the anal and caudal are articulated and dichotomised. The interrarial membrane is quite thick, rendering difficult the counting of the rays without dissection.

The scales are exceedingly small, imbedded in the skin, not imbricated and much less numerous anteriorly than posteriorly. They are sub-circular with wide radiating grooves all around, cutting up the concentric striae.

The ground color is light ashy grey, upon which irregular ocellae and blotches of dark olive green are disposed. The ocellae are surrounded by a lighter file, giving a quite handsome appearance to this fish. These ocellae and blotches cover the head, body, and dorsal fin, the upper margin of which is light olive. A narrow band of the same may be observed posteriorly along the base of the dorsal fin and middle region of the caudal. The anal is uniform dark brown or black with a whitish border like the dorsal. Its margin is slightly scalloped. In

young specimens the ocellae and blotches are small, exhibiting, consequently, more of the ground color

References to the figures.—Plate XXVa, fig. 1, represents *Anarrichthys felis*, size of life, from the bay of San Francisco, California. Fig. 2 is a section of the body taken immediately behind the thorax. Fig. 3 is a scale taken upon the dorsal region beyond the middle of the length of the body.

List of specimens.

| Catal. No. | Cor. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimens. | Collected by— |
|------------|----------|--------------|--------------|----------------------|-----------------|---------------------------|-----------|----------------------|---------------------|
| 511 | ..... | 3 | Adult.. | San Francisco, Cal.. | 1856 | Dr. W. O. Ayres ... | 12 | Alcoholic. | Dr. Ayres..... |
| 692 | 3380 | 1 | ..do.... | California..... | 1853 | Lt. W. P. Trowbridge..... | ..... | Bones ... | Lieut. Trowbridge.. |
| 693 | 3381 | 1 | ..do.... | Monterey, Cal..... | 1853 |do..... | ..... | .....do..... |do..... |

Family GOBIDAE, Bonap.

The body is small in size and sub-fusiform in shape, generally protected with scales either cycloid or ctenoid in structure. The united ventrals assume the shape of a funnel, being themselves composed of an external undivided ray, and soft, articulated, and sometimes branched ones. They are inserted either in advance, under, or posterior to the base of the pectorals. The rays of the pectoral fins are divided. The dorsal fin is always composed of spinous and of articulated rays, constituting sometimes two distinct fins, occasionally contiguous upon their base. The maxillary teeth are of various kind—velvet, card-like, or canines. The palate itself is toothless. The gills, four in number, are complete; that is to say, each one is composed of two fully developed branchial combs. The last branchial split (or aperture) itself may be observed between the fourth gill and the inferior pharyngeal bone. An air bladder exists in several of the types composing this family. There are no pyloric appendages.

SYN.—*Gobidae*, BONAP. Saggio Distr. metod. Anim. Vertebr. 1831, 110.

Gobioides, CUV. R \ddot{u} gn. Anim. II, 1817, 249; 2d ed. II, 1829; &, ed. illustr. Poiss. 169.—ACASS. Poiss. foss. IV, 1834.—CUV. & VAL. Hist. nat. Poiss. XI, 1836, 187.

Gobioidae, RICHARDS. FAUN. BOR. AMER. III, 1836, 88.

Gobioidci, M \ddot{U} LL. in Wieg. Arch. f. Naturg. I, 1843, 297.

Several members of this family exhibit a *papilla genitilis* in both sexes, as is also the case in the Blennioids above referred to.

GOBIUS, Artedi.

GEN. CHAR.—Body elongated, sub-fusiform, compressed, covered with scales cycloid in structure and moderate in size. The head is sub-conical, more or less elongated, its upper surface scaleless. Mouth of moderate size. Velvet or card-like teeth upon both jaws, the external series oftentimes stronger and more conspicuous. An isthmus. Palate toothless. Two dorsal fins, entirely separated or contiguous upon their base. Caudal posteriorly entire. Anal situated opposite the second dorsal, and, like the latter, not united to the caudal. Ventrals inserted under the thorax. Pectorals well developed.

SYN.—*Gobius*, ARTEDI, Gen. Pisc. ed. Walbaum, 1792, 188.—LINN. Syst. Nat. ed. Gmelini, I, 1788, 1196.—CUV. R \ddot{u} gn. Anim. II, 1817, 254; 2d ed. II, 1829; &, ed. illustr. Poiss. 177.—CUV. & VAL. Hist. nat. Poiss. XII, 1837, 1.—DEKAY, New Y. Faun. IV, 1842, 160.—STOREY, Synops. 1846, 124.

The genus *Gobius*, as characterized above, reduces very materially the number of species which it is intended to include. Further observations upon the numerous species already

described may require the foundation of several other genera, with which the present one will have to harmonize.

1. GOBIUS LEPIDUS, G r d.

PLATE XXVa, FIGS. 5—6.

SPEC. CHAR.—Body elongated, slender, and very compressed. Head sub-conical; jaws equal; gape of mouth oblique; posterior extremity of maxillary extending to a vertical line drawn back of the pupil. Interocular space narrow. Reddish brown; fins blackish.

SYN.—*Gobius gracilis*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 134.

The specific name of *gracilis* being preoccupied in the genus *Gobius*, for a British species, we propose the above as a substitute.

About three inches and a quarter in total length—body, head, and caudal fin, included. The body is slender, of an elongated aspect, very much compressed, and gradually diminishing in depth from the nape to the peduncle of the tail. The greatest depth taken beneath the first dorsal fin enters seven times and a half in the total length, whilst the least depth on the peduncle of the tail is about two-thirds of the greatest.

The head is elongated and sub-conical, constituting about the fifth, or a little more, of the total length. The jaws are even, and the gape of the mouth is oblique; the posterior extremity of the maxillary reaches a vertical line passing immediately behind the pupil. The eye is large, sub-elliptical; its longitudinal diameter entering about four times in the length of the side of the head. The interocular space is very narrow, measuring but one fifteenth of an inch. The branchial fissures are separated under the throat by a wide isthmus.

The first dorsal fin is a little lower than the second, and separated from the latter by a considerable space. The caudal, which is contained five times and a half in the total length, is rounded upon its posterior margin. The anal is not quite so long as the second dorsal, but as deep as the latter is high, if not deeper. The vent, placed immediately in advance of the anal, is opposite the anterior margin of the second dorsal. The origin of the ventral corresponds to a line drawn immediately behind the base of the pectorals; their posterior extremity is far from reaching the vent; they are elongated, sub-lanceolated. The pectorals are broad and short, since their posterior extremity does not extend as far as the tip of the ventrals. Both, the base of the pectorals and the origin of the ventrals, are situated in advance of the anterior margin of the first dorsal fin.

D VII, 20; A 17; C 5, 1, 6, 5, 1, 4; V 5; P 20.

The scales are very small, extending over the cheeks and opercular apparatus. We could detect no lateral line, but many scales had fallen owing to their deciduous character.

The color of the head and body is reddish brown, minutely and inconspicuously dotted with grey or black, apparent under the magnifying glass. The throat and fins are blackish, or greyish black, the latter occasionally margined or tipped with white.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------------------------|-----------------|----------------------------|----------------------|-------------------|
| 361 | 1 | San Francisco, California..... | 1853 | Lieut. R. S. Williamson... | Alcoholic... | Dr. Heermann..... |
| 362 | 1 |do..... | 1855 |do..... |do..... | Dr. Newberry..... |

2. GOBIUS NEWBERRII, Gr d.

SPEC. CHAR.—Body slender and compressed. Head blunt and rounded off; jaws equal; gape of mouth oblique; posterior extremity of maxillary extending to a vertical line drawn back of the orbit. Interocular space broad. Olivaceous, variegated with black.

SYN.—*Gobius newberrii*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 136; and, in Bost. Journ. of Nat. Hist. VI, 1857; Plate XXV, figs. 5—8.

This is quite a handsome species, less elongated in its general aspect and more fusiform in its outline than *G. lepidus*. The largest specimen we have seen, out of many, measured but little over two inches.

The body is compressed, swollen upon the thoracic region, and tapering posteriorly in a very decided manner. The greatest depth is contained about five times and a half in the total length, and the least depth, on the peduncle of the tail, is about one-half the greatest.

The head is obtuse or else the snout is rounded anteriorly so as to give the entire region an obtuse appearance. It is contained four times and a half in the entire length. The jaws are equal and the gape of the mouth is oblique, precisely as in *G. lepidus*. The posterior extremity of the maxillary extending to a vertical line drawn back of the orbit. The eye is small, sub-circular, its horizontal diameter entering about four times in the length of the side of the head. The interocular space is quite broad, compared to the same region in *G. lepidus*, since in specimens a good deal smaller it is nearly double the width it has in the latter. The branchial fissures are likewise separated under the throat by a wide isthmus.

The first dorsal fin is separated from the second by a narrow space, not contiguous as formerly stated by us. It is also lower. As to its length, it is contained once and a half in that of the second dorsal, measured upon their bases. The anal is as deep as the second dorsal is high, it is shorter upon its base, and its anterior margin placed a little posterior to the anterior margin of the latter. Both fins terminate evenly posteriorly, whilst in *G. lepidus* the tips of the posterior rays of the dorsal project further back than those of the anal. These fins have also a proportionally longer base in *G. lepidus* than in the present species. The caudal fin is rounded upon its posterior margin and constitutes a little more than the fifth of the entire length. The vent has the same position, opposite the anterior margin of the second dorsal, than in *G. lepidus*, and the tips of the ventral fins are far from reaching it. The latter are sub-ovate, inserted immediately under the base of the pectorals. The pectorals, themselves, are sub-ovate also; their posterior extremity projects beyond that of the ventrals. Thus, in the relative position and extension of the pectoral and ventral fins we have good discriminating characters between this species and *G. lepidus*. The formula of the fins is as follows:

D VIII, 13; A 12; C 3, 1, 6, 6, 1, 2; V 5; P 18.

The scales are small and quite inconspicuous; a lateral line is not apparent. The scales themselves are sub-circular, deeper than long, cycloid in structure, exhibiting diverging grooves upon their anterior section only. They are smaller upon the upper than upon the lower regions of the body.

The ground color is olivaceous, though the dorsal region appears almost blackish, owing to the accumulation of innumerable black dots which constitute small blotches encircling isolated spots of the ground color. The middle region of the flanks is equally mottled with black; the inferior regions alone being unicolor. The dorsals and anal are either entirely blackish and margined with white, or else the second dorsal is spotted like the back. The caudal is olivaceous,

with transverse series of black spots simulating continuous narrow bands. The pectorals and ventrals are unicolor and rather lighter than the belly and inferior surface of the head. The upper surface of the head presents the same hue as the back.

List of specimens.

| Catal. No. | No. of specs. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|---------------|--------------|-----------------------|-----------------|------------------|----------------------|------------------|
| 360 | 24 | Adult.. | Tomales Bay, Cal..... | 1856 | E. Samuels | Alcoholic... | E. Samuels |

Family CYCLOPTERIDÆ, Bonap.

The body is scaleless and protected by a naked skin, sometimes flabby, at others leathery, and occasionally studded with small indurated plates. The united ventral fins are discoid; their soft rays being undivided. The same is true with regard to the rays of the pectorals, except in the genus *Cyclopterus*, where they bifurcate. The anterior dorsal fin is often wanting or else reduced to a mere unnoticed rudiment. There are three and a half gills, the fourth having but one branchial comb. The last branchial aperture or split is wanting.

SYN.—*Cyclopteridae*, BONAP. Sagg. Distr. meth. Anim. Vert. 1831, 118.—DE KAY, N. Y. Faun. IV, 1842, 305.—STORER, Synops. 1846, 228.

The representatives of this family are mostly acanthopterians, *Lepadogaster* being a malacopteran. It has been observed by Joh. Müller that the pyloric appendages do not constitute a family trait; the latter being quite numerous in the genus *Cyclopterus*, or Lump-fish, whilst they are entirely wanting in *Lepadogaster* and *Gobiesox*, which belong to the same family. The *papila genitalis*, the same anatomist has observed in both sexes in the species of *Lepadogaster*, and at least in the male sex in the species of *Gobiesox*.

LEPADOGASTER, Gouan.

GEN. CHAR.—Head large, broad and depressed, without tentacles. Mouth moderate sized, provided with small and conical teeth upon the premaxillaries and the lower jaw. Palate smooth. Body scaleless, anteriorly broad and sub-depressed, posteriorly compressed and tapering. One soft-rayed dorsal fin more or less elongated, not continuous with the caudal. Anal fin elongated also and likewise separated from the caudal. Posterior margin of caudal fin rounded off. Ventrals united into a sub-circular abdominal disc, conjointly with a portion of the pectorals. Branchial apertures continuous under the throat and partly overlapped by the anterior edge of the abdominal disc.

SYN.—*Lepadogaster*, GOUAN, Hist. Pisc. 1770.—Risso, Ichth. de Nice, 1810; Hist. nat. Eur. mérid. III, 1826, 271.—Cuv. Règn. Anim. II, 1817, 224; 2d, ed. II, 1829; & ed. Illustr. Poiss. 307.

The generic characters which are here assigned to *Lepadogaster* are chiefly derived from the species of our western coast, the only one at our command at the present time. The numerous species which have been referred to this genus must be distributed into several genera with more closely defined characters.

LEPADOGASTER MAEANDRICUS, G r d.

SPEC. CHAR.—Upper surface of head very much depressed; eyes moderate, and directed upwards and forwards. Angle of the mouth extending to a vertical line drawn in advance of the eye. Upper jaw slightly protruding beyond the lower. Dorsal fin nearly equal to the caudal in length, but inserted more anteriorly. Ground color olivaceous brown, with a mesh work of black line all over the head and body. Inferior surface of head and belly dull yellow.

SYN.—*Lepadogaster reticulatus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 155.

The specific name which, on a former occasion, we had bestowed upon this fish having proved preoccupied by a species of the Mediterranean sea, described by Risso, "Histoire naturelle de l'Europe méridionale, vol. III, 1826, 277," we have availed ourselves of the present opportunity to give it another appellation, although the latter, with several others of its congeners, may hereafter constitute a generic group distinct from that of *Lepadogaster* proper.

The head is broad, semi-elliptical when viewed from above. Its upper surface, which is very much depressed, is declivous sideways as well as towards the snout. It constitutes nearly the third of the entire length, which, in the specimen described, is about three inches and a half. Its inferior surface is flattened. The mouth is broad in a front view of it, but not deeply cleft, for its angle extends to a vertical line drawn across the anterior rim of the orbit only. The upper jaw is somewhat protruding beyond the symphysis of the lower one. The eye is small, sub-elliptical in shape, situated towards the upper surface of the head, and directed upwards and forwards; its horizontal diameter is contained about six times in the length of the sides of the head. The opercular apparatus is entirely buried in the muscles of that region, and which are quite developed. The branchial apertures are continuous under the throat, overlapped by the anterior margin of the membranous abdominal expansion. The branchiostegal rays are six on either side, though three only, the innermost, are fully developed, the others remaining quite rudimentary upon the middle region of the throat. The base of the anterior portion of the pectoral fin is very fleshy, bearing a membranous pouch-like expansion quite conspicuous posteriorly to the edge of the opercle.

The body is anteriorly broader than deep; it diminishes gradually in depth and width towards the origin of the tail, which is quite compressed and very much reduced, terminated by a slender caudal fin rounded off upon its external margin. The origin of the dorsal fin is situated opposite the vent and further apart from the extremity of the snout than the tip of the caudal. It is composed of articulated, but simple and undivided rays, thirteen or fourteen in number, the tips of the posterior ones not quite reaching the insertion of the caudal. The anal begins a little further back than the dorsal, being as deep as the latter is high, and extending a little further posteriorly, the tips of the posterior rays nearly reaching the base of the caudal. The rays of which it is composed are all simple and articulated. Even the rays of the caudal are simple and undivided, as usual articulated. The ventrals are inserted upon the middle of the convexity of the pelvic bones. Their rays are sub-cartilaginous, imbedded in the membranous disc which they constitute, either nine or ten in number and simple, or else four or five branched ones, a fact which we could not make out clearly, having but one specimen at our command. At any rate we could see no rudiment of a spiny ray, such as is said to exist in *Gobiesox*. The anterior pectorals are broad, exteriorly rounded, composed of twenty-three articulated but undivided rays, the twenty uppermost being slender, and forming a fan-shaped fin situated upon the side of the chest, whilst the three lowermost are stouter, somewhat independent from the other, and situated under the head, where they complete the disc formed

by the union of the ventrals. The membranous expansion is very considerable under the throat and overlaps the branchial apertures, which, as already stated, are continuous. The surface of the discoid expansion exhibits large pavement-like papillae upon its anterior periphery. The posterior portion of the pectorals are quite independent from the ventral disc. They are situated sidewise in the rear of the ones just described and inserted upon the thoracic arch. Subovate in shape, the rays of which they are composed are very slender, articulated, undivided inferiorly and dichotomised superiorly, the inferior rays being much more slender than the upper ones. They are quite numerous. Their absolute number we could not ascertain.

Br. VI: VI; D 14; A 13; C 3, 1, 5, 4, 1, 3; V 10; P 23.

The skin is naked, scaleless, and rather leathery than soft and flabby, as in other genera of this family. There are neither filaments nor flaps of any kind about the head or elsewhere. A small conical *papilla genitalis* was observed upon the specimen before us, and which is a female full of roe. A small specimen of a species of *Patella* was found in its stomach.

The ground color is olivaceous brown above, the inferior surface of the head and belly being of a dull yellow. Upon the upper surface of the head and body and sides of the tail extends a beautiful mesh work of black lines.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------------|----------------------------|-----------------|-----------------------|---------------------|------------------------|
| 516 | I | Adult. | San Luis Obispo, Cal.----- | 1853 | Lt. W. P. Trowbridge. | Alcoholic. | Lt. W. P. Trowbridge.. |
| 517 | I | Young. | S. Faralones, Cal.----- | 1855 |do..... |do..... |do..... |
| 518 | I |do..... |do..... | 1855 |do..... |do..... |do..... |

CYCLOGASTER, Gronov.

GEN. CHAR.—Head rather small or moderate in size, sub-conical, the snout somewhat protruding. Mouth broadly open, but not deeply cleft; small and conical teeth upon the premaxillaries and lower jaw (dentaries). None on either the vomer or palatines. Branchial apertures small and separated. Body scaleless and flabby, compressed and tapering. One dorsal fin quite long and continuous with the caudal. Anal fin similarly elongated and continuous with the caudal also, which is lanceolated. Pectoral fins well developed, extending anteriorly beneath the thoracic region, not quite united and surrounding the abdominal disformed by the ventrals.

SYN.—*Cyclogaster*, GRONOV. Mus. Ichthyol. II, 1756; Act. Helv. IV, 265; pl. xxiii; & Zoophyl. 1763.—ARTEDI, Gen. Pisc. ed. *Walbaumi*, 1792, 634.—DUM. Ichthyol. Anal. 1856, 164.

Liparis, ARTEDI, Syn. Pisc. Editio IIa, 1793, 117.—KROYER, Danm. Fiske II, 1845, 518.—SPORER, Synops. 1846, 230.

It is stated by Professor Johannes Müller,¹ that in *Liparis* the fifteen anterior dorsal rays are not articulated, resembling, therefore, the spinous rays of the other acanthopterians. In the species, however, which we have examined, the same rays we saw distinctly articulated, though undivided.

Pallas, in his *Spicilegia Zoologica*, VII, 19; pl. iii, figs. 1-6, and *Zoographia Rosso-Asiatica*, vol. III, ed. of 1834, p. 74, describes and figures under the name of *Cyclopterus gelatinosus*, a species of *Cyclogaster*. It has been recorded in more recent works under the head of *Liparis*. It is an inhabitant of Kamtschatka, and undoubtedly related to *C. pulchellus*, from which it is, however, quite distinct.

¹ *Wieg.* Archiv. f. Naturg. 1843, I, 295.

We are not prepared to say whether it is equally distinct from Dr. Ayres' *Liparis mucosus*.¹ Should this prove to be the case, the latter would constitute a third species of *Cyclogaster* along our northwestern coast.

Cyclopterus callyodon of Pallas is related to *Cyclogaster pulchellus*, and if distinct from the latter it will constitute a fourth species in the present genus.

CYCLOGASTER PULCHELLUS, Grd.

SPEC. CHAR.—Snout bluntly rounded; posterior extremity of maxillaries extending to a vertical line drawn in advance of the pupil. Inferior edge of pectoral fins falciform. Origin of dorsal fin placed somewhat posteriorly to the upper edge of the base of the pectorals. Anterior margin of the anal situated nearer the extremity of the snout than the tip of the caudal. Light olive brown above, with longitudinal waving lines of darker brown; abdomen and throat whitish. Sides exhibiting white dots.

SYN.—*Liparis pulchellus*, AYRES, in Proc. Cal. Acad. Nat. Sc. 1, 1855, 23.

A specimen of this species, a little over four inches in total length, was sent, labeled by Dr. Ayres, to the Smithsonian Institution; it is, therefore, smaller than the one upon which the original description is based.

The body is elongated, compressed, and tapering gradually towards the tail. The head, which is moderate, is contained about five times in the total length; it is furthermore sub-quadrangular in shape, declivous towards the snout, which protrudes slightly beyond the lower jaw. The eye is sub-circular, its longitudinal diameter entering about five times in the length of the side of the head. The mouth is broad when viewed in front, but is not deeply cleft, since the posterior extremity of the maxillary extends but to a vertical line drawn in advance of the pupil. The lips are well developed and flabby. The teeth are very small, disposed upon transversely oblique series on each jaw bone. The branchial apertures are quite small, and situated above the base of the pectorals; four slender branchiostegal rays may be observed right and left within the membrane.

The dorsal and anal fins are united to the caudal; the origin of the dorsal takes place somewhat posteriorly to the upper edge of the base of the pectoral fins. The anterior margin of the anal is nearer the extremity of the snout than the tip of the caudal fin. Both fins are composed of articulated and undivided very slender rays, which increase gradually in height and depth towards their posterior portion. The separation between the caudal rays and those of both the dorsal and anal is not easily traced, since they are all simple or undivided. The ventral disc is elliptical, enclosed sideways by the inferior prolongation of the pectorals. The latter are large, the lateral portion being quite elongated, composed of more slender and crowded rays than the inferior portion. The external outline of the fins is falciform; all the rays are simple, though articulated.

The vent is abdominal, being placed midway between the posterior edge of the ventral disc and the anterior margin of the anal fin.

The skin is scaleless, smooth, and flabby, loosely attached to the muscles. Large and numerous mucous pores may be seen upon the head especially, and constituting a lateral line upon the anterior region of the body.

Dr. Ayres describes the color as "light olive brown, with numerous narrow, waving lines of darker brown running longitudinally, and forming in some instances rings and irregular

¹ Proc. Cal. Acad. Nat. Sc. 1, 1855, 24.

² Zoogr. Rosso-Asiatica, III, 1831, 75.

figures; abdomen and throat white; some small brown and white spots on the sides, one series faintly indicating a lateral line with a slight downwards curve."

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Origin'l No. | Nature of specimens. | Collected by— |
|------------|--------------|-------------------------|-----------------|----------------------|--------------|----------------------|-----------------|
| 519 | 1 | San Francisco, Cal..... | 1856 | Dr. W. O. Ayres..... | 39 | Alcoholic... | Dr. Ayres |

Family LOPHIDAE, Bonap.

This is the family to which the "Devil fish" of our Atlantic coast belongs. It includes, generally speaking, scaleless fishes, the skin of some of them exhibiting bony tubercles (*Malthe*) or small spiny grains (*Chironectes*). In the majority the head is very large and broad whilst the body is reduced and tapering posteriorly. There are others in which the head is of moderate size compared to the body, which, instead of being elongated, is subelliptical in profile, being then, as usual for fishes of such a shape, compressed. The absence of the suborbital bone is not altogether peculiar to the fishes under consideration, since we find it wanting in some batrachoids also. Another trait, a good deal more conspicuous than the one just alluded to, consists in the elongation of two carpal bones, which constitute a kind of peduncle, at the extremity of which the pectoral fin is articulated. Hence the name of "Pectorales pédiculées," or "Pediculati," by which this family has sometimes been designated. In batrachoids all the carpal bones are considerably developed. The branchial apertures, moreover, open behind the insertion of the pectorals, whilst they are anterior to the latter fins in batrachoids.

The gills themselves are variable in number, according to the genera; some having three, others three and a half, and others still, two and a half only. As to the intestine it is simple, the "Devil fish" alone exhibiting a few pyloric appendages.

SYN.—*Lophidae*, BONAP. Sagg. Distr. anim. vertebr. 1831, 111..

As far as we are acquainted with the marine ichthyic fauna of western North America, we have not heard of any Lophioids as just characterised, and if mention is made of it in this report, it will be easily justified by the fact that the batrachoids which follow having been united with them into the same group, the characters now assigned to the latter could not be fully appreciated unless placed on a parallel with the former. The systematic position of the *Lophidae*, properly so called, will be at the confine of the Acanthopterian order.

Family BATRACHIDAE, Swains.

The few genera of which this family is composed are still ranked amongst the *Lophidae* by several writers and placed at the end of the order of Acanthopterians. The toad fish of our Atlantic coast (*Batrachus tau*) is one of its representatives.

About a year ago, while tracing the distinctive traits between the *Lophidae* and the *Batrachidae*, and comparing their natural affinities with those of the other families of the order to which they all belong, we arrived at the conclusion that the *Batrachidae* ought to follow the

Trachinidae in the method, and we contemplated their insertion at page 38 of this report. When the first portion of our MSS. went to press, however, professional duties diverting our attention from this subject, a previous pagination brought this family at the present juncture, where we must now give it to the reader.

We cannot help thinking that the natural affinities of the *Batrachidae* with the *Trachinidae* are more intimate than would appear at first sight, and we should not be surprised if further researches into their structure should favor their union into one single group, for *Uranoscopus*, or star-gazer, seems to establish a natural transition from the *Batrachidae* to the *Trachinidae*. It is anatomically related to the Trachinids by the absence of the air bladder and the presence of pyloric appendages, whilst zoologically it reminds us of *Batrachus* and allied genera, by the shape of the head and body, the structure and gape of the mouth, and of the fins also: the position of the ventrals being the same in Trachinids and Batrachoids, inserted as they are in advance of the thoracic belt, and hence anteriorly to the base of the pectorals.

SYN.—*Batrachidae*, SWAINS. Ess. class Fishes Amph. and Rept. II, 1839.

The general aspect of the batrachoids is that of a large and depressed head followed by a body more or less tapering, sub-depressed anteriorly and compressed posteriorly, protected by ctenoid scales or entirely scaleless. The branchial apertures are continuous under the throat in *Uranoscopus*, and widely separated by an isthmus in *Batrachus* and in *Porichthys*. There are four, branchial combs in *Uranoscopus*, and three only in *Batrachus* and *Porichthys*. The two latter want the sub-orbital bone, whilst the former possesses it largely developed.

The carpus is very much developed, but all the carpal bones contribute to its development; besides, the pectorals fins, far from presenting a pediculated appearance, exhibit a broad and fan-like base.

PORICHTHYS, Girard.

GEN. CHAR.—Body elongated, thickish anteriorly, quite tapering posteriorly. Head smooth, large, and depressed. Eyes rather small. Mouth broad, moderately cleft, with its gape directed obliquely upwards. Lower jaw longest. Canine teeth upon the jaws, front of vomer, and along the palatine bones. Preopercle spinous. Branchial apertures large, extending below the insertion of pectorals, and separated by a wide isthmus. There are six branchiostegals rays on either side. Pectorals spear-shaped. Ventrals inserted in advance of the thoracic arch. Anterior dorsal fin rudimentary. Second dorsal and anal elongated, approximating to, but not united with, the caudal. Skin smooth and scaleless. Several series of mucous pores.

SYN.—*Porichthys*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 141.

This genus differs from *Batrachus* by its dentition as well as by the numerous series of mucous pores which are observed over the head and body. Moreover, the head is smooth compared to *Batrachus*, since there are but few filiform tentacles instead of the membranous flaps which exist in the latter named genus. The branchial apertures are wider though the number of the gills is the same.

PORICHTHYS NOTATUS, Grd.

PLATE XXV.

SPEC. CHAR.—Upper surface of head quite flat. An acute preopercular spine stretching across the opercle. Posterior extremity of maxillar bone extending to a vertical line drawn posteriorly to the orbit. Four series of pores on either side of the body. A subgular and an abdominal series, as also several of these on the sides of the head. Upper regions dark bluish violet; sides and belly silvery grey. A sub-crescentic vitta beneath the eye.

SYN.—*Porichthys notatus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 141 and 151.

The largest specimens which we have before us measure about nine inches and a half in total length, the head forming the fourth part of it, the caudal fin excluded. The body is sub-cylindrical anteriorly, compressed, rather more so posteriorly, and tapering very regularly towards the insertion of the caudal fin.

The eye is rather small and situated near the upper surface of the head; it is sub-circular in shape, and its longitudinal diameter is contained six or seven times in the length of the side of the head. The mouth is very broad viewed in front, not very deeply cleft, since the posterior extremity of the maxillary extends to a vertical line drawn somewhat behind the posterior rim of the orbit. The lower jaw is the longest, and, as already observed, the gape of the mouth is directed obliquely upwards as in *Uranoscopus*. The teeth, at the symphysis of the lower jaw, are more slender and smaller than on the branches of that bone (dentary). The smallest teeth are those observed upon the premaxillaries, which extend almost to the entire length of these bones. The palatine teeth are a little larger posteriorly than anteriorly; the most conspicuous ones are observed upon the vomer. The surface of the tongue is smooth. The side of the head exhibits but one single spine inserted upon the opercle. It is quite acerated and conspicuous though oftentimes covered by a thick skin. The branchiostegal apparatus is very much developed; the branchial apertures are wide, though separated beneath by a broad isthmus. These apertures extend to the inferior surface of the head in advance and beneath the inferior edge of the base of the pectoral fins, but not as far as the insertion of the ventrals. The branchiostegal rays are well developed, six on either side.

The first dorsal fin consists of two small spines situated somewhat in advance of the anterior margin of the second dorsal, and oftentimes so inconspicuous as not to attract the attention of the observer. The second dorsal is quite long, extending to almost the entire dorsal line; it increases slightly in height backwards and terminates near the insertion of the caudal, with which it however does not unite, though the tips of the posterior rays overlap the base of the last mentioned fin. The rays are very much subdivided; the interradiation membrane being quite tough and strong. The origin of the anal is situated opposite the fifth or sixth ray of the second dorsal and extends a little further back, though not united with the caudal. In structure and shape it is similar to the second dorsal, the latter, mayhap, being somewhat higher than the anal is deep. The interradiation membrane appears also more thickish and tough, and the extremity of each ray is expanded and projects beyond the membrane proper. The caudal is comparatively quite a small fin; it enters about nine times and a half in the total length. Its posterior margin is rounded off. The pectorals are well developed, spear-shaped in general appearance, the middle rays being the longest. Their base is very thick and convex; the rays are very much bifurcated. Their extremity projects considerably beyond the vent and the anterior margin of the anal. The vent itself is situated close to the latter fin. The ventrals are inserted under the throat in advance of the inferior edge of the branchial apertures. The anterior ray is a rudimentary spine buried in the thickness of the skin which surrounds the second ray, which is articulated only, whilst the following two and last are subdivided. Their extremity hardly reaches the base of the pectorals.

Br. VI: VI; D II, 35 or 37; A 34; C 3, 1, 5, 5, 1, 2; V 1, 3; P 18 or 20.

The head and body are scaleless. Minute cutaneous appendages may be observed upon the periphery of the maxillar bones, behind the premaxillaries, and also upon the inferior peripheric edge of the lower jaw, partly covered by the lips. There are several series of pores beginning upon the head and extending along the body. We observe one series, right and

left, from the frontal region to the base of the caudal fin, approximating closely to the dorsal. A second series originates at the nostrils, passes beneath the eye, sends downwards a post-ocular branch, proceeds along the tympanic region sending off a preopercular branch, then onwards along the upper edge of the opercle and middle region of the back to the base of the caudal. A third series proceeds from the symphysis of the dentary (lower jaw) to the opercular apparatus, where it bifurcates, one branch following the inferior edge of the sub-opercle, the other branch the inferior edge of the opercle. A fourth series extends from the throat to the branchiostegal apparatus. A fifth series originates immediately behind the preceding one and extends within the base of the ventrals, hence diverges towards the chest after sending a recurrent branch outside of the insertion of the ventrals and another to the base of the pectorals, posteriorly to which it still ascends a little, meets with the series from behind the pectorals, and following the inferior middle region of the body terminates before it reaches the caudal fin. Finally, a sixth series begins under the thorax and extends to the base of the caudal, approximating closely the anal fin.

The color of the upper region of the head and body is dark bluish violet; the sides and the belly being occasionally silvery grey, at others simply lighter than on the back. There is a sub-crescentic dark vitta beneath the eye, and each pore reflects a golden dot.

References to the figures.—Plate XXV, fig. 1, represents *Porichthys notatus*, size of life, from the bay of San Francisco, California; figure 2, an inferior view of the entire fish; figure 3 is a side view of the head; figure 4, an upper view of the same; figure 5, a pectoral fin; figure 6, a ventral fin. The bifurcations of the two inner rays were taken by the artist for independent rays, hence the fact of five instead of three being represented in this figure. The series of pores are not fully represented.

List of specimens.

| Catal. No | No. of specs. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|-----------|---------------|--------------|---------------------------|-----------------|-----------------------|----------------------|--------------------|
| 520 | 1 | Adult.. | San Francisco, Cal..... | 1853 | Lt. W. A. Whipple .. | Alcoholic... | Dr. Kennerly |
| 521 | 1 | Young.. | Presidio, Cal..... | 1853 | Lt. Wm. P. Trowbridge |do..... | Lt. Trowbridge.... |
| 522 | 2 | Adult.. | Monterey, Cal..... | 1853 |do..... |do..... |do..... |
| 523 | 1 | ..... | Fort Steilacoom, W. T.... | 1854 | Dr. Geo. Suckley.... |do..... | Dr. Geo. Suckley.. |
| 694 | 1 | ..... | San Diego, Cal..... | 1857 | A. Cassidy..... |do..... | A. Cassidy..... |

ORDER II.

ANACANTHINI.

The order of Anacanthinians is to include fishes whose anatomic structure is similar to that of the preceding order, or Acanthopterians. The air bladder, when extant, wants, likewise, an air duct. We observe here, as in the preceding order, scales of both the cycloid and ctenoid types. The principal differences between the two orders consist in the absence of spiny rays to the fins of Anacanthinians, and in the ventral fins which may be wanting, or present and inserted under the thoracic belt or else under the throat.

When the ventral fins are entirely wanting we have then the sub-order *Apodes*, whilst the sub-order *Thoracici* is composed of the remaining members of the order in which the ventral fins are more or less developed.

SYN.—*Anacanthini*, MÜLL. in *Wieg. Archiv für Naturg.* I, 1845, 130.

The order itself is composed of a portion of the “Malacoptérygiens sub-brachieus,” and a portion also of the “Malacoptérygiens apodes” of the Cuvierian system.

SUB-ORDER I.

APODES.

The ventral fins in this sub-order are entirely wanting. It is composed of but one family, and that is represented along the Pacific coast by the Sand lance genus, and by *Ophidion* also.

SYN.—*Apodes*, LINN. *Syst. Nat.* ed. X, 1758, 244.—*Iconogr. Encycl.* II, 1850, 204.

There are now two sub-orders of *Apodes* in the class of fishes. The second is alluded to further on, and occupies a place in the order of Malacopterians.

Fishes wanting the ventral fins are, moreover, met with elsewhere in the class, without, however, constituting groups of a higher value than genera, showing that the same organic structure may be variously subordinated in the ichthyic method.

Family OPHIDIDÆ, Bonap.

The body is slender and elongated, compressed, provided with minute and inconspicuous scales. The ventrals, and sometimes even the pectoral fins, are wanting. The pseudo-branchiae exist, but, as already stated, the air bladder has no communication with the throat, and exhibits that curious vascular mesh-work peculiar to the fishes, in which that bladder is deprived of an air duct.

SYN.—*Ophididae*, BONAP. Sagg. Distr. Anim. vertebr. 1831, 118.
Ophidini, MÜLL. in *Wieg.* Archiv für naturg. I, 1843, 329.

It is doubtful yet as to whether *Ammodytes* belongs to the family of *Ophididae*. The air bladder appears to be wanting, at least in the American species of both the Atlantic and Pacific coasts. The conformation of the jaws, as observed by Joh. Müller, somewhat resembles that of the *Scopelidae*, still the absence of an adipose fin and the extension of the first dorsal forbid its association with the latter group. We regret that time will not permit us entering into anatomical researches, by which alone the systematic position of this genus could be ascertained, a desideratum which we hope to comply with at no distant period.

OPHIDION, Artedi.

GEN. CHAR.—Head short, obtuse; jaws equal. Teeth upon the jaws and the palate also. Gill openings large, and extending under the throat forwards, without being absolutely continuous. Pectoral fins extant. Dorsal and anal fins continuous with the caudal. Two pairs of small barbels inserted at the point of the hyoid bone. Scales cycloid.

SYN.—*Ophidion*, ARTED. Gen. Pisc. 1738; ed. *Walb.* 1792, 154.—LINN. Syst. Nat. ed. X, 1758, 259.
Ophidium, CUV. Rôgn. anim. II, 1817, 238; 2d ed. II, 1829; &, ed. illust. Poiss. 325.—DEKAY, New Y. Fauna, 1842, 315.—STORER, Synops. 1846, 235.

OPHIDION TAYLORI, Grd.

SPEC. CHAR.—Head contained nearly seven times in the total length. The eye is rather large and circular; its diameter entering about three times and a half in the length of the side of the head. The posterior extremity of the maxillar bone extends to a vertical line drawn about midway between the pupil and the posterior rim of the orbit. The origin of the dorsal fin is situated a little way posteriorly to a vertical line which would intersect the base of pectorals. Ground color olivaceous, sprinkled over with blackish specks; sides of the head and belly whitish yellow. Vertical fins margined with a black file.

The largest specimen observed measures about three inches and a quarter; the species inhabits the sands of Monterey beach.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|---------------------|-----------------|-------------------------|----------------------|-------------------------|
| 867 | 6 | Monterey, Cal.----- | 1857 | A. S. Taylor, Esq.----- | Alcoholic. | A. S. Taylor, Esq.----- |

AMMODYTES, Artedi.

GEN. CHAR.—Head elongated, sub-conical; lower jaw longest. Jaws and palate toothless. Gill openings continuous under the throat. Pectoral fins extant. Dorsal fin extending nearly the whole length of the back; anal fin long; neither of which continuous with the caudal, which is forked or else sub-crescentic. Scales cycloid in structure.

SYN.—*Ammodytes*, ARTEDI, Gen. Pisc. 1738; ed. *Walb.* 1792, 104; &, Deser. spec. Pisc. 1793, 55.—CUV. Rôgn. anim. II, 1817, 240; 2d ed. II, 1829; &, ed. illustr. Poiss. 327.—DEKAY, New Y. Fauna, IV, 1842, 317.—STORER, Synops. 1846, 237.

Two species of this genus have been mentioned by Pallas as occurring about the seas of Kamtschatka: *Ammodytes hexapterus* and *A. septipinnis*; but the former alone belongs to the genus *Ammodytes*, since the latter is provided with abdominal ventral fins, and therefore excluded from the family we are now treating of.

AMMODYTES PERSONATUS, G r d .

SPEC. CHAR.—Head constituting about the fifth of the total length. Posterior extremity of maxillary extending to the anterior rim of the orbit. Eyes rather large. Origin of dorsal fin situated in advance of the extremities of the pectorals. The caudal fin is posteriorly sub-crescentic. Greyish brown above; silvery beneath; base of caudal, black.

SYN.—*Ammodytes personatus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 137.

The head, which is sub-conical and pointed, constitutes the fifth of the total length; the largest specimen before us measuring four and a half inches. The gape of the mouth is somewhat oblique owing to the protraction of the lower jaw beyond the upper one; the posterior extremity of the maxillar bone corresponding to a vertical line intersecting the anterior rim of the orbit. No teeth on either jaw; none on the vomer and palatine bones. The eye is large and circular; its diameter entering about five times in the length of the side of the head. The branchial apertures are very wide, and the opercular apparatus largely developed; the sub and interopercle being nearly equal to the opercle, the free edge of the sub-opercle extending considerably beyond that of the opercle. Radiating striae or ridges may be observed on the preopercle and interopercle. The branchiostegals are elongated and slender, seven on either side.

The body is compressed, deeper than broad, the dorsal and abdominal regions rounded, diminishing gradually backwards in depth and width both.

The dorsal fin, the origin of which is placed at an inch from the tip of the upper jaw, in a specimen measuring three inches and seven-tenths, is nearly of equal depth throughout its whole length; the tip of its posterior rays, when bent backwards, do not quite reach the insertion of the caudal fin. Its rays being slender and not bifurcated. The caudal fin enters about eleven times in the total length; its posterior margin is sub-crescentic and its medial rays bifurcated. The anal fin is less than half the length of the dorsal, being posteriorly even with the latter, hence its origin placed backwards of the middle of the dorsal. It is deeper anteriorly than posteriorly, and where deepest it is deeper than the dorsal, whilst its depth behind is equal to the height of the dorsal opposite. Its rays are likewise slender and not bifurcated. The pectorals, which are inserted near the lower part of the thoracic belt, are moderate sized, rather elongated, composed of both simple and bifurcated rays, the bifurcated ones occupying the middle of the fins. When brought alongside the body their posterior extremity extends considerably beyond a vertical line drawn at the origin of the dorsal. The absence of the ventrals is a trait peculiar to the family to which the species belong.

Br. VII: VII; D 55; A 25; C 3, 1, 7, 6, 1, 4; V —; P 14.

The vent is placed near the anterior margin of the anal fin.

The scales, which are disposed upon transversely oblique series, are deeper than long, provided all around with wide radiating furrows. The lateral line begins opposite the posterior angle of the opercle, and takes a straight course to the peduncle of the tail along the line of intersection between the dorsal muscles and the lateral myocomma. The flanks exhibit a shallow groove, parallel to the vertebral column, and intersecting the middle bent of the lateral myocomma.

Finally, another similar groove extends from under the pectorals to the peduncle of the tail, along the line of intersection between the abdominal muscles and the lower extremities of the

lateral myocomma. This groove is, moreover, furnished with a thin though opaque membrane, which gives it the appearance of a ridge, especially along the abdominal region, where it is more developed than further behind.

The dorsal region is greyish brown; the lower half of the sides and the belly being silvery; the base of the caudal is black.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------|--------------------------|-----------------|--------------------------|----------------------|------------------------|
| 612 | 3 | Adult.. | Cape Flattery, W. T..... | 1855 | Lieut. W. P. Trowbridge. | Alcoholic. | Lieut. Trowbridge..... |

SUB-ORDER II.

THORACICI.

The ventral fins being present, they are inserted under the thoracic belt, beneath the pectorals, or somewhat in advance of the latter.

Three families compose this sub-order, two of which have furnished us with representatives from the Pacific coast. The third, or that of *Echeneidae*, is, so far, unknown in that region.

SYN.—*Thoracici*, LINN. *Syst. Nat.* ed. X, 1758, 260.—*Iconogr. Encycl.* II, 1850, 204.

Fishes with a thoracic position of the ventral fins are met with in some of the other orders of the class, but that character is more subordinate yet, having not the value it is entitled to amongst anacanthinians.

Family GADIDÆ, Bonap.

When told that the codfish typifies this family it is enough to enlist the attention of our readers. The cod-fisheries, and the immense trade connected with them, is one of the greatest sources of wealth to a sea-coast population.

Most of the representatives of this family, cod, haddock, frost fish, hake, coal fish, &c., are tenants of the frigid and temperate waters, and generally of marine habits; the ling or methy, and allied species, being the only ones found in fresh waters.

Their body is elongated, sub-fusiform in profile, either covered with small or moderate scales, cycloid in structure, often hidden in the thickness of a soft skin. The head is proportionally well developed; the mouth large or moderate. Its upper surface generally scaleless; sometimes the cranial region is covered with minute scales. The teeth are varying between the rasp or card-like type and the slender canines; they are acerated, unequal in size, disposed upon irregular series on both jaws, and the front of the vomer; the palatine bones being toothless. The premaxillar bones constitute almost exclusively the upper arcade of the mouth and bear the teeth at the exclusion of the maxillaries, which appear towards the angle of the mouth only. The opercular apparatus is spineless. The gill apertures are wide, extending obliquely forwards under the head, where they are continuous; the branchial rays being six or seven in number on either side.

There are two or three dorsal fins; one or two anals. The ventrals being inserted in advance of the thoracic arch, hence jugular in position.

The gills are four in number, fully developed. The pseudo-branchiae, on the other hand, are not visible. The stomach is elongated, strongly muscular; there are also numerous pyloric appendages. The swimming or air bladder has no air duct; it is well developed and strong, and occasionally indented on the sides.

SYN.—*Gadidae*, BONAP. Sagg. distr. anim. vert. 1831, 117.—DEKAY, New Y. Fauna, IV, 1842, 274.—STORER, Synops. 1846, 215.

Gadoideae, RICHARDS, Faun. Ber. Amer. III, 1836, 241.

The Gadoids are comparatively scarce along the coast of California and Oregon. Besides the two species hereon described, there is but another known to naturalists. It has been put on scientific record under the appellation of

BROSMIUS MARGINATUS.

SYN.—*Brosmius marginatus*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1854, 13.

And since no specimens have, so far, been seen by us, we must refer our readers to the description just alluded to.

We regret not having had more perfect specimens of the pollack, to which was affixed the name of

MERLANGUS PRODUCTUS,

SYN.—*Merlangus productus*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 64,

in order to clear up the doubts that still exist touching its identity with, or specific difference from, *Homalopomus trowbridgii*, described further on.

The seas of Kamtschatka, however, furnish several more species of this family, which it is desirable should be better known. Thus *Gadus wachna*, PALL., *G. gracilis*, TILES., and *G. pygmaeus*, PALL. appear to fall within the characters of *Morrhua*; whilst *Gadus chalcogrammus*, PALL. is a *Merlangus*, and *Gadus fimbria*, PALL. probably a *Merlucius*.

The "North Pacific Exploring Expedition" ought to enlighten us upon that subject.

MORRHUA, (Belon!!), Cuv.

GEN. CHAR.—Body and head elongated. Mouth moderate in size, or well developed, the upper jaw generally protruding beyond the lower. Chin provided with a harbel. Card or velvet-like teeth upon the jaws and front of the vomer. Palatine bones toothless. Tongue smooth. Gill apertures wide and continuous under the head. Branchiostegal rays, six or seven on either side. Three dorsal and two anal fins, generally distinct. Upper surface of head and opercular apparatus covered with minute scales. Scales of the body small, or of medium size, cycloid in structure.

SYN.—*Morrhua*, (BELON!!), CUV. R^{egn.} Anim II, 1817, 212; 2d ed. II, 1829; &, ed illustr. Poiss. 291.—RICH. Faun. Ber. Amer. III, 1836, 242.—STORER, Synops. 1846, 215.—DEKAY, New Y. Fauna, IV, 1842, 274.

It would have been desirable that the name of *Gadus* be preserved for a certain number of species of this family, and especially for some of those which are now included in the genus *Morrhua*; the two genera, *Gadus* and *Morrhua*, being retained, in the event only of a convenient sub-division into two natural groups of the species now generally referred to the latter genus.

MORRHUA PROXIMA, Grd.

PLATE XLa, FIGS. 5—8.

SPEC. CHAR.—Snout sub-conical; thickish; upper jaw protruding beyond the lower one. Posterior extremity of maxillary bone extending to a vertical line which would intersect the pupil. Dorsal and anal fins all distinct from one another. Anterior anal longer than the second dorsal. Caudal fin posteriorly sub-truncated. Yellowish ash or brown above; sides and belly silvery white.

SYN.—*Gadus proximus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 141 & 154.

Morrhua californica, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1854, 9.

We think the species allied to *Gadus gracilis*, TILES., and described in *Pallas*, Zoogr. Ross. Asiat. III, 1831, 186; and still more so to *G. pygmaeus*, PALL. loc. cit. pag. 199.

This appears to be a rather small species, for, amongst all the specimens brought home by several parties, the largest measures but seven and a quarter of an inch. In this respect it reminds us of *M. pruinosa* and *M. minuta*, of our New England coast. It is especially related to the former species, *M. pruinosa*, the tomcod or frost fish of our fishermen.

The body is slender, elongated, and compressed, sub-fusiform in profile, rather graceful in appearance. The greatest depth is under the anterior dorsal fin, hence the outline tapers gradually towards the insertion of the caudal.

The head is contained about four times and a half in the total length, or a little over that measure. The snout is sub-conical, rather pointed, the upper jaw overlapping considerably the lower one, which exhibits under its symphysis the characteristic barbel of the genus. The mouth is of moderate development; the posterior extremity of the maxillary extending to a vertical line drawn through the middle of the pupil. The eye is above the medium size, sub-circular in form, its diameter being contained about four and a half times in the length of the side of the head. The nostrils are placed much nearer the orbit than the extremity of the snout. The branchial apertures are continuous under the throat, and extend as far anteriorly as the posterior rim of the orbit. The branchiostegal rays are six on either side, and rather well developed.

The three dorsal fins are distinct from one another. The anterior one is sub-triangular, higher than long. The second dorsal is longer than high, sub-triangular in shape also, and lower than the first. The third dorsal fin is longer than high, resembling the second in shape, being only smaller than the latter. The caudal is sub-truncated upon its posterior margin.

The posterior anal is situated opposite the third dorsal, and similar in general size and outline. As to the anterior anal fin, it is longer than its opposite, the second dorsal, and deeper also than the latter is high. Its anterior margin corresponds to the posterior ray of the first dorsal, and its posterior ray is placed almost opposite the anterior margin of the third dorsal fin. The ventrals are slender; their filiform extremity reaches the vent, which is placed immediately in advance of the first anal fin. The pectorals are rather small and slender; their posterior extremities extend to a vertical line intersecting the vent.

Br. VI: VI; D 13, 21, 22; A 26, 21; C 5, 1, 16, 16, 1, 5; V 6; P 17.

The rays, as a general thing, are bifurcated or subdivided. The scales are small, sub-elliptical in shape, exhibiting radiating furrows upon their entire periphery. The focus of irradiation is eccentric towards the anterior extremity of the scale.

The color above is yellowish ash or yellowish brown, with an occasional reddish hue. The

sides and belly are lighter, often of a silvery white tint. The dorsals, caudal, and posterior anal, often exhibit a darkish hue, caused by the accumulation of minute dark reddish dots. The anterior anal, the ventrals, and the pectorals, are yellowish and unicolor.

References to the figures.—Plate XLa, fig. 5, represents, size of life, *Morrhua proxima*, from the Bay of San Francisco, California. Fig. 6 is a section of the anterior portion of the body. Fig. 7, a scale from the dorsal region. Fig. 8, a scale from the abdominal region.

List of specimens.

| Catal. No. | No. of specs. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|---------------|--------------|-------------------------|-----------------|----------------------------|----------------------|---------------------|
| 524 | 3 | Adult.. | San Francisco, Cal..... | 1853 | Lt. A. W. Whipple..... | Alcoholic. | Dr. Kennerly |
| 525 | 5 | ...do.... | ...do..... | 1853 | Lt. R. S. Williamson..... | ...do.... | Dr. Heermann |
| 526 | 5 | ...do.... | Presidio, Cal..... | 1853 | Lt. Wm. P. Trowbridge..... | ...do.... | Lt. Trowbridge..... |
| 527 | 5 | ...do.... | ...do..... | 1853 |do..... | ...do.... |do..... |
| 528 | 1 | ...do.... | Cape Flattery, W. T.... | 1854 |do..... | ...do.... |do..... |

HOMALOPOMUS, Girard.

GEN. CHAR.—General aspect of head and body elongated. Mouth large; lower jaw longest, and protruding beyond the upper. No barbel to the chin. Conical and acute teeth upon the premaxillaries (upper jaw) and dentaries (lower jaw). Similar teeth upon the front of the vomer along its external margin. Palatine bones toothless. Tongue smooth. Gill apertures very wide, and continuous under the head. Branchiostegals, seven on either side. Three dorsal fins; second and third contiguous. Two anal fins contiguous. Ventrals composed of seven rays. Upper surface of head and opercular apparatus covered with minute scales. Cheeks smooth and scaleless. Scales covering the body small, or of moderate development, cycloid in structure.

SYN.—*Homalopomus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 132.

The specimen upon which the genus *Homalopomus* was based happening to have its fins mutilated was the cause of the error which we now rectify. Half broken in the first and second dorsals, the remaining portion, which is unarticulated, suggested the idea that they were spiny rays, and the union, or rather the contiguity of the second and third dorsal fins, with a depression in the outline, was supposed analogous to what is observed in *Heterostichus*, for we were likewise deceived by the structure of the anal fins, which, being contiguous, and the rays broken upon their extremities, the anterior one appeared as if composed of spiny rays. The structure of the ventrals ought to have cautioned us against that mistake, but at that time we had no confidence in those fins as affording exclusively safe characters of classification.

The natural affinities of the genus *Homalopomus* are intermediate between *Merlangus* and *Merluccius*, the dorsal and anal fins being constructed upon the pattern observed in *Merlangus*, whilst the ventral fins are identical in structure with those of *Merluccius*. Had we not framed this genus under misapprehended affinities we would have placed the following species in the genus *Merlangus* or *Merluccius*, it was immaterial where, and await further information upon the fishes of the North Pacific ocean.

We have received one specimen from Dr. Ayres of his *Merlangus productus*, collected in the Bay of San Francisco, California. The species is very closely allied to *Homalopomus trowbridgii*, and evidently belongs to the same genus, whether *Merlangus*, *Merluccius*, or *Homalopomus*; and if identical with *H. trowbridgii*, the specific name of *productus* will have to be restored to it as

having priority of publication. The only differences which we observe between *M. productus* and *H. trowbridgii* consist in the former having a larger head, and a more anterior situation of the ventral fins. The specimens, however, are not sufficiently well preserved to enable establishing these differences with certainty.

HOMALOPOMUS TROWBRIDGII, Grd.

PLATE XLa, Figs. 1-4.

SPEC. CHAR.—Snout pointed; mouth deeply cleft; posterior extremity of maxillary extending to a vertical line drawn through the posterior rim of the pupil. Eye large. Second and third dorsals continuous; anal fins continuous also. Extremity of pectorals reaching the anterior margin of the anal fin. Greyish brown above; silvery grey beneath.

SYN.—*Homalopomus trowbridgii*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 132.

The general aspect of the fish is elongated and very much tapering posteriorly. The length of the specimen figured is nineteen inches and a half. The head is sub-pyramidal, entering four times and a half in the total length. The lower jaw is longest, protruding beyond the upper, hence the gape of the mouth is directed slightly upwards. The posterior extremity of the maxillary extends to a vertical line drawn across the posterior rim of the pupil, that is, exactly midway between the tip of the lower jaw and the origin of the pectorals. The premaxillaries and dentaries are provided with a double row of canine teeth, largest upon the inner row. The teeth themselves are conical, acerated, and curved inwardly. The symphysis of the premaxillaries is toothless, so that a smooth area is observed at the anterior part of the upper jaw. Small, acerated, canine teeth exist upon the front of the vomer. The palatine bones are toothless. The tongue, broad, thick, fleshy, rounded upon its anterior thin margin, is perfectly smooth upon its surface. The eye is large, sub-circular, its horizontal diameter entering five times in the length of the side of the head. Its posterior rim is nearer the base of the pectoral fins than the extremity of the snout. The nostrils are situated a little in advance of the orbit. The gill openings are broadly cleft, and are continuous under the throat; the branchiostegal rays are seven in number on either side. The bones of the opercular apparatus are perfectly smooth, there being neither spines nor serrations upon their edges. The limb of the preopercle exhibits a series of very large mucous follicles, not unlike the cavernous bones of Sciaenoids.

The body is compressed, lanceolated, thickest anteriorly, very much tapering posteriorly. The greatest depth enters about six times in the total length. The peduncle of the tail not occupied by the fins is very narrow; its termination is spear-shaped, and surrounded by a slender caudal fin, concave upon its posterior margin. The anterior dorsal fin is comparatively small, sub-triangular in general appearance. A vertical line dropped from its origin passes immediately behind the base of the pectorals. It is composed of ten slender articulated rays, the third of which is the longest; they bifurcate towards their tips. The second dorsal is continuous with the third, there being a depression in the outline to indicate the separation between the two fins. In the specimen now before us, from nineteen to twenty inches long, the second dorsal is separated from the first by a space of half an inch. It is the longest of the three, and also the lowest in the absolute. The rays are articulated and bifurcated. The third dorsal is somewhat longer, and a little lower than the first, its rays being more highly bifurcated than in the two preceding. The caudal is sub-crescentic upon its posterior margin, and

composed of highly bifurcated rays. The anal fins are continuous in the same manner as the second and third dorsals. Indeed nothing is more alike in shape and structure than those opposite fins. The first anal has the general shape, the same length as the second dorsal, its depth alone being somewhat less than the height of the latter; and the second anal is the counter part of the third dorsal. The origin of the anterior anal fin is situated opposite the third ray of the second dorsal, whilst the posterior rays of the second anal and the third dorsal are perfectly even. The second anal fin is higher than the first, which completes the resemblance alluded to. The vent is situated close to the anterior margin of the anal fin. The insertion of the ventrals is placed under a line intersecting the middle of the opercle; these fins are composed of seven bifurcated rays. The pectorals are long and slender; their base is situated in advance of the anterior margin of the first dorsal, their extremity extending posteriorly to a vertical line which would be drawn immediately in advance of the origin of the anterior anal fin. The formula of the rays is as follow:

Br. VII: VII; D 10, 20, 22; A 20, 22; C 7, 1, 11, 10, 1, 6; V 7; P 14.

The scales are of moderate development, sub-elliptical in shape, and cycloid in structure, with traces of radiating furrows upon their anterior section only. Minute scales are observed on the upper surface of the head, opercular apparatus, and temporal region; the cheeks, properly so called, are scaleless. The lateral line is very conspicuous; starting from the upper part of the thoracic belt it undergoes a slight depression under the anterior half of the second dorsal fin, keeping nearer the back than the belly, thence extending straightway to the base of the caudal fin along the middle of the flanks.

The ground color is uniformly greyish brown above, and silvery grey beneath. The upper surface of the head is quite dark, whilst the cheeks are of a pure silvery hue. The fins being unicolor as far as we could ascertain.

References to the figures.—Plate XLa, fig. 1, represents *Homalopomus trowbridgii*, somewhat reduced in size. Fig. 2 is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. |
|------------|--------------|---------|---------------------------------|-----------------|-------------------------------|---------------------|
| 285 | 1 | Adult.. | Astoria, Oregon Territory | 1853 | Lieut. W. P. Trowbridge | Alcoholic... |

Family PLEURONECTIDÆ, Bonap.

We meet here with a curious anomaly in the general law of symmetry, for, in the fishes which compose the present family, one of the sides acquires a marked preponderance over the other side, owing chiefly to the position of the eyes on the side just alluded to; it may be on the right or on the left. The rule is pretty constant amongst the species, and if we do occasionally observe individuals of the same species with the eyes on either side, one is the rule, the other the exception; for, in many instances, the rule holds good for entire genera where

the eyes are placed either on the right or on the left side. The side on which the eyes are situated is generally the one where the diversity of coloration is displayed, whilst the other is, generally speaking, colorless, else unicolor. This circumstance is easily accounted for by the oblique position these fishes assume in their native element; the colorless side being directed downwards, is placed in almost the same position as the abdominal region in the other member of the class.

The body of these fishes is very flat and very much compressed, sub-elliptical in general outline, short or elongated, according to the genera. The dorsal fin extends the whole length of the back, the anal occupying mostly the entire region from the vent to the caudal fin. The pectorals, when extant, are equally developed; they are wanting in some species. The ventrals being inserted under the thoracic belt.

The position of the eyes on one side being the result of a torsion of the bones of the cranium, the mouth is variously distorted, and varies also very much in size. The maxillar teeth are more developed on the side where the eyes are situated, being sometimes entirely absent from the other side. The palate is toothless. The scales are of the ctenoid type to a few exceptions which are cycloid in structure. There is no air bladder.

SYN.—*Pleuronectidae*, BONAP. Sagg. distr. anim. vertebr. 1831, 117.

Platessoideae, RICHARDS. Faun. Bor. Amer. III, 1836, 255.

Planidae, DEKAY, New Y. Fauna, IV, 1842, 293.—STORER, Synops. 1846, 223.

According to the observations made by Van Beneden, the young of this family at the period of hatching present a symmetrical form equal to that of any other fish, the assymetry being brought about during their ulterior growth. It has also been observed that while yet immature, and when the eyes have already assumed their final situation, the young flat fish swims in a perfectly horizontal position, the dorsal and abdominal outlines being on the same level, whilst they take and keep an oblique position so soon as their growth is completed.

There are two species of this family mentioned by Dr. Ayres as occurring on the Pacific coast of North America, specimens of which we have not seen. One is a "Halibut," supposed to be identical with *Hippoglossus vulgaris* (Proc. Cal. Acad. Nat. Sc. 1855, 41), seldom found so far south as the entrance of the Bay of San Francisco, though very abundant further north, whence it is brought to the San Francisco market.

The other is a "Flounder," and has been described under the name of

Platessa bilineata, AYRES, in Proc. Cal. Acad. Nat. Sc. 1855, 40.

It is taken in the Bay of San Francisco and brought to the market of that city.

PARALICHTHYS, Girard.

GEN. CHAR.—Eyes moderate, situated on the right side. Mouth large; snout sub-conical; jaws sub-equal. Slender and conical teeth on both sides of the jaws. Origin of dorsal fin situated in advance of the orbits. Dorsal and anal fins not continuous with the caudal; latter sub-truncated posteriorly. Surface of the head scaly as well as the body. Lateral line arched above the pectoral fins, hence straight to the base of the caudal.

The general aspect of the body is elongated and ellipsoid, reminding us of certain species of the genus *Platessa*, whilst the gape of the mouth resembles more that of *Rhombus*.

PARALICHTHYS MACULOSUS, Grd.

SPEC. CHAR.—Body quite elongated and ellipsoid; peduncle of the tail strangulated. Lower jaw slightly the longest; posterior extremity of maxillary dilated, and extending to a vertical line drawn posteriorly to the orbits. Origin of the anal fin situated opposite the base of the pectorals. Dorsal and anal fins even posteriorly. Posterior margin of the caudal sub-truncated. Scales small and pectinated. Reddish brown, maculated.

SYN.—*Pleuronectes maculosus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 155.

The body is elongated, sub-elliptical, the dorsal and ventral outlines constituting most regular curves, into which the head immerses with but a very slight depression above the eyes. The peduncle of the tail is slightly contracted immediately behind the posterior margin of both the dorsal and anal fins, which terminate evenly. From this point to the base of the caudal fin the caudal region assumes a dove tail appearance. The caudal fin itself is undulating upon its posterior edge, the external and central rays being slightly longer than the intermediate ones.

The total length of the specimen now before us is about seven inches and a half, the head entering in it four times and one-third. The lower jaw is the longest; the posterior extremity of the maxillar bone reaches a vertical line drawn behind the posterior rim of the orbit. Slender and conical teeth may be observed on either side of the jaws. The eyes, which are placed on the right side, are of medium size, elliptical in shape, their horizontal diameter entering about five times and a half in the length of the side of the head. The origin of the dorsal fin is situated opposite the anterior rim of the orbit; that of the anal is placed opposite the base of the pectorals, both of these fins being composed of simple rays. The rays of the caudal are highly dichotomised. The pectorals are moderate sized, and composed of slender and bifurcated rays, except the outer ones, which remain simple. The ventrals are quite small, inserted in advance of the pectorals, overlapping the vent, and extending as far as the third ray of the anal. Their rays are likewise bifurcated.

Br. VI: VII; D 68; A 52; C 3, 1, 7, 6, 1, 2; V 6; P 1, 10.

The scales are small, sub-elliptical, longer than deep, and pectinated. They extend over the opercular apparatus, the head, and even the jaws; they may also be observed on the rays of most of the fins, especially on the caudal. The lateral line starts from the scapular region, describing an arch above the pectoral fins, to follow afterwards the middle of the flanks to the caudal fin.

The ground color of the right side, being the one on which the eyes are situated, is reddish brown, scattered all over with numerous spots of a darker hue. The left side is uniformly pale yellow.

• *List of specimens.*

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------|----------------------|-----------------|-------------------------|---------------------|-----------------|
| 701 | I | Adult. | San Diego, Cal. | 1853 | Lieut. W. P. Trowbridge | Alcoholic... | A. Cassidy..... |

PLATICHTHYS, Girard.

GEN. CHAR.—Eyes on either the right or left side. Mouth rather small; snout somewhat produced; lower jaw longest; small and conical teeth on both sides of the jaws. Origin of dorsal fin situated opposite the middle of the orbit; dorsal and anal fins not extending to the caudal; latter posteriorly sub-convex. Surface of head scaly like the body. Lateral line slightly arched above the pectoral fins, hence straight to the base of the caudal.

SYN.—*Platichthys*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 139; and, VIII, 1856, 136.

This genus has the general aspect of *Rhombus*, from which it differs by a smaller mouth, a dorsal fin beginning above the orbit, and by both the dorsal and anal fins being separated from the caudal. The scales, moreover, have a proclivity of becoming quite prickly and rough to the touch.

To this genus belongs *Pleuronectes stellatus* of Pallas,¹ or *Platessa stellata* of modern writers.² The latter species is closely allied to *P. rugosus*, described further on, from which it may even not differ. An actual comparison between the specimens is, however, demanded, before a settlement of the question can be arrived at.

1. PLATICHTHYS RUGOSUS, GRD.

SPEC. CHAR.—Eyes moderate, situated on the left side. Interocular space moderate. Peduncle of tail long. Origin of dorsal fin corresponding to a vertical line intersecting the middle of the pupil. Scales very rugose and plate-like. Lateral line slightly arched above the pectoral fins. Left side dark reddish brown; fins olivaceous, dorsal and anal with alternate vertical bands of black, caudal with longitudinal bands of the same hue. Ventrals and pectorals unicolor. Right side dull yellow.

SYN.—*Platichthys rugosus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 139 and 155.

The general form of the body is sub-elliptical, leaving out the snout and the peduncle of the tail. The head, which is of medium size, constitutes about the fourth of the total length, which measures nine inches in the specimen we describe. The occiput is very much depressed, the snout sub-conical, the lower jaw being the longest and protruding beyond the upper. A row of short, conical teeth may be observed on either side of the jaws. The posterior extremity of the maxillary extending somewhat beyond the anterior rim of the orbit, approximating it closely when the mouth is shut. The eyes are moderate sized and, as a general rule, situated on the left side; they are sub-elliptical and their horizontal diameter contained about six times in the length of the side of the head. The interocular space is of moderate width. The branchiostegals are seen on either side.

The origin of the dorsal fin takes place upon a vertical line which would intersect the pupil of the upper eye. Its rays increase in height to the posterior third of its length, hence diminishing again to the terminus of the fin. The origin of the anal corresponds to a vertical line drawn at some distance behind the base of the pectorals, terminating evenly with the dorsal, at a considerable distance from the insertion of the caudal, giving the tail a rather long peduncle. The caudal fin itself is posteriorly rounded or sub-truncated, constituting a little less than the fifth of the total length. The ventrals are inserted somewhat in advance of the base of the pectorals, their posterior extremity not extending quite as far as the anterior margin of the

¹ Zoographia Rosso-Asiatica, III, 1831, 416.

² The Zoology of the Voyage of H. M. S. Herald. Reptiles and Fish, 1854, 164.

anal, but overlap considerably the vent, which is situated nearly midway between the insertion of the ventrals and the origin of the anal. The pectorals are of but moderate development.

Br. VII: VII; D 57; A 42; C 3, 1, 7, 7, 1, 2; V 6; P 11.

The middle rays of the pectorals and those of the caudal are bifurcated once; in the other fins they are simple. The scales are modified into small bony shields with their surface covered with minute prickles very rough to the touch. They are isolated and scattered over the body, and more thickly set together over the head. A row of larger and rougher ones may be observed along the base of the dorsal and anal fin, and very minute ones over the fins. The lateral line from the suprascapular region slightly ascends above the pectorals, passed which it follows a straight course along the middle of the flanks, the peduncle of the tail, and the caudal fin. The dermic productions just alluded to are smaller and less numerous on the right than on the left side, that is, on the side opposite to the one on which the eyes are situated.

The color on the left side is dark reddish brown, the fins being greyish olive. The dorsal exhibiting five, and the anal four vertical bands of black, the caudal four longitudinal streaks of the same tint, whilst the pectorals and ventrals are unicolor. On the opposite side the body and head are yellow or olive.

List of specimens.

| Catal. No. | No. of specs. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|---------------|--------------|---------------------|-----------------|----------------------------|----------------------|----------------------|
| 695 | 1 | Adult.. | San Francisco, Cal. | 1853 | Lieut. R. S. Williamson .. | Alcoholic... | Dr. Heermann |
| 606 | 5 | ----- | Presidio, Cal. | 1853 | Lieut. W. P. Trowbridge .. |do..... | Lieut. Trowbridge .. |
| 696 | 1 | Young . | Petaluma..... | 1855 | E. Samuels |do..... | E. Samuels |

2. PLATICHTHYS UMBROSUS, Grd.

SPEC. CHAR.—Eyes rather large and situated on the right side. Interocular space narrow. Peduncle of tail short. Origin of dorsal fin corresponding to a line intersecting the anterior rim of the pupil. Scales normal, though some of them are quite rugose. Lateral line conspicuously arched above the pectoral fins. Right side uniform blackish brown; left side light brown. Dorsal, anal, and caudal fins obsolete maculated.

SYN.—*Platichthys umbrosus*, GRD, in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 136.

The body is sub-elliptical in its outline and very much tapering towards the peduncle of the tail, which is short and somewhat strangulated at the terminus of both the dorsal and the anal fins. The head is moderate sized, constituting nearly the fourth of the entire length, which measures about seven inches and a quarter. The snout is rather short and sub-conical, the gape of the mouth oblique, with the lower jaw slightly projecting beyond the upper. Small and conical teeth may be observed on either side of the jaws, perhaps somewhat more conspicuous on the left than on the right side. The posterior extremity of the maxillary extends to a vertical line drawn midway between the anterior rim of the orbit and that of the pupil. The eyes are proportionally large, elliptical, and placed on the right side and separated from one another by a very narrow interocular bridge. Their longitudinal diameter enters about four times and a half in the length of the side of the head, less than once in advance of the orbit. Each nostril

has a double aperture, one of which being tubular. The branchial apertures are rather wide, continuous under the throat; the branchiostegals being six on either side.

The origin of the dorsal fin corresponds to a vertical line which would intersect the anterior rim of the pupil and slightly inflexed towards the left side. The rays increase in height towards the posterior third of the fin to diminish again posteriorly, all being inclined backwards. The anal has the same general structure and appearance, and terminates evenly with the dorsal at a short distance from the base of the caudal, its origin corresponding to a line drawn immediately behind the base of the pectorals. The latter are moderate sized and slender, the left more so than the right one; both having dichotomised rays, though less fully developed in the left fin. The ventrals are rather small, inserted in advance to the base of the pectorals, and extend somewhat beyond the anterior margin of the anal fin and, consequently, overlapping the vent. Their middle rays are likewise dichotomised. The caudal fin, which is posteriorly rounded or sub-convex, enters five times and a half in the total length; its rays are simply bifurcated without any further subdivision.

Br. VI: VI; D 74; A 59; C 3, 1, 6, 6, 1, 3; V 6; P 9.

The scales on the right side are of but moderate development, longer than deep posteriorly, ciliated or pectinated, some of them very conspicuously, others but slightly; others still are rugose over their entire exposed surface, being quite rough to the touch. Over the head and opercular apparatus all the scales are of the rugose type. On the left side all the scales present a smooth appearance, and they do not extend over the dorsal, caudal, and anal fins, as is the case on the right side.

The color of the right side is uniform blackish brown; the left side of a light brown. The vertical fins are obsoletely maculated.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimens. |
|------------|--------------|--------|---------------------------|-----------------|-------------------------------|----------------------|
| 607 | 1 | Adult. | Cape Flattery, W. T. | 1856 | Lieut. W. P. Trowbridge | Alcoholic... |

PLEURONICHTHYS, Girard.

GEN. CHAR.—Eyes rather large, situated on the right side. Interocular space very narrow. Head small. Mouth small, its gape being oblique, the jaws subequal, and the snout subtruncated. Teeth inconspicuous, occupying both sides of the jaws. Origin of dorsal fin placed either in advance of the pupil, or else the entire orbit. Dorsal and anal fins not extending to the caudal; latter posteriorly rounded. Scales small, cycloid in structure. Lateral line slightly raised above the pectoral fins, otherwise linear.

SYN.—*Pleuronichthys*, Grn. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 139.

The body is rather deep, and in that respect resembling somewhat *Rhombus*, or else combining the idea of *Rhombus* and *Solea* in its general outline. The smallness of the head and mouth are, however, characters which will at once enable a student to discriminate between these genera.

1. PLEURONICHTHYS COENOSUS, Grd.

SPEC. CHAR.—Body sub-elliptical. Posterior extremity of maxillary extending to a vertical line drawn midway between the pupil and the anterior rim of the orbit. Origin of dorsal fin curved towards the left side of the head, and corresponding to the anterior rim of the upper orbit on the right side. Ground color olivaceous brown, maculated

SYN.—*Pleuronichthys coenosus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 139.

The body is sub-elliptical, the head quite small, and the snout very short and blunt, the lower jaw being longer than the upper, and the mouth rather small, with its gape oblique. Minute, conical, and acute teeth may be observed on either side of the jaws. The posterior extremity of the maxillary extends beyond the anterior rim of the orbit, without, however, reaching a vertical line drawn in advance of the pupil. The eyes, which are situated on the right side, are large and sub-elliptical; their longitudinal diameter entering about three times in the length of the side of the head. The interocular space is very narrow and ridge-like. The head itself is contained about five times and a half in the total length of the fish. The branchial apertures are moderate, and not contiguous under the throat.

The origin of the dorsal fin, which is bent towards the left side, takes place opposite the anterior rim of the upper orbit; it is quite elevated towards its posterior third, generally speaking well developed, and terminated at a short distance from the insertion of the caudal. The origin of the anal corresponds to a vertical line drawn posteriorly to the base of the pectorals, increasing in height towards its middle, and terminating evenly with the dorsal. The rays of both the dorsal and anal fins are rather stoutish, not bifurcated and provided on the left side with a membranous expansion which overlap each other when the fins are inclined backwards. The peduncle of the tail is very short and stright. The caudal fin, which constitutes a little less than the fourth of the total length, is rounded or convex upon its posterior margin. The insertion of the ventrals is placed in advance of the base of the pectorals; they are broad and rather short, although extending beyond the anterior margin of the anal; their rays are not bifurcated. The pectorals are moderate sized, the left being somewhat smaller than the right, with a less decided bifurcation of its rays.

Br. VI: VI; D 74; A 54; C 3, 1, 7, 6, 1, 4; V 6; P 1, 10.

The body is covered with small scales, somewhat smaller on the left than on the right side; they are sub-elliptical, longer than deep, and posteriorly entire and smooth instead of being pectinated. Over the opercular apparatus and head they are smaller also than on their respective side. Those occupying the base of the caudal are likewise diminutive and irregularly shaped. The lateral line, which is nearly straight, is slightly raised into a depressed curve immediately above the pectoral fins.

The ground color of the right side is deep brown, maculated with blackish and yellowish; the left side is of a uniform soiled yellow.

The specimen described, the only one that has fallen under our investigations, measures seven and a half inches in total length.

List of specimens.

| Catal. No | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|-----------|--------------|---------|--------------------------|-----------------|-------------------------|---------------------|-----------------|
| 697 | 1 | Adult.. | San Francisco, Cal. | 1853 | Lieut. R. S. Williamson | Alcoholic... | Dr. Heermann .. |

2. PLEURONICHTHYS GUTTULATUS, G r d.

SPEC. CHAR.—Body sub-cylindrical. Posterior extremity of the maxillary extending to a vertical line drawn between the pupil and the anterior rim of the orbit. Origin of the dorsal situated opposite the pupil. Ground color of a greyish lead hue, besprinkled with whitish spots and black dots.

SYN.—*Pleuronichthys guttulatus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 137; and, Journ. Bost. Soc. Nat. Hist. VI, 1857. Pl. xxv, figs. 1—4.

The body is sub-cylindrical, deeper than in *P. coenosus* when the depth is compared to the entire length. The head is small, and constitutes about the fourth of the total length; the eyes, situated on the right side, are well developed, elliptical, their longitudinal diameter being contained three times in the length of the side of the head. The interocular space is exceedingly narrow and raised, ridge-like, above the surface of the head. The snout is very blunt and short, the mouth small, with its gape oblique upwards, and both jaws even. The posterior extremity of the maxillary corresponds to a vertical line drawn midway between the anterior rim of the orbit and the pupil. The opercular apparatus and cheeks are scaly; the branchial fissures moderate, and not continuous under the throat.

The origin of the dorsal fin corresponds to a vertical line drawn immediately in advance of the pupil; it is gradually increasing in height to the line of greatest depth of the body, to diminish again gradually posteriorly, terminating at a small distance from the base of the caudal. The anterior margin of the anal corresponds to a vertical line drawn immediately behind the base of the pectoral fins. It is shaped like the dorsal, and terminates evenly with the latter. The caudal, which enters about five times in the total length, is rounded upon its posterior margin. The origin of the ventrals is situated in advance of the base of the pectorals, in advance even of the posterior edge of the opercular apparatus; they are small and sub-lanceolated; their posterior extremity overlaps the vent and reaches the anal fin. The pectorals themselves are rather small, and directed obliquely upwards and backwards.

D 67; A 47; C 4, 1, 8, 7, 1, 3; V 6; P 13.

The scales are quite small, longer than deep, cycloid in structure, with diverging grooves upon their posterior section only. The lateral line is slightly arched above the pectoral fins, hence nearly straight along the middle of the flanks to the base of the caudal fin. A similar mucous line may be traced from the upper rim of the uppermost eye, along the back, giving off a connecting branch to the lateral line across the occipital region, and losing itself into the fin beyond the middle of the length.

The ground color is greyish or lead, densely sprinkled all over with black dots and whitish spots. The fins being olivaceous similarly dotted with black, but exhibiting fewer white spots.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|-----------------------|-----------------|-------------------|----------------------|------------------|
| 363 | 4 | Tomales bay, Cal----- | 1855 | E. Samuels. ----- | Alcoholic--- | E. Samuels ----- |

PAROPHRYS, Girard.

GEN. CHAR.—Eyes large, situated on the right side. Interocular space very narrow. Mouth moderate; snout sub-conical; lower jaw longest. Teeth small, inconspicuous, occurring on the left side of the jaws only. Origin of dorsal fin situated opposite the pupil; dorsal and anal fins not extending to the caudal; latter posteriorly sub-truncated; a spine at the origin of the anal. Surface of head scaly. Scales very small and cycloid in structure. Lateral line but slightly raised above the pectoral fins.

SYN.—*Parophrys*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 139.

The body is elongated, sub-elliptical, resembling somewhat in its outline some species of *Platessa* and *Solea*, the head of the latter excepted. The presence of teeth on the colorless side of the jaws is a trait partaken by *Solea* also, hence another relationship between these two genera. The gape of the mouth is oblique upwards, which, added to the sub-conical protrusion of the snout, gives the head the physiognomy of *Platessa*. The spine which is observed at the anterior margin of the anal is a trait which occurs in other genera.

PAROPHRYS VETULUS, Grd.

SPEC. CHAR.—Body quite elongated and sub-elliptical; peduncle of the tail slender. Posterior extremity of maxillary extending to a vertical line drawn inwardly to the anterior rim of the orbit. Origin of anal fin placed posteriorly to the base of the pectorals. Dorsal and anal fins nearly even posteriorly. Scales minute; lateral line very conspicuous. Color of body and head reddish ash; fins olivaceous, maculated.

SYN.—*Parophrys vetulus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 140, 142, & 155.

The average size of the specimens before us is about five inches. The elongated body is quite tapering posteriorly, less so anteriorly, where it is terminated by a rather small head and an acute snout, the peduncle of the tail being slender. The head itself constitutes somewhat less than the fourth of the total length, to which the greatest depth stands as one to three. The mouth is small, the lower jaw being the longest, and the posterior extremity of the maxillary overruns slightly a vertical line drawn across the anterior rim of the orbit. The teeth, which are minute, exist on the left side of the jaws only. The eyes are situated on the right side; they are very large horizontally, elliptical, and closely approximated, being separated by a very narrow and elevated ridge. Their longitudinal diameter enters four times in the length of the side of the head. The origin of the dorsal takes place opposite the pupil of the upper eye, and terminates at a short distance from the insertion of the caudal. The origin of the anal corresponds to a vertical line drawn posteriorly to the insertion of the pectorals, terminating evenly with the dorsal; a small and acute horizontal spine may be observed at its anterior margin, and directed forwards. The caudal is slender, posteriorly truncated, and contained about five times and a half in the total length. The pectoral fin of the left side is somewhat smaller than that on the right, both being rather slender. The ventrals are small, inserted opposite the base of the pectorals, with their anterior edge somewhat in advance to the latter. Their posterior extremity projecting beyond the vent, and somewhat the origin of the anal. There are six branchiostegals on the right, and five on the left side.

Br. VI: V; D 86; A 64; C 3, 1, 7, 7, 1, 3; V 6; P 11.

The middle rays of the ventrals and pectorals of either side exhibit bifurcated rays, though less deeply than those of the caudal. The rays of the dorsal and anal are, as usual, undivided.

The scales are very small, and extend over the head and portion of the caudal fin. They are

sub-elliptical, longer than deep, and posteriorly furrowed. The lateral line is nearly straight, presenting but a slight curve, convex upwards, just above the pectoral fin.

The ground color of the right side is reddish ash with diffused darker spots spread all over the body and fins. The left side is pale reddish yellow and unicolor.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------------|--------------------------|-----------------|---------------------------|---------------------|----------------------|
| 698 | 5 | Adult.. | San Francisco, Cal..... | 1853 | Lt. R. S. Williamson..... | Alcoholic. | Dr. A. L. Heermann. |
| 699 | 3 | Adult.. |do..... | 1853 | Lt. A. W. Whipple..... |do..... | Dr. C. B. Kennerly.. |
| 700 | 3 | ..... | Presidio, Cal..... | 1853 | Lt. W. P. Trowbridge..... |do..... | Lt. Trowbridge..... |
| 608 | 1 | Adult.. | Port Orford, Oregon..... | 1856 |do..... |do..... |do..... |
| 609 | 1 | Adult.. | Astoria, Oregon..... | 1856 |do..... |do..... |do..... |

PSETTICHTHYS, Girard.

GEN. CHAR.—Eyes large or moderate, situated either on the right or the left side. Interocular space very narrow or moderate. Mouth rather large; snout bluntly rounded; jaws sub-equal. Teeth slender and conical, on both sides of the jaws. Origin of dorsal fin situated anteriorly to the orbit. Dorsal and anal fins approximating the caudal without being continuous with it. Posterior margin of caudal rounded or convex. A small spine in advance of the anal. Surface of the head scaly. Scales varying in size, according to the species. Lateral line almost straight anteriorly.

SYN.—*Psettichthys*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 140.

The general aspect of this genus is elongated, and reminds us of *Solea*, which analogy is aided by the blunt outline of the head. The eyes and mouth are much larger than in *Solea*, and the presence of teeth on both sides of the jaws exclude all idea of generical affinities between these two genera.

1. PSETTICHTHYS MELANOSTICTUS, Grd.

SPEC. CHAR.—Body elongated and rather slender. Eyes moderate, situated on the right side; interocular space moderate. Lower jaw somewhat longer than the upper. Posterior extremity of maxillary extending to a vertical line drawn in front of the pupil. Anterior rays of dorsal higher than those immediately succeeding. Dorsal and anal fins even posteriorly. Origin of anal fin situated somewhat posteriorly to the base of the pectorals, and provided with a small spine. Scales quite small, cycloid in structure; lateral line very slightly raised above the pectorals. Ground color cinereous, interspersed with crowded black dots.

SYN.—*Psettichthys melanostictus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 140.

The body is elongated, slender, and tapering posteriorly. Its greatest depth is contained about three times in the total length, in which the head enters somewhat less than four times. The mouth is large and its gape oblique; the lower jaw being the longest. The posterior extremity of the maxillar bone extends to a vertical line drawn in advance of the pupil. The teeth, which occupy both sides of the jaws, are very slender. The eyes, which are well developed, occupy the right side; their horizontal diameter enters four times and a half in the length of the side of the head. The interocular space is of moderate width. The origin of the dorsal fin takes place opposite the anterior rim of the left or upper eye; its anterior rays, which occupy the declivity of the occiput, are higher than the following ones, which increase

gradually in height to a certain distance, then diminishing again rapidly to the terminus of the fin, which does not extend to the base of the caudal. The origin of the anal is situated somewhat posteriorly to the base of the pectorals. An acute and inconspicuous spine, directed horizontally forwards, may be observed at the anterior margin of that fin; the soft rays increase gradually in size for a given distance, to diminish posteriorly exactly as is the case in the dorsal, terminating evenly with the latter fin. The peduncle of the tail is somewhat dilated near the insertion of the caudal, the central rays of which being the longest, the posterior margin of that fin is necessarily convex. The pectorals are small and the ventrals smaller still; both being exteriorly rounded when expanded. The extremity of the ventrals do not reach the anterior margin of the anal when bent in that direction. The insertion of the same fins is placed in advance of the base of the pectorals. The branchiostegals are six on either side; the branchial apertures being continuous under the throat.

Br. VI: VI; D 78; A 60; C 4, 1, 6, 6, 1, 3; V 6; P 12.

The rays of the dorsal and anal fins being undivided; those of the other fins bifurcated or dichotomised. The scales are very small, longer than deep, and extending over the head and vertical fins. The lateral line, from the scapular region, take a declivous course until it reaches the middle of the flank posteriorly to the tip of the pectorals; hence straightway to the caudal fin. The total length of the specimen described is four inches and three quarters. The ground color of the right side is cinereous interspersed with crowded black dots, which are occasionally confluent or irregularly grouped into patches. The left side is uniform dull yellow.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------------------|-----------------|---------------------------|----------------------|---------------------|
| 704 | 1 | San Francisco, Cal. | 1853 | Lt. R. S. Williamson..... | Alcoholic. | Dr. Heermann..... |
| 610 | 1 | Astoria, Oregon | 1856 | Lt. W. P. Trowbridge..... | do..... | Lt. Trowbridge..... |

2. PSETTICHTHYS SORDIDUS, Grd.

PLATE XLb.

SPEC. CHAR.—Body elongated and sub-elliptical. Eyes large, situated on the left side; interocular space very narrow. Jaws nearly even when mouth is closed. Posterior extremity of the maxillary extending to a vertical line intersecting the pupil. Anterior rays of dorsal fin gradually increasing in height. Dorsal and anal fins nearly even posteriorly. Origin of anal situated on a line passing immediately behind the base of the pectorals, and preceded by a very small spine. Scales moderate sized; lateral line almost straight from head to tail. Ground color of a soiled yellow; the scales being margined with black.

SYN.—*Psettichthys sordidus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 142 & 155.

The general outline is sub-ellipsoid; the total length being nearly five inches and a half, in which length the greatest depth enters a little short of three times. The head constitutes nearly the fourth of the total length. The gape of the mouth is oblique, and when closed the extremities of the jaws are even; the posterior extremity of the maxillar bone extending to a vertical line which would intersect the pupil. The teeth are slender, unequal, sub-conical, and acerated, occupying either side of the jaws. The eyes are proportionally large, sub-elliptical,

and so closely approximated that the interocular space consists of a mere bony ridge; they are situated on the left side, and their horizontal diameter is contained four times in the length of the side of the head, somewhat less than once in advance of the anterior rim of the orbit.

The origin of the dorsal fin takes place near the nostril, on the right side of the anterior rim of the upper orbit; its rays are gradually increasing in height to near the posterior third of the extent of that fin, to diminish again rather rapidly backwards. It terminates near the base of the caudal without being contiguous to it. The anal commences on a line situated posteriorly to the base of the pectorals, and terminates almost evenly with the dorsal; its middle rays being somewhat deeper than those of the latter fin are high. The caudal fin, which enters about six times in the total length, is sub-lanceolate or convex upon its posterior margin. The right pectoral fin is smaller than the left, which is but moderate sized, and rather more tapering. The ventral fins are small also, though proportionally broad at their base or insertion, which is partly opposite the base of the pectorals and partly anterior. On the accompanying figure they are represented too much forwards. There are six branchiostegals on the left side and five only on the right; the branchial aperture being continuous under the throat.

Br. VI; V; D 82; A 72; C 1, 1, 7, 6, 1, 1; V 6; P 1, 10.

The only rays that are bifurcated or dichotomised may be observed in the caudal and left pectoral. The scales are of moderate size, longer than deep, sub-elliptical, and finely pectinated upon their posterior margin; their anterior section exhibiting radiating grooves. They cover the opercular apparatus and cheeks, extending likewise to some of the fins. The lateral line takes nearly a straight course from the suprascapular region to the base of the caudal, it being but slightly raised anteriorly. The ground color is of a soiled yellow; the scales being margined and the fins speckled with blackish.

Reference to the figures.—Plate XI, b, fig. 1, represents the left side of *Psettichthys sordidus*, size of life. Fig. 2 the right side of the same. Figs. 3 and 4 are scales of the lateral line from either side; the other scales were not preserved on the specimen.

Specimens from Presidio exhibit upon their body and fins irregular small black spots, in addition to the color elsewhere alluded to.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------------------|-----------------|---------------------------|----------------------|------------------------|
| 702 | 1 | San Francisco, Cal. | 1853 | Lt. A. W. Whipple | Alcoholic. | Dr. C. B. Kennerly.... |
| 611 | 4 | Coast of California..... | 1853 | Lt. W. P. Trowbridge..... | do..... | Lt. Trowbridge..... |
| 703 | 12 | Tomaes bay, Cal..... | 1855 | Mr. E. Samuels | do..... | E. Samuels..... |

ORDER III.

PHARYNGOGNATHI.

The inferior pharyngeal bones unite together into an odd bony piece, oftentimes so intimately as to leave no vestige of the original suture (for, homologically speaking, there are two inferior pharyngeals, a right and a left); at others, though strongly united, a faint trace of the suture is still apparent, as is the case in *Chromididae*, of the acanthopterygian sub-order, treated further on, and of which no representative has as yet been found in western North America properly so called. The chromids belong to a more southern clime; the valley of the Rio Grande del Norte (Rio Bravo) appears to be its northern limit in this continent.

SYN.—*Pharyngognathi*, MÜLL. in *Wieg.* Archiv für Naturg. I, 1843, 305; & I, 1845, 136.

This order is composed of malacopterygians and acanthopterygians, the former having their body protected with cycloid scales, whilst in the latter we observe both types: the cycloid and the ctenoid according to the families. The air bladder, in the adult fish, has no air duct leading to the mouth. The vomer and palatine bones are toothless.

SUB-ORDER I.

MALACOPTERYGII.

The rays which enter into the composition of the fins are all of the soft and articulated kind, some of which remaining simple whilst the others bifurcate to various degrees. The ventrals are abdominal; the dorsal is situated far back opposite the anal. The scales exhibiting the cycloid structure.

SYN.—*Pharyngognathi malacopterygii*, MÜLL. in *Wieg.* Arch. für Natur. I, 1843, 310; & I, 1845, 136.

Malacopterygii, LINN. Syst. Nat. ed. VI, 1748.—OWEN, Lect. comp. anat. Vert. 1846, 48.—Bd. Icon. Enc. II, 1850, 204.

A single family constitute, for the present at least, this sub-order. It was placed by former systematic writers in the same order with the other malacopterygians (*Physostomi*) prior to the anatomical researches of Professor Müller, who has brought to light the peculiar structure of their inferior pharyngeal bones as well as that of the air bladder, above alluded to.

Family SCOMBERESOCIDÆ, Owen.

In this family we observe the same intimate union of the inferior pharyngeals without any vestige of suture, as in *Labridae* and *Pomacentridae*. The body is elongated, sometimes very considerably so, covered with scales, cycloid in structure, with a row of keeled ones on either side of the belly and distinct from the lateral line. The dorsal fin is opposite the anal and composed

of soft articulated rays as in the malacopteran order, and the ventrals, abdominal in their position, are likewise composed exclusively of soft and articulated rays. The air bladder has no air duct leading to the throat. There is no cul-de-sac to the stomach; the pyloric appendages are also absent. The stomach itself is straight and hardly distinguishable from the intestine into which it gradually passes. The pseudobranchiae are glandulous, being covered by the mucous membrane of the branchial apertures and hence concealed. The gills are all fully developed, the last branchial aperture being also extant.

SYN.—*Scomberesoces*, MULL. in *Wieg.* Archiv für Naturg. I, 1843, 310; & I, 1845, 136.

Scomberesocidae, OWEN, Lect. on Comp. Anat. Vertebr. 1846, 48.—Bo. Iconogr. Encycl. II, 1850, 204.

As the name implies, the fishes of this family bear some external resemblances to the macquerels (*Scomber*) amongst the Acanthopterians and the pickerels (*Esox*) amongst Physostomians or abdominal Malacopterygians. It is one of those instances in which the true characters, the ones which decide of the affinities and relationships of a group, are often hidden under forms analogous to other groups.

BELONE, Cuv.

GEN. CHAR.—Body very elongated, anguilliform, and very slender. Head long and slender also. Upper jaw formed exclusively by the intermaxillaries, which constitute, together with the lower jaw, a slender and pointed bill. Slender and conical teeth on both jaws, which are margined exteriorly by small prickles or else very exiguous teeth. No lips at all. The roof of the mouth generally smooth. Opercle and preopercle smooth. Branchial apertures continuous under the throat. One dorsal fin situated very far back and opposed to the anal. Posterior margin of caudal generally emarginated. Ventrals inserted about the middle of the body. Upper surface of head, cheeks, and opercular apparatus provided with very small scales. Scales of body, small.

SYN.—*Belone*, Cuv. R^{ègn.} anim. II, 1817, 185; 2d ed. II, 1829; & ed. illustr. Poiss. 233.—Cuv. & Val. Hist. nat. des Poiss. XVIII, 1846, 389.—DEKAY, New Y. Fauna IV, 1842, 227.—STORER, Synops. 1846, 186.

The species of this genus are known in the United States under the names of "bill-fish," "silver gar," and "gar-fish;" the latter being a misapplication, since it properly belongs to the various species of *Lepidosteus*. They are by no means common, that is to say, not numerous in individuals, unless they should frequent the deep and inaccessible bottoms. In their geographic distribution they extend over a wide range of the temperate zone, although each region appears to own its peculiar species.

BELONE EXILIS, Grd.

SPEC. CHAR.—Anterior margin of anal situated in advance of the dorsal. Caudal fin moderately emarginated; inferior lobe slightly the largest. Ventral fins small. Scales larger on the flanks than on the dorsal region. Lateral line sub-median, inconspicuous. Another line extends from the inferior edge of the branchial openings along the lower portion of the flanks, and meets the lateral line above the terminus of the anal fin. Back dark green; middle of flanks silvery; lower half of sides and belly rufous. Fins olivaceous; upper ones dark, lower ones lighter.

SYN.—*Belone exilis*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 149.

The entire length of the specimen described measures about twelve inches and a half, the head forming a little less than the third of it. The body is very slender, tapering gradually posteriorly, and sub-cylindrical: the depth being somewhat greater than the width. The occipito-frontal region is flattened and the inter-ocular region longitudinally grooved. The eye

is large and sub-circular, and its horizontal diameter comprised about eleven times in the length of the side of the head, seven times in advance of its anterior rim.

The anal fin commences somewhat in advance of the dorsal, but does not extend quite as far back as the latter, which is less developed than the former. The general outline of the two fins is the same; their anterior third is much higher or deeper and sub-triangular, whilst the remaining portion is quite low and gradually diminishing posteriorly. The caudal fin is short and proportionally well developed, moderately emarginated posteriorly, the inferior lobe being slightly larger than the upper. The ventral fins are small; their insertion is equi-distant between the base of the caudal fin and the posterior rim of the orbit. The pectorals are slender, and directed obliquely upwards.

Br. XI: XI; D 16; A 20; C 4, 1, 7, 6, 1, 3; V 6; P 14.

It was by inadvertance that, on a former occasion, we gave but thirteen rays to the anal fin. The external ray of the ventrals is simple, that is, undivided though distinctly articulated.

The scales are quite small upon the dorsal region, above the lateral line; they increase in size from beneath it to the lower portion of the flanks, along the middle of which the lateral line itself takes an inconspicuous course towards the peduncle of the tail, whence it becomes more apparent to the base of the caudal. A line of mucous pores, marked by peculiar scales, and a good deal more apparent than the lateral line, may be traced from the inferior edge of the branchial apertures along the lower portion of the flanks, in passing immediately above the insertion of the ventrals, and when near the terminus of the anal, ascends to meet the lateral line. The scales themselves are cycloid, without radiating grooves, and, as a matter of course, without pectinations. They are sub-circular upon the dorsal region and sub-elliptical upon the flanks, and placed so as to be deeper than long. The cheeks, the upper part of the opercle, the middle of the occipital and fronto-nasal region, are covered by small scales. The upper surface of the bill is perfectly smooth.

The dorsal region is dark green; a silvery streak extends along the middle of the flanks, whilst the lower half of the sides and belly are of a dull reddish hue. The upper surface of the bill is greenish brown; the inferior surface, side of the head, and thoracic region, silvery. The fins are olivaceous; the dorsal and caudal dark, the pectorals, ventrals, and anal, light.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------------|---------------------|-----------------|--------------------------|---------------------|------------------|
| 485 | 1 | Adult.. | San Diego, Cal..... | 1853 | Lt. W. P. Trowbridge.... | Alcoholic. | A. Cassidy |

SUB-ORDER II.

ACANTHOPTERYGII.

The anterior portion of the dorsal fin is composed of spinous and inarticulated rays which, however, constitute but one continuous fin with the soft and articulated rays. A few spinous rays exist likewise at the anterior margin of the anal, and the external ray of the ventrals is a spine also. The sides of the head are, generally speaking, smooth or spineless; the edge of the opercular bones being occasionally serrated. The scales are either ctenoid or cycloid in structure.

SYN.—*Pharyngognathi acanthopterygii*, MÜLL. in *Wieg. Archiv für Naturg.* I, 1845, 136.
Acanthopterygii, LINN. *Syst. Nat. ed. VI*, 1748.—*Iconogr. Encycl.* II, 1850, 204.

Four families are on record in this sub-order, one of which, the Chromid, is without representatives in the collections upon which we are now reporting, but will be alluded to in the Report of the United States and Mexican Boundary Commission. The Pomacentrid family has yielded, so far, but one species along the Pacific coast of North America. As to the Labrids, they appear to be more numerous, although we have had the opportunity of examining the specimens of but one species. The Embiotocoids seem to compensate for the apparent scarcity of the former and to constitute a prominent feature of the ichthyic fauna of the Pacific coast of the United States.

Family POMACENTRIDÆ, Agass.

The body is rather deep than elongated, and covered with scales ctenoid in structure or else posteriorly ciliated. The lateral line is interrupted in its course. The dorsal fin is unique and constructed as in Labroids. The lips are not fleshy, and the nostrils simple. The pharyngeal teeth being card-like, the accessory gills, or pseudo-branchiæ, comb-like, and a very small split is to be observed behind the fourth branchial arch, the fourth gill having two unequal branchial combs, the hind one being atrophied and quite small. An air bladder, but no air duct. The stomach has a cul-de-sac, and the pylorus a few appendages.

SYN.—*Pomacentridæ*, AGASS. in *Nom. Zool. Pisc.* 1847, Add. 5.
Labroidei ctenoidei, MÜLL. in *Wieg. Archiv für Naturg.* I, 1843, 306; and, I, 1845, 136.

In their external form and appearance the fishes of this family recall to mind the *Squamipennes*, except the system of coloration, which is always of a more uniform cast. As an article of food they are not esteemed, although served upon the table of the seacoast population.

GLYPHISODON, Lacép.

GEN. CHAR.—Body compressed, sub-elliptical in profile, covered with large scales. Head moderate, scaly. Mouth small, provided with maxillar teeth only, disposed upon a single row, closely set together, narrow, with a sharp and often emarginated crown. Checks and opercular apparatus scaly also. Opercle and proopercle with serratures or spines. Two anal spinos. Lateral line not continued to the base of the caudal.

SYN.—*Glyphisodon*, LACEP. *Hist. nat. des Poiss.* IV, 1802.—Cuv. & Val. *Hist. nat. des Poiss.* V, 1830, 442.—STORER, *Synops.* 1846, 79.

The Atlantic coast of the United States is wanting in species of this genus, seemingly created for a warm clime, for two of them are met with in the Caribbean Sea, commonly known as the Gulf of Mexico. Along the Pacific coast they appear, likewise, to be limited to a rather southern latitude.

GLYPHISODON RUBICUNDUS, Grd.

PLATE XXIV.

SPEC. CHAR.—Body very deep and sub-elliptical in profile. Head moderate; mouth and eye small. Opercular scales very large. Spinous portion of dorsal fin very low; soft portion of dorsal and anal sub-lanceolated. Posterior margin of caudal deeply emarginated, the lobes being rounded off. Tips of ventrals reaching the vent. Lateral line ending under the soft portion of the dorsal fin. Color uniform deep crimson.

SYN.—*Glyphisodon rubicundus*, GRD. in Proc. Acad. Nat. Sc. Philad, VII. 1854, 148.

The body, which is very much compressed, has a very short and contracted appearance, and so has the head, which is of but moderate development. Its greatest depth, measured upon a vertical line intersecting the ventral fins, is a little more than the half of the length, the caudal fin excluded. The anterior dorsal region is convex and the profile of the head very declivous, with two depressions, one upon the occiput, the other upon the snout, and in all probabilities more conspicuous in grown specimens than in those of immature growth. The head itself forms about the fourth of the total length, the largest specimen before us measuring nine inches and a half from the snout to the extremity of the caudal fin. The mouth is small; the posterior extremity of the maxillary corresponding to a vertical line drawn considerably in advance of the orbit. The lips are quite fleshy and free all around upon their external margin. The eye is situated high up, is small and circular, and its diameter contained five times in the length of the side of the head. The branchial apertures are continuous under the throat, although the fissure does not extend forwards under the hyoid apparatus. The branchial rays are three on either side, all well developed.

A vertical line drawn from the origin of the dorsal fin would intersect the base of the pectorals or even pass in front of the latter. The spinous portion of that fin is quite low and its upper outline almost straight; the soft portion rises into an acute triangle, the summit of which being directed upwards and backwards. The anal has the same general shape as the soft dorsal, its summit, however, diverging a good deal less from the horizontal line of the body, thus approximating more the caudal fin. The peduncle of the tail is well defined. The caudal is very large, deeply emarginated, but the lobes are uniformly rounded and broad. The ventrals are well developed, broad, and elongated, their tips reaching the vent, which is situated a little in advance of the anterior margin of the anal. The pectorals are very broad, rounded upon their posterior margin, their extremities not extending as far posteriorly as the tips of the ventrals.

Br. III: III; D XII, 16; A II, 15; C 3, 1, 7, 6, 1, 2; V I, 5; P 19.

The scales are very large, especially upon the middle of the flanks and upon the opercle. Twenty longitudinal series of them may be counted between the dorsal region, in advance of the dorsal fin, and the abdominal line. They are deeper than long, pectinated posteriorly, and provided upon their anterior section with radiating furrows. Smaller and irregularly disposed scales may be observed along the bases of all the fins, except the ventral, between which, inferiorly, a lanceolated blade of scales projects. The frontal, post, and sub-ocular scales are

a good deal smaller than those on the cheeks; the inferior edge of the sub-orbital bone being free.

The color is uniform deep crimson red throughout. The ventrals, dorsal, and anal being margined externally with greyish black. The lips appear to have a much deeper, mayhap, purple hue, as also the cephalic depressions above alluded to.

References to the figures.—Plate XXIV, fig. 1, represents *Glyphisodon rubicundus*, size of life. We have, however, seen larger specimens. Fig. 2 is an ideal section across the line of greatest depth of body. Fig. 3, a scale from the dorsal region. Fig. 4, a scale from the lateral line. Fig. 5, a scale from the abdominal region.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------|---------------------|-----------------|--------------------------|----------------------|---------------------|
| 484 | 2 | Adult.. | Monterey, Cal..... | 1854 | Lt. W. P. Trowbridge.... | Alcoholic. | Lt. Trowbridge |
| 868 | 1 | ..... | San Diego, Cal..... | 1857 | A. Cassidy..... |do..... | A. Cassidy..... |

Family LABRIDÆ, Bonap.

The body is elongated and covered with scales, cycloid in structure, the lateral line being either continuous or interrupted behind. There is but one dorsal fin anteriorly spinous, the spines of which being mostly provided with a membranous flap at the posterior edge of their upper extremity. Fleshy lips surround the jaws. The pharyngeal bones are provided with blunt pavement-like teeth or transverse plates, and the union of the inferior pair takes place without leaving any trace of its suture. The fourth-gill has but one branchial comb, and the last branchial split behind it is wanting. The accessory gills or pseudo-branchiæ are present. The stomach has no cul-de-sac; the pyloric appendages are wanting; the air bladder is simple.

SYN.—*Labridæ*, BONAP. Sagg. Distr. Anim. Vert. 1831, 111.—DEKAY, New Y. Fauna, IV, 1842, 172.—STORER, Synops. 1846, 133.

Labroideæ, RICHARDS. Faun. Bor. Amer. III, 1836, 106.

Labroidei cycloidei, MÜLL. in Wieg. Archiv für Naturg. I, 1843, 305; & 1, 1845, 136.

A species of this family was made known under the name of

Labrus pulcher, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1854, 1,

but since no specimens were procured we can offer no description of the same.

JULIS, Cuv.

GEN CHAR.—Body elongated and compressed. Head moderate, elongated, and sub-conical, scaleless. Mouth small; teeth conical, largest in front. Branchial apertures separated under the throat by an isthmus. Spinous portion of dorsal fin generally lower than the soft portion. Caudal fin in most instances rounded posteriorly. Scales large; lateral line nearer the dorsal than the abdominal outlines, falling posteriorly so as to reach the middle of the peduncle of the tail.

SYN.—*Julis*, Cuv. Règn. anim. II, 1817, 261; 2d ed. II, 1829; & ed. illustr. Poiss. 196.—Cuv. & Val. Hist. nat. Poiss. XIII, 1839, 358.—STORER, Synops. 1846, 138.—DUM. Ichthyol. analyt. 1856, 305.

The Atlantic species of this genus were never met with along the eastern shore of North America, but they seem quite abundant in the warmer waters of the Caribbean sea.

JULIS MODESTUS, Grd.

SPEC. CHAR.—Body slender, elongated, and much compressed. Head sub-conical. Eye large and sub-circular. Angle of the mouth not reaching the anterior rim of the orbit. Isthmus very narrow. . Origin of dorsal fin situated opposite the base of the pectorals. Insertion of ventrals placed under the postere-inferior edge of the base of the pectorals. Caudal posteriorly sub-truncated. Rufous brown above, yellowish upon the sides, and dull white or yellow beneath. Anterior seven dorsal spiny rays provided with a basal black spot. A black blotch at the base of the caudal fin.

SYN.—*Julis modestus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 151.

The body is elongated, slender, very much compressed, sub-fusiform in its profile, and tapering away from the origin of the anal fin. The largest specimen which we have examined measured seven inches in total length, and in which the greatest depth, taken upon the middle of the abdomen, enters between five and six times. The head is sub-conical, constituting nearly the fifth of the entire length of the fish. The eye is rather well developed, circular in shape, its diameter entering about four times and a half in the length of the side of the head. The mouth is moderate sized, its cleft nearly horizontal, the jaws being equal, and the posterior extremity of the maxillary extending to a vertical line drawn about midway between the extremity of the snout and the centre of the pupil. The teeth are sub-conical, slender, and tapering, the anterior ones considerably more developed than the rest, and behind which a second row may be observed, short and tuberculiform. The edge of the opercular bones is thin and entire, the preopercle exhibiting a membranous expansion extending superiorly beyond the insertion of the pectorals, whilst the sub and inter-opercle cover entirely the branchiostegals, of which there are four on either side. The branchial apertures themselves are wide and sub-continuous under the throat. A perpendicular line dropped from the origin of the dorsal fin would intersect the base of the pectorals. The rays of the dorsal fin itself are slender, especially the spinous ones, which increase gradually in height, whilst the others are almost equal, with a tendency in the posterior ones of being more elevated. The origin of the anal is situated opposite the eleventh or twelfth dorsal ray, and extends a little further back, although the tip of its posterior rays do not reach the base of the caudal fin. Its depth is nearly equal to the height of the soft portion of the dorsal. The caudal, which is posteriorly sub-truncated, enters about six times and a half in the total length. The insertion of the ventral fins corresponds to a vertical line drawn immediately behind the base of the pectorals; they are rather small and slender, and composed exclusively of soft and articulated rays. The pectorals are much larger than the ventrals, extending considerably more backwards than the latter, neither of which reaching the vent, placed at the anterior margin of the anal fin.

Br. IV: IV; D IX, 13; A 15; C 3, 1, 6, 6, 1, 3; V 6; P 12.

The scales are very large, longer than deep, with radiating grooves upon their anterior and posterior sections, which are more developed than the lateral sections. The lateral line follows the third rows of scales from the supra-scapular region to near the terminus of the dorsal fin, where it falls to the middle of the peduncle of the tail, which it follows to the caudal fin.

The color is dark rufous brown above, of a lighter hue upon the sides, and dull whitish yellow beneath. A black spot may be observed at the base of the seven anterior dorsal spiny rays, and a similar blotch at the base of the caudal fin. The pectorals, ventrals, and anal fin are yellowish olive, the dorsal and caudal being olivaceous.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------|----------------------------|-----------------|--------------------------|----------------------|---------------------|
| 705 | 2 | Adult.. | San Diego, Cal | 1853 | Lt. W. P. Trowbridge.... | Alcoholic. | A. Cassidy..... |
| 706 | 2 | ..... | Monterey, Cal..... | 1853 |do..... |do..... | Lt. Trowbridge..... |
| 707 | 1 | ..... | Island of San Miguel, Cal. | 1855 |do..... |do..... |do..... |

Family EMBIOTOCOIDAE or HOLCONOTI, Agass.

The ichthyic group, of which we propose now to treat, is one that has created the most vivid interest, not only amongst ichthyologists, but likewise among naturalists at large, when the singularity of their habits was announced to the world.

In their general form and external appearance these fishes have nothing peculiarly striking. Their aspects remind us of fishes familiar to all, such as the sunfish, pond-perch, or bream (*Pomotis*), of our fresh water streams, ponds, and lakes; and the sheepshead and porgee (*Sargus*), of marine habits.

Their body is much compressed, oval, or elliptical, covered with scales of moderate size, cycloid in structure, and thus widely distinct from those of both percoids and sparoids, to which *Pomotis* and *Sargus* belong. The cheeks and opercular apparatus are covered with conspicuously developed scales. The opercular apparatus, itself, wants either spines or serratures. The branchiostegal rays are five or six in number, generally concealed under the lower edge of the opercular apparatus. The branchial aperture of either side meets its fellow under the throat, leaving no room for an isthmus. The mouth, variable in size according to the genera, is surrounded by well developed lips, either fleshy or thin, a character which they bear in common with the labroids (*Tautog*, *Chogset*, or *Conner*, of our eastern coast), to which family these fishes are intimately related. The lip surrounding the lower jaw is either free all round or else united by a frenum to the symphysis of its jaw. The upper jaw is exclusively formed by the intermaxillaries, which, together with the maxillaries, situated immediately behind, possess a greater or lesser degree of protractility according to the genera. Teeth exist upon the intermaxillaries, the dentaries, and pharyngeals; the maxillaries, the vomer, and the palatines, are toothless. On the pharyngeals the teeth are pavement-like; on the jaws they are conical or sub-conical, slightly curved inwardly, and disposed, either upon a single or upon a double row, on both jaws. Again we may observe a double row on the upper jaw and a single row on the lower one. The scales, we have already stated, are cycloid in structure, sometimes deeper than long; at others, longer than deep, provided with radiating furrows upon their anterior section only. As to the fins, there is a long and unique dorsal, anteriorly spinous, sheathed at its base by one or more rows of scales, separated from those of the body by a linear furrow, not extending, however, along the whole base of that fin. The spinous portion alone is capable of being folded backwards, and partly to disappear between the sheath, no doubt a provision of nature to assist the process of parturition. The anal varies in length and depth according to the genera and species, but is always provided anteriorly with a few short spinous rays. Its anterior soft rays

are generally thinner, more closely set together, and less divided than the posterior ones. A membranous, sub-tubercular growth upon the base of the anterior soft rays of the latter fin will distinguish males from females. The caudal fin is generally more or less forked. The ventrals are sub-thoracic, and provided exteriorly with a strong spinous ray. In most genera a naked area may be detected along the middle of the belly between the ventral fins and the anal, and partly overrun anteriorly by a lanceolated scaly blade inserted between and near the base of the ventrals.

But the most remarkable trait in the organization of the fishes of this family consist in the mode of reproduction. The eggs, instead of being laid, as is the case in most fishes, are retained within the body of the female, where they undergo, not only their embryonic growth, but likewise a growth which might be termed larval, it being subsequent to their escaping from the egg envelope, until they have attained a size sometimes of several inches in total length. Nevertheless, this peculiarity of habits is not altogether without analogy in the class of fish. Moreover, it bears no resemblance whatever to the marsupialian gestation: in the first place the eggs develop in the ovary, not in a uterus, and there is no placental connexion of any sort; secondly, the young are not at liberty to quit and enter the ovarian cavities alternately and at pleasure.

The observations which we have made upon the genital apparatus of the female have satisfied us that there exists an ovarian sheath or sack, which, during the early period of pregnancy, is an elongated and sub-cylindrical tube, containing the ovaries proper, two in number, each of which consisting of two, three, or more vascular membranes, attached by their upper edge to the upper floor or roof of the sheath, forming either one or two pouches (according to the number of these membranes) of the same length as the sheath itself, widely open beneath, though not in direct communication with one another, since the membranes hang loosely down, reaching the lower floor of the sheath.

The eggs are formed within the texture of the ovarian membranes themselves. We have examined the ovaries of *Ennichthys heermanni* and *Embiotoca argyrosoma* when the sheath within which they were contained was not larger than an ordinary quill. Numerous eggs could be observed in a very immature state, appearing to the unarm'd eye like minute dots. Under the microscope (Plate XXVI, fig. 9), they exhibited evident traces of the germinal vesicle surrounded as yet with a very scanty supply of vitelline substance.

The sheath and the ovaries are gradually increasing in bulk, as the eggs themselves first increase in size and the embryos afterwards. The sheath is chiefly a muscular membrane, whilst the ovaries, we have stated, are altogether vascular.

When mature, the eggs either fall into the space between the membranes or ovarian pouches, or else remain attached to the ovaries until the embryos issue out of them. We are inclined to think that they drop into the pouches as eggs. At any rate we found very young embryos loosely contained in the ovarian pouches when no trace of the egg membrane could be seen within the tissues of the ovaries in the shape of a *corpus luteum* or a graffian vesicle. Whatever be the case, numerous eggs or embryos may be observed within one pouch. The young thus remain together until grown to a considerable size, when, filling up the space in a more compact manner, the ovarian membranes, in their nature very expansive, will extend a fold between each embryo. In this manner every individual young, when removed sideways from the ovary, appears to the operator as though enclosed in a separate cavity, pouch, or

follicle of the ovary, whilst in reality the membranes may be stretched out or extended, and the entire progeny loosened from all adherence or connexion with them.

The male organs of generation consist of two spermaries, a right and a left, perfectly independent from one another, having each its separate duct, discharging their contents into an elongated cloaca, into which the bladder likewise empties its contents. This cloaca communicates with the exterior by a sub-circular opening, the edge of which being rather protruding. Such is that apparatus: the same in its general structure as in the other osseous fishes. There is no sheath enclosing the two spermaries, and this fact throws a considerable light upon the morphology of the ovaries; the latter being, in fact, two in number, but so closely connected together as to simulate a single organ. Thus the general disposition, not the plan of structure, of these organs, is adapted to the mode of reproduction; a single sheath being a more simple adaptation than two, one for each ovary.

How the mechanical act of fecundation takes place we are not prepared to say from direct observations: the eggs themselves must be fecundated within the ovarian sheath; a copulation of some sort is, therefore, required, and it is not improbable that at this period the eggs have dropped from the ovarian membranes into the pouches or spaces between these membranes, in which they are freely floating.

There are a few points in the history of the development of the young which may be deduced from partial observations represented on Plate XXVI.

The hatching of the embryos takes place at an early period. After leaving the egg shell they have an abdominal bag containing the remaining yelk which is to be gradually absorbed during a period when neither the mouth nor the esophagus are formed. The fins are as yet undeveloped (figs. 1 and 2). The eyes begin with a deposition of an external layer of black pigmentum, in every respect similar to the same organs in invertebrata (figs. 1, 3, and 5). The head is anteriorly rounded, and the cleft of the mouth not yet apparent at the period when the fins begin to develop (fig. 1). The caudal has the start over all the other fins; its posterior margin is first lanceolated, then rounded, with a convexity gradually diminishing until it is perfectly straight, when a gradual emargination commences, and from a slight crescent reaches the forked shape which it has in the adult. The soft and articulated portion of the dorsal and anal fins next assume a development reaching extraordinary proportions, which they again gradually lose so soon as free from parental sheltering. The posterior portion of these fins is especially to be noticed as longer or deeper than the anterior portion (the reverse of what we observe in the adult), and extending generally beyond the base of the caudal fin, a character, therefore, not exclusively proper to the genus *Rhacochelius*. The spinous portion of these same fins, on the other hand, develop but slowly and gradually, reaching their full growth at a late period. The ventrals and pectorals are likewise tardy in their appearance. The scales are fully developed before the young leave the ovarian sheath.

The first notice that was made public in relation to these fishes appeared in November, 1853,¹ with additional remarks in May, 1854.² New species of that family were likewise subsequently described.³ But the real knowledge of the remarkable peculiarities concerning some of their habits was obtained in the spring of 1852 by Dr. Thomas H. Webb, while attached to the

¹ Amer. Journ. of Sc. & Arts, second series, vol. xvi, p. 380.

² Ibid., vol. xvii, p. 365.

³ Proc. Acad. Nat. Sc. Philad. VII, 1854, pp. 105, 122, 134, and 151.

United States and Mexican Boundary Commission, assisted by Captain Ottinger, of the United States revenue cutter, at that period in the bay of San Diego, California. The following abstract is taken from the MSS. of Dr. Webb's journal :

“On the 3d of May, during a boisterous and cold weather, Captain Ottinger caused his seine to be drawn across the harbor. Caught many tiger and shovel-nose sharks, two flounders, two specimens of a fish somewhat like our sculpin ; also, *a number of small fish, about three or four inches long, each of which contained ten or twelve living young.*”

“Upon gently pressing one of these fishes between the palms of the hands the young would glide, or as it were leap forth, to a considerable distance, and if received in a vessel of water would swim and dart about in full enjoyment of their piscine revels. Some of these viviparous progeny I exhibited to the commissioner and several gentlemen then tarrying at San Diego, and I kept quite a number of them alive in my room many days. In the mother they were not, so to speak, indiscriminately huddled together, but methodically arranged, and placed in such juxtaposition as to form a compact series without the loss of any interstitial space ; in other words, so disposed, not in right lines, but in a curvilinear position, and with the head of one to the tail of the adjoining one (and so on in alternate succession) as best to accommodate the whole family. Indeed the same beautiful systematic order, the same adaptness of means to ends were observed here that so eminently characterize all of nature's works.”

“Upon leaving San Diego I took extra pains to preserve specimens of this fish, but these special efforts proved in the main unavailing. I wrapped them separately in cloth, sewed the wrappers, and immersed the whole in whiskey. Our route home was a long and circuitous one, and, much to my disappointment, on examining the contents of the bottles after my arrival in this city (Boston), I found they were mostly destroyed, with the exception of some of the young.”

We have deemed it interesting to relate the above observations, as they may serve to corroborate those made subsequently by Mr. A. C. Jackson. The species observed by Dr. Webb we refer to *Holconotus rhodoterus*, the young of which we had an opportunity ourselves to examine in a pregnant specimen from Presidio, California. The young were found in the very position as described by Dr. Webb.

Much prior to 1842 specimens of this family of fishes were collected by the naturalists of the United States Exploring Expedition, but at a period, it seems, when the young were not to be observed, and, since the species themselves have not yet been investigated, the discovery of the curious fact of their viviparity has thus been postponed for two entire lustrums.

It would have given us a great deal of pleasure and personal satisfaction had we been able to identify all the species which have been described by Prof. Agassiz and Dr. W. P. Gibbons. The brevity of their descriptions, without authentic specimens at our command, has made our task one of ungratefulness and of difficulties. Placed between two evils we have chosen that which we considered least prejudicial to the progress of ichthyology. The species previously identified we now present with a great deal of caution until safely compared with their prototypical specimens. It must, nevertheless, be gratifying to ichthyologists to find, accompanying our descriptions, figures sufficiently accurate to remove any possible doubt as regards the species which we have in view. A safe opportunity is henceforth afforded to clear up their synonymy,

which, in the present state of things, we could but render more confused in attempting their ulterior identification.

EMBIOTOCA, Agass.

GEN. CHAR.—Head of moderate development; mouth small; upper jaw slightly the longest. Lips thick and fleshy, lower one attached by a frenum to the symphysis of the dentary (chin). Pre-maxillaries protractile. Teeth on both jaws, short, conical, blunt, slightly recurved and disposed upon one single row. Pharyngeal teeth pavement-like. Spinous portion of dorsal fin generally lower than the soft; the greatest difference in height between the two being observed upon their contiguity. Five or six branchiostegal rays. Scales of medium development; lateral line well marked, continuous from head to base of caudal and concurrent with the dorsal outline. No scales upon the fins.

SYN.—*Embiotoca*, AGASS. in Amer. Jour. of Sc. 2d series, XVI, 1853, 336; and, XVII, 1854, 366.—GAD. in Proc. Acad. Nat. Sc. Philad. VII, 1855, 320.

There is another feature which exists more or less developed in the different species of this genus; we refer to an area of enlarged scales upon the post pectoro-ventral region. This character is particularly evident in *E. jacksoni*, *E. cassidii*, and *E. webbi*.

It is also proper to state that in two instances (*E. ornata* and *E. cassidii*) the young, towards the period of their escape, have exhibited a structure of the fins which reminds us forcibly of what has been said to be the case in *Rhacochilus toxotes*; the posterior extremity of both dorsal and anal fins extending beyond the base of the caudal; the latter being long and truncated.

1. EMBIOTOCA JACKSONI, Agass.

PLATES XXVII & XXVIII, and PLATE XXVI, FIGS. 3 & 4.

SPEC. CHAR.—General form sub-elliptical. Anal broadly rounded upon its external margin; origin of that fin opposite the sixth or seventh articulated ray of the dorsal. Tips of pectorals reaching a vertical line intersecting the base of the third articulated ray of dorsal. Eyes rather of small than of medium development. Posterior extremity of maxillary reaching a vertical line passing in advance of anterior rim of orbit. Frontal region slightly depressed above the eyes. Branchiostegals five in number. About sixty scales in lateral line. Female, uniform dark purplish brown; male, olive brown with diffused darker blotches.

SYN.—*Embiotoca jacksoni*, AGASS. in Amer. Jour. of Sc. second series, XVI, 1853, 387; and, XVII, 1854, 366.—GAD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 151; and, VII, 1855, 320.

As far as our own observations go, both males and females of this species reach about the same size. From among a dozen specimens, two of them appear full grown. They are nearly eleven inches in total length, and four in greatest depth. They are those which we have caused to be represented on the accompanying plates; one being a female, the other a male.

The head constitutes the fourth of the distance between the end of the snout and the tips of the central rays of the caudal. Its upper surface is gently sloping from the occiput forwards, with a slight depression above the eyes. The snout is sub-conical and rounded. The eyes, sub-circular in shape, are under the medium size; their horizontal diameter being comprised a little more than four times in the length of the side of the head, measured as usually from the extremity of the snout to the extreme posterior margin of the opercle. The mouth is small, its gape slightly oblique upwards, and the posterior extremity of the intermaxillary extending to a vertical line intersecting the anterior rim of the orbit. There are from twelve to fourteen teeth on the upper jaw, and from ten to twelve on the lower. They occupy the anterior portion of the mouth. Four concentric rows of scales may be observed on the cheeks; the row nearest to

the orbit is the most extensive and contains the largest scales of that region. The preopercle is provided with an expanded membranous limb. The opercle, sub and interopercle, are covered with conspicuous scales considerably smaller, however, on the interopercle than on the two other pieces, the line of union of which is not discernible exteriorly. The branchiostegal rays are entirely concealed under the interopercle.

The relations which exist between the length and the depth of the body may be deduced from an inspection of the figures. The section across the line of greatest depth (fig. 2) will also serve to give a better idea of the thickness than any description could convey.

A line dropped vertically from the origin of the dorsal fin would intersect the middle of the base of the pectorals. The base of the spinous portion is about one-third shorter than that of the soft. The membrane uniting the spines is emarginated to nearly the half of the height of these rays, the tips of which exhibit a membranous flap, being a continuation of that membrane along their posterior edge. The articulated rays are bifurcated three times; the first bifurcation subdivides each ray for nearly the two-thirds of their length, whilst the third affects but a few of the central ones. The extremities of the posterior rays extend about to the middle of the length of the peduncle of the tail. The caudal fin is comprised a little over five times in the total length of the fish. Its rays subdivide five times, beginning from near their base and gradually superadding one another, when the fifth subdivision is observed towards their extremities and still quite conspicuous. The anterior spiny rays of the anal fin are but little conspicuous, partly concealed by a membranous envelop, obliquely inserted, and capable of folding backwards close to the anterior soft ray. The figures will give a correct idea of their proportional length. The soft portion of that fin is exteriorly sub-convex or sub-rounded, composed of two sorts of rays: upon the anterior third of thin, slender, and undivided ones, whilst in the remaining portion of that fin the rays are twice sub-divided, the first subdivision being noticeable from the first third of their length. The extremities of the posterior rays extend further backwards than those of the dorsal fin; but the base itself extends further back, and a line dropped vertically from the insertion of the last ray of the dorsal would intersect the anal so as to leave ten or twelve rays posteriorly. The insertion of the ventrals is opposite the fifth dorsal spiny ray. The extero-anterior margin of these fins is provided with a stout spine about half the length of the adjoining articulated ray. The articulated rays themselves are subdivided three times, the first subdivision appearing at a short distance from their base. The base of the pectorals has the shape of an arch obliquely situated upon the thoracic region. These fins are broad and well developed; the extremities of their longest rays extending beyond the tip of the spiny ray of the ventrals and corresponding to a vertical line intersecting the fourth articulated ray of the dorsal. The rays subdivide three times upon their extend. The formula of the fins is as follows:

MALE: D IX, 22; A III, 10 + 17 = 27; C 4, 1, 6, 6, 1, 3; V I, 5; P 20.

FEMALE: D X, 21; A III, 10 + 16 = 26; C 4, 1, 6, 6, 1, 3; V I, 5; P 20.

The scales being of medium size, we notice about seven rows of them between the lateral line and the base of the dorsal fin, in advance of the dorsal furrow, and about nineteen between the same spot and the base of the ventral fins. Fifty-nine to sixty scales may be observed in the lateral line itself. The dorsal furrow originates under the first articulated ray, extending to the fifteenth, where it disappears. The sheath above it is composed anteriorly of three series of

scales of unequal size, tapering posteriorly to but one series. On the middle of the abdomen they are sensibly larger than elsewhere, and upon the post pectoro-ventral region they are altogether out of proportion with the rest. Opposite the base of the anal fin they are smaller and irregular; they likewise diminish in size towards the belly and chest. As to their structure, the figures given will speak for themselves: a little longer than high, with the posterior margin regularly convex, the anterior margin truncated, and the superior and inferior edges sub-linear or slightly curved.

The ground color appears to have been dark purplish brown, deeper in the female than in the male, in which it has a tendency to a more olive hue, with diffused darker spots or blotches. The spinous portion of the dorsal fin, the extremity of the caudal, and the pectorals, are rather yellowish, whilst the soft portion of the dorsal, the base of caudal, the anal, and the ventrals, are uniformly deep purplish in the female, lighter in the male, in which a yellowish elongated spot is observed at the base of the posterior extremity of the dorsal. The head presents the same tint as the body.

While in the immature state of growth some individuals of this species exhibit, sometimes, transverse greyish bands across the body, less distinct, however, on the belly than on the back. A light vitta may likewise be seen extending along the base of the anal fin for nearly its whole length, and disappearing almost entirely in large specimens.

The female genital apparatus of the specimen figured was found to consist of an elongated, tubular, membranous sheath, extending from the thoracic belt to the vulva. To the upper roof of the sheath are firmly attached some highly vascular membranes hanging downwards, and dividing the whole tube into elongated pouches or compartments. Five of these vascular membranes were found to be present, and by an attentive examination it was soon discovered that they were in fact the true ovaries, two in number, as required by the law of symmetry: the right ovary being composed of three membranes, and the left of two only. Consequently the right ovary had two pouches or partitions, and the left only one. Upwards of sixty young were found in these organs; about an equal number in each ovary; a few more, however, in the right-sided one.

The young (Plate XXVI, figs. 3 and 4), from six to seven-tenths of an inch in total length, could be seen pellmell in each pouch. The yolk bag was still to be observed in the shape of a hernia under the abdomen; the pectoral and ventral fins showing no signs of their presence. The spinous portion of the dorsal existing in a rudimentary state only, there being a few spines close to the anterior margin of the articulated portion of the same fin, which is greatly developed, as well as the caudal and anal, the anterior spines of which are not yet to be seen. The central rays of the caudal are much longer than the lateral ones, giving to that fin almost a spear-shaped appearance. The peduncle of the tail is very well developed; the posterior rays of either the dorsal and the anal do not extend to the base of the caudal, though proportionally more developed than in the adult. The head is rounded, and the cleft of the mouth but slightly indicated. The eye consists of an external layer of black pigmentum.

This species inhabits the Bay of San Francisco, where it appears to be common.

Plates XXVII and XXVIII represent *Embiotoca jacksoni*.

Plate XXVII, fig. 1, is the male sex somewhat reduced in size.

Fig. 2, a section of the same, across the line of greatest depth of the body.

Fig. 3, a scale from the dorsal region.

Fig. 4, a scale from the lateral line.

Fig. 5, a scale from the abdominal region.

Plate XXVIII, fig. 1, is the female sex, likewise reduced.

Fig. 2, a section across the line of greatest depth.

Figs. 3, 4, and 5, scales from the back, lateral line, and abdomen, magnified as usual.

Plate XXVI, fig. 3, represents the young, size of life, as taken in the ovary of the female above represented.

Fig. 4, is the same embryo enlarged three times, in order to render its features more conspicuous and tangible.

List of specimens.

| Catal. No. | No. of specs. | Sex and age. | Locality. | When collected. | Whence obtained. | Origin'l No. | Nature of specimens. | Collected by— |
|------------|---------------|--------------|-------------------------|-----------------|---------------------------|-------------------|----------------------|------------------|
| 530 | 2 | Adult.. | San Francisco, Cal..... | 1853 | Lt. R. S. Williamson..... | ..... | Alcoholic. | Dr. Heermann .. |
| 531 | 2 | ..... | .....do..... | 1853 |do..... | ..... | .....do..... |do..... |
| 532 | 2 | ..... | Tomaes Bay, Cal..... | 1855 | Mr. E. Samuels..... | 339 and 342 |do..... | Mr. Samuels..... |

2. EMBIOTOCA CASSIDII, Grd.

PLATE XXIX and PLATE XXVI, Fig. 12.

SPEC. CHAR.—General form sub-ellipsoid. Frontal region very slightly depressed above the eyes. Anal undulated upon its external margin; its origin being opposite the third articulated ray of the dorsal. Tip of pectorals reaching a vertical line that would intersect the base of last spiny ray of dorsal. Eyes above the medium size. Posterior extremity of maxillary not reaching the vertical of the anterior rim of orbit. Branchiostegals six in number. Fifty-seven scales in the lateral line. Purplish brown, with about twelve transverse bands of a deeper tint.

SYN.—*Embiotoca cassidyi*, GRD. in Proc. Acad. Nat. Se. Philad. VII, 1854, 151; and, VII, 1855, 320.

Adult specimens of this species having come under our examination since its first publication, any doubts which might have been entertained in regard to its characters are thus entirely removed. It is always a more or less critical responsibility to establish species upon immature specimens, and we are glad of the opportunity thus afforded us to draw up a more complete description than the one previously published.

The general appearance of this species is more contracted, more elliptical than in *E. jacksoni*, yet the proportions between the head and the body are nearly the same. The profile, however, is sloping more rapidly forwards. The posterior margin of the opercular apparatus forms a more convex or else a more complete curve, which, when added to an eye proportionally larger, gives to it a physiognomy altogether peculiar. The horizontal diameter of the eye is comprised nearly four times in the length of the side of the head, and exactly once anteriorly to the orbit. The posterior extremity of the maxillary does not extend quite to the vertical of the anterior rim of the orbit. There are six branchiostegal rays on either side, of a moderate development.

The origin of the dorsal fin is nearly opposite to the anterior extremity of the base of the

pectorals. The base of the spinous portion is but a little shorter than that of the soft. The membrane uniting the spines is less emarginated than in *E. jacksoni*. The articulated rays are bifurcated but twice; the extremities of the posterior rays extending a quarter of an inch more backwards than the base of the anal. The rays of the caudal bifurcate four times; the length of the fin itself constituting the sixth of the total length. The anal fin, the articulated rays of which exhibit signs of a third bifurcation, is elongated, undulating upon its external margin; its anterior spine is situated opposite the third articulated ray of the dorsal. A line dropped vertically from the posterior extremity of the base of dorsal will intersect the base of the twenty-third articulated ray of the anal. The insertion of the ventrals does not vary materially from that in *E. jacksoni* when compared to the dorsal spines. The extero-anterior spiny ray, however, is proportionally longer. The articulated rays subdivide thrice. The base of the pectorals is greater than in the latter species; their tip extends backwards to a vertical line drawn at the anterior articulated ray of the dorsal; the rays subdivide twice.

The formula of the fins is as follow:

Male: Br. VI: VI; D X, 20; A III, 10 + 16 = 26; C 3, 1, 6, 6, 1, 2; V I, 5; P 20.

The general aspect of the scales, as well as the number of longitudinal rows, is nearly the same as in *E. jacksoni*, being, however, smaller on the sub-thoracic region. The dorsal furrow originates likewise under the first articulated ray of the dorsal fin, extending to the sixteenth. The sheath above it is composed anteriorly of two rows of scales, and posteriorly of one row only. The anterior radiating furrows of the scales themselves are more numerous than in *E. jacksoni* and *E. webbi*.

The ground color of the head and body is purplish brown; the latter exhibiting about a dozen vertical bands of a deeper hue, extending almost to the inferior outline of the abdomen. The pectoral fins are olivaceous; the other fins being of a deep purple. A light olivaceous streak may be observed along the base of the soft dorsal.

In specimens which have not completed their growth, the ground color is of a light olivaceous tint; the transverse bands being dusky.

The species appears to be quite common in the bay of San Diego, California, where the specimen figured has been obtained.

Six specimens, of an average size of two inches and a half, were received from the same locality. These we consider as being the young, and accordingly have caused the outline of one of them to be represented on Plate XXVI, fig. 12. It is upon this specimen that the species was first established. It bears a very great resemblance to the young of *Embiotoca ornata*, figured on the same plate (fig. 11). We observe the same shape of the caudal fin, the same prolongation of the posterior articulated rays of both the dorsal and the anal fins. The most prominent difference will be found in the length of the anal. The ground color is greenish yellow with transverse greyish bands. The fins are all light yellow or straw color; in one specimen we noticed the tip of ventrals and anterior portion of anal assuming a darker hue.

It is worthy of remark, that while these young were caught in open waters, they are smaller than those of *Embiotoca ornata*, taken within the body of the mother. This must be explained by the fact that the parent from which they issued differed very materially in bulk.

Plate XXIX, fig. 1, represents a male individual of *Embiotoca cassidii*, size of life.

Fig. 2 is a section across the line of greatest depth of the body.

Fig. 3, a scale from the dorsal region.

Fig. 4, a scale from the lateral line.

Fig. 5, a scale from the abdominal region.

Figs. 3, 4, and 5 are magnified.

Plate XXVI, fig. 12, represents the young, taken in the open water of the Bay of San Diego, California.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------|-----------------|-----------------|----------------------|----------------------|---------------|
| 544 | 5 | Adult | San Diego, Cal. | 1853 | Lt. W. P. Trowbridge | Alcoholic | A. Cassidy |
| 600 | 1 | Young | do | 1853 | do | do | do |

3. EMBIOTOCA WEBBI, Grd.

PLATE XXX.

SPEC. CHAR.—General form ellipsoid. Frontal region sub-concave; occiput prominent. Anal undulated upon its external margin, its origin being opposite the fifth articulated ray of the dorsal. Tip of pectorals reaching the vertical of the third articulated ray of dorsal fin. Eyes above the medium size. Posterior extremity of maxillary extending to a vertical line drawn at the anterior rim of orbit. Branchiostegals, five on right side, six on the left. Fifty-four scales in the lateral line. Olive brown, with indistinct purplish blotches.

SYN.—*Embiotoca webbi*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1855, 320.

This species is closely allied to the preceding, the differences consisting in the shape of the head, the cleft of the mouth, the proportional height of the dorsal fin, the insertion of ventrals and anal, the extension of pectorals, and shape and structure of the scales.

The snout is obtuse; the posterior extremity of the maxillaries corresponds to a vertical line intersecting the anterior rim of the orbit. The eye is large and circular, a little smaller than in *E. cassidii*, being intermediate in size between the latter and *E. jacksoni*. The posterior convexity of the opercle is less prominent than in *E. cassidii*, being also provided with one more row of scales upon its surface. The rows of scales upon the cheeks do not vary in either of the species so far described.

The origin of the dorsal fin is exactly opposite the anterior extremity of the base of the pectorals. The spinous portion constitutes three-sevenths of the length of the base of the whole fin. The membrane uniting the spines is more emarginated than in *E. cassidii*, and the soft portion is anteriorly more elevated than in the latter. The articulated rays of the fin bifurcate but twice. The caudal holds the same relations towards the total length as in *E. cassidii*, but its rays bifurcate only three times. The anal has the same structure: three spines, ten undivided, and fifteen divided rays, the divisions observed being of the first, second, and third degree. The anterior spine is situated opposite the fifth articulated ray of the dorsal fin. The insertion of the ventrals is under the fourth dorsal spine. The articulated rays of these fins sub-divide three times. The tips of the pectorals extend backwards as far as the third articulated ray of the dorsal; their rays are thrice bifurcated.

Formula of the fins:

Male: Br. VI: V; D IX, 21; A III, 10 + 15 = 25; C 3, 1, 6, 6, 1, 2; V I, 5; P 20.

The scales are a little higher than long, in that respect differing from those both of *E. jacksoni* and *E. cassidii*, and, moreover, to be distinguished from the latter by a smaller number of radiating furrows upon their anterior section. The dorsal furrow commences under the second ray of the soft dorsal, terminating under the sixteenth; the sheath above it is composed of two rows of scales anteriorly, and of one posteriorly.

The ground color is dusky brown above, yellowish brown beneath, with cloudy patches of reddish brown. The pectorals are yellowish, the dorsal, caudal, anal, and ventrals purplish and yellowish; a yellow streak is observed along the base of the soft portion of the dorsal.

This species inhabits the bay of San Diego, together with the preceding species.

Plate XXX, fig. 1, represents a male specimen of *Embiotoca webbi*, size of life.

Fig. 2 is a section across the line of greatest depth.

Fig. 3, a scale from the dorsal region.

Fig. 4, a scale from the lateral line.

Fig. 5, a scale from the abdominal region.

Figs. 3, 4, and 5 are magnified.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------|---------------------|-----------------|-------------------|----------------------|-----------------|
| 545 | 2 | Adult.. | San Diego, Cal ---- | 1853 | Lieut. Trowbridge | Alcoholic..... | A. Cassidy..... |

4. EMBIOTOCA LINEATA, Grd.

PLATE XXXI and PLATE XXVI, Figs. 5 & 6.

SPEC. CHAR.—Body sub-elliptically elongated. Anal fin elongated, with external margin nearly straight, diminishing gradually in depth posteriorly, its origin being opposite to the sixth articulated ray of the dorsal. Tip of pectorals reaching a vertical line intersecting the base of last but one dorsal spine. Eyes of medium size. Posterior extremity of maxillary even with the vertical of anterior rim of orbit. Frontal region slightly depressed above the eyes. Branchiostegals five in number. Sixty-two scales in lateral line. Ground color of upper region dark olive or reddish brown; roddish yellow beneath. Sides of abdomen with light longitudinal stripes intersecting the point of union of the rows of scales. Anal deep purple, with a yellowish vitta at its base.

SYN.—*Embiotoca lineata*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 134, and, 151; also, VII, 1855, 320.

The head constitutes the fourth of the length, excluding the forked portion of the caudal fin. The snout is sub-conically rounded, the angle of the mouth, or rather the posterior extremity of the maxillary extending to a vertical line drawn immediately in advance of the orbit. The eye being of medium size, its diameter enters four times in the length of the side of the head. The nostrils are placed nearer to the eye than to the end of the snout. The scales on the cheeks constitute three distinct sub-concentric rows, the innermost being the largest; two scales indicate a fourth row upon the concavity of the preopercle. The opercle is higher than broad, and covered with about six obliquely vertical rows of scales extending downwards upon the sub-opercle, which is closely united to the former. Upon the interopercle the scales are much

smaller and irregularly disposed in series. The branchiostegal rays, five on either side, are entirely concealed under the opercular apparatus. The upper surface of the head is perfectly smooth; four scales constitute an insulated group upon the supratympanic region.

The body is very much compressed, the greatest thickness being about one-third of the greatest depth, which is contained twice and two-thirds of a time in the total length. The dorsal and ventral outlines are regularly arched, giving to the body a sub-elliptical profile. The profile above the eye is slightly depressed. The peduncle of the tail is of medium development; its least depth is less than a third of the depth of the body.

A line drawn vertically downwards from the origin of the dorsal fin would pass behind the posterior end of the insertion of the pectorals. The base of the spinous portion of that fin, along which may be counted ten spines, is but a little shorter than the remaining portion, composed of twenty-four or five rays, bifurcating once from below their middle, there being but very few in the centre which exhibit a tendency towards a bifurcation of the second degree. The anterior articulated rays are about twice the height of the posterior ones; they gradually diminish backwards, giving a nearly straight outline to the upper edge of the fin. The caudal is forked; its length enters about six times in the total length; its rays show traces of a bifurcation of the fifth degree. The anal is nearly straight upon its external margin; its anterior spines are slender, followed by ten undivided and twenty bifurcated rays, their bifurcation being altogether similar to the rays of the dorsal fin. The anterior articulated rays are likewise twice as high as the posterior, which approximate nearer to the base of the caudal than those of the opposite fin. The origin of the ventrals is situated opposite the third dorsal spine. Their exterior and spiny ray is half the length of the next articulated one, which is the longest of all; their posterior extremity reaches a vertical line drawn from the third articulated ray of the dorsal. A bifurcation of the third degree may be observed upon the extremity of the rays. The pectoral fins, the central rays of which also sub-divide three times, are of medium development; their posterior extremity corresponds to the vertical of the last dorsal spine.

The formula of the fins is as follows:

Br. V: V; D XI, 24 + 1; A III, 10 + 20 = 30; C 2, 1, 6, 6, 1, 1; V I, 5; P 22.

The scales are of medium size; the lateral line contains sixty-two of them; eight rows may be counted above the lateral line, and eighteen rows beneath it. The largest scales occupy the middle of the flanks; they diminish gradually in size towards the dorsal, as well as towards the abdominal and thoracic regions. The dorsal groove extends anteriorly to the tenth dorsal spine, disappearing towards the twentieth articulated ray. The sheath above the groove is composed anteriorly of two, and posteriorly of one row of scales. The scales on the dorsal region are a little higher than long, whilst in the lateral line and on the abdomen they are a little longer than high; their posterior edge is regularly convex, the sides slightly rounded, and the anterior margin nearly straight.

The ground color along the dorsal region is dark olive, with longitudinal stripes of purplish brown running through the middle of the scales. On the flanks below the lateral line the ground color has become purplish, the longitudinal stripes having widened, leaving but a narrow streak of a light olivaceous hue running parallel to one another, intersecting the point of union between the rows of scales; they become less and less distinct as they approach the abdominal

region, which is yellowish. The dorsal, caudal, ventrals, and anal are purplish red, the latter exhibiting a yellowish streak or vitta along its base. The pectorals are more of a yellowish hue.

This species inhabits the bay of San Francisco, California.

The specimen figured, on being opened, was found to contain twenty young ones, of an average length of eight-tenths of an inch (Plate XXVI, figs. 5 and 6). The body is sub-fusiform, scaleless, deepest anteriorly, and terminated by a rounded head, with the cleft of the mouth but slightly apparent. The remnant of the yolk forms a yet prominent abdominal hernia-like bag. The eye consists of a mere layer of black pigmentum. The pectorals and ventrals have not made their appearance yet. There are but seven very short spines visible in the dorsal fin. The articulated rays of the dorsal and anal are proportionally very long, but the posterior ones do not yet extend beyond the base of the caudal, being, therefore, more similar to the adult. The anal spines are not yet to be seen. The caudal is lanceolated, its central rays being much longer than the lateral ones, in which respect this fin differs widely from the shape it assumes in the adult fish.

Plate XXXI, fig. 1, represents *Embiotoca lineata*, from the bay of San Francisco, somewhat reduced in size.

Fig. 2 is a transverse section across the line of greatest depth of the body.

Fig. 3, a scale from the dorsal region.

Fig. 4, a scale from the lateral line.

Fig. 5, a scale from the abdominal region.

Plate XXVI, fig. 5, represents the young, size of life, taken in the ovaries of the specimen above figured.

Fig. 6, same as fig. 5, enlarged three times.

List of specimens.

| Catal. No. | No. of specs. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|---------------|--------------|-------------------------|-----------------|----------------------------|----------------------|---------------------|
| 533 | 2 | Adult. | San Francisco, Cal..... | 1853 | Lt. R. S. Williamson.... | Alcoholic .. | Dr. Heermann |
| 534 | 1 | ..... | .....do..... | 1853 |do..... |do..... |do..... |
| 535 | 1 | ..... | Tomales Bay, Cal | 1855 | Mr. E. Samuels..... |do..... | Mr. Samuels |
| 536 | 1 | ..... | San Francisco, Cal..... | 1853 | Lt. R. S. Williamson |do..... | Dr. Newberry |
| 537 | 1 | ..... | .....do..... | 1853 | Lt. A. W. Whipple |do..... | Dr. Kennerly |
| 538 | 1 | ..... | Presidio, Cal. | 1853 | Lt. W. P. Trowbridge.... |do..... | Lt. Trowbridge..... |

5. EMBIOTOCA ORNATA, Grd.

PLATE XXVI, FIG. 11.

SPEC. CHAR.—General form sub-elliptical. Posterior extremity of maxillary extending to a vertical line which would pass behind the posterior nostrils. Eyes of medium size. External margin of anal nearly straight; its origin being opposite the fifth articulated ray of dorsal. Tips of pectorals falling under the vertical of the tenth dorsal spine. Insertion of ventrals situated under the fifth dorsal spine. Branchiostegals five in number. About sixty-four scales in the lateral line. Color dark brown above, flanks and abdomen yellowish golden with purple stripes along the line of union between the rows of scales. Scales on thoracic region provided with a central purple spot.

SYN.—*Embiotoca lineata*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 151.

Embiotoca ornata, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1855, 321.

This species is so closely allied to *E. lineata*, that on a former occasion it was identified with it. The general form is most alike that of the latter species, being sub-elliptical. The head seems to preserve the same general proportions in regard to the entire length, but the snout is much more truncated in *E. ornata*. The frontal outline is also more declivous. The posterior extremity of the maxillary extends to a vertical line drawn behind the posterior nostril, thus not reaching the anterior rim of the orbit. The anterior nostril is the smallest of the two. The eye is sub-circular; the diameter of the orbit enters four times and a half in the length of the side of the head, its anterior rim being nearer the extremity of the snout than in *E. lineata*. The branchiostegals are five on either side.

The origin of the dorsal fin is situated opposite the anterior extremity of the base of the pectorals; its eleven spinous rays extend over a base not quite as long as the articulated rays. The latter are but twice bifurcated. The origin of the anal is situated more posteriorly than in *E. lineata*, as compared to the dorsal. Its structure presents likewise some differences worth noticing: there are, as usual, three short spines; then eleven undivided articulated rays, followed by three with signs of division without separation of the branches; next to these twenty well divided ones, with bifurcations of the second degree only. The caudal fin is missing in the specimen before us. The articulated rays of the ventral fins subdivide three times, with traces of a fourth division in a few; the insertion of these fins corresponding to a vertical line drawn from the fifth dorsal spine. The pectorals, the rays of which subdivide twice with traces of a third division, extend posteriorly to the vertical of the tenth dorsal spine.

The formula of the rays is:

Br. V: V; D XI, 24; A III, 11 + 3 + 20 = 34; C? 1, 6, 6, 1, ?; V I, 5; P 23.

The ground color above is uniform dark brown, almost blackish. The flanks and abdomen are yellowish golden with longitudinal stripes of purple along the line of union of the rows of scales. On the thoracic region each scale is provided with a purple spot upon its middle, whilst the outer portion has the golden hue of the abdominal scales. The head is dark purple or deep reddish brown with sinuating bluish lines on the cheeks and opercular apparatus.

A specimen of this species, about twelve inches in total length, caught in the bay of San Diego, was received in a rather mutilated state. On being opened we found five young ones still retained within the folds of the ovaries. Most of the brood, we suppose, had made their escape. Those left measure a little less than three inches in total length, their greatest depth being equal to the third of the length, (Plate XXVI, fig. 11). The scales are all perfectly developed. The spiny rays of the dorsal and anal fins have now the proportional height of those in the adult, but the posterior articulated rays of these same fins are much larger and extend beyond the base of the caudal. The caudal is subtruncated, the central rays are beginning gradually to recede as well as the posterior rays of both dorsal and anal, which must have had a much greater length at a previous period, judging of this by the filaments that dropped from their extremity as we removed the young from the ovaries. The body is light reddish orange, with the peculiar longitudinal stripes very conspicuous. The two anterior thirds of the dorsal, the anterior third of the anal and the base of the ventrals, exhibit a reddish orange deeper than on the body; the posterior third of the dorsal and anal fins are rather yellowish. An elongated jet black spot exists near the base of the anterior portion of the soft

dorsal. The tip of the ventrals is black. The upper edge of the spinous dorsal fin is also black.

Plate XXVI, fig. 11, represents the young of *Embiotoca ornata*, size of life, as taken within the body of its parent, from the bay of San Diego, California.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------|-------------------------|-----------------|------------------------|----------------------|---------------------|
| 541 | 1 | Adult.. | San Diego, Cal..... | 1853 | Lt. W. P. Trowbridge.. | Alcoholic.. | A. Cassidy..... |
| 542 | 1 | ..do.... | S. Farallones, Cal..... | 1854 |do..... |do..... | Lt. Trowbridge..... |
| 543 | 1 | ..do..... |do..... | 1854 |do..... |do..... |do..... |

6. EMBIOTOCA PERSPICABILIS, Grd.

PLATE XXXII & PLATE XXVI, FIGS. 1 & 2.

SPEC. CHAR.—Body sub-elliptically elongated. Frontal region gently declivous. Eyes of medium size. Posterior extremity of maxillary not quite reaching the anterior rim of the orbit. Anal fin long, its anterior undivided rays longer than the rest, and its origin situated opposite the twelfth articulated ray of dorsal. Tips of pectorals reaching vertical line intersecting base of last dorsal spine. Five branchiostegal rays. Sixty-three scales in lateral line. Deep purplish brown above, lighter beneath. Flanks with light narrow longitudinal stripes intersecting the point of union of rows of scales. Dorsal, caudal, anal, and ventral fins reddish purple; pectorals yellowish.

SYN.—*Embiotoca perspicabilis*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1855, 321.

There is still another species most closely allied to *E. lineata*, differing from it by a more elongated body, a longer anal fin which is inserted more posteriorly in its relations to the dorsal. The shape of the anal fin, again, is likewise different, being concave upon its outer margin and much deeper anteriorly where only nine undivided rays are observed. The eyes are proportionally larger and the ventral fins situated more backwards. The same general features will distinguish this species from *E. ornata*.

The frontal region forms a continuous curve with the dorsal outline, being, consequently, much less prominent than in both *E. lineata* and *E. ornata*. The head constitutes a little less than the fourth of the entire length. The eye, which is large and circular, enters four times and a half in the length of the side of the head. The posterior extremity of the maxillary almost reaches a vertical line drawn in advance of the orbit. There are five branchiostegal rays on either side.

The greatest depth of the body is rather more than one third of the entire length. The peduncle of the tail is of medium development. A line drawn vertically downwards from the origin of the dorsal fin would intersect the middle of the base of the pectorals. The spinous portion of that fin (dorsal) is gradually rising from the first to the eighth spine, and occupying three sevenths of the base of the whole fin. The articulated portion is anteriorly twice the height of the last spine; it gradually diminishes posteriorly. The rays composing it bifurcate twice. The caudal is broadly developed, forked, and its rays highly subdivided, since divisions of the sixth degree may readily be observed. The origin of the anal is situated opposite the twelfth articulated ray of the dorsal; its anterior undivided rays being longer than the rest and gradually diminishing from forwards backwards; the external margin of that fin assumes a concave outline. Its base is comprised a little over six times in the entire length, instead of

less than five times, as is the case in *E. lineata* and *E. ornata*. The undivided rays are nine in number, followed by twenty-one divided up to the third division. The insertion of the ventral fins is opposite the fifth dorsal spine. Their external spine is slender and acute, and the articulated rays bifurcate three times, but the third bifurcation does not affect all the subdivisions. The pectorals are broadly developed and their posterior extremities reach a vertical line which would intersect the last dorsal spine. Their rays subdivide four times. Thus, in the fins, we find:

Br. V: V; D X, 24; A III, 9 + 21 = 30; C 3, 1, 6, 6, 1, 2, V I, 5; P 22.

The lateral line forms a curve parallel to that of the back. It contains sixty-two scales. There are eight longitudinal rows of scales above it and eighteen beneath, largest on the middle of the flanks. The scales themselves are generally longer than deep, provided with but few radiating furrows, and oftentimes not even fully developed, as represented in fig. 3. Scales are well developed on the opercle and cheeks, but rather small in the supratympanic group.

The ground color is dark reddish brown above and on the sides, with light longitudinal stripes between the rows of scales on the latter region. On the abdomen and thoracic region the hue is of a soiled yellow, with partial metallic reflections. The dorsal, caudal, and anal fins have the same general tint as the upper region of the body, with, perhaps, a redder hue. The ventrals and pectorals are reddish inwardly and olivaceous outwardly.

The specimen figured being a female, on being opened was found to contain about eighty young of an average size of half an inch. The whole embryo consisting of cells, with no signs yet of the cleft of the mouth. A layer of black pigmentum constituted the eye. Membranous ridges above and below showed the first steps in the formation of the fins. The caudal itself was a mere membranous expansion of the cellular substance of the body. As such, the embryos had made their escape from the eggs. They could be seen lying between the ovarian membranes in the manner described on p. 165.

This species inhabits Puget's Sound; the specimen figured and described was procured at Fort Steilacoom, on the 1st of February, 1855, by Dr. Geo. Suckley, who made the following observation: "This fish was speared in shallow salt water. It is said to be excellent for the table, and is found in tolerable numbers. Below the lateral line are eighteen mazarine blue streaks, running nearly parallel from gills to tail, and both above and below the lateral line a series of blue spots, disposed crescentically beneath the eye and on the opercles. The spaces between these spots are of an olivaceous color, changing, according to light, to resplendent golden and purplish green reflections. The mazarine blue of the back is darker than it is on the sides below the lateral line. When fresh caught the general color of the fish, as it first strikes the eye, is rather more of an indigo blue than a mazarine. Anterior part of the belly golden."

Plate XXXII, fig. 1, represents *Embiotoca perspicabilis*, somewhat reduced in size.

Fig. 2 is a section across the line of greatest depth.

Fig. 3, a scale from the dorsal region.

Fig. 4, a scale from the lateral line.

Fig. 5, a scale from the abdominal region.

Plate XXVI, fig. 1, exhibits the embryo, size of life, as removed from the ovarian sheath.

Fig. 2, the same embryo, double its natural size.

List of specimens.

| Catal. No. | No. of specs. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|---------------|--------------|-------------------------------------|-----------------|----------------------|----------------------|----------------|
| 540 | 1 | Adult.. | Ft. Steilacoom, Puget's Sound, Or'n | 1853 | Gov. I. I. Stevens.. | Alcoholic... | Dr. Snckley... |

7. EMBIOTOCA ARGYROSOMA, Grd.

SPEC. CHAR—General form elongated; head rather small, sub-conical, anteriorly rounded. Eyes circular and well developed. Posterior extremity of the maxillary reaching a vertical line drawn in advance of the anterior rim of the orbit. Tip of pectoral fins not extending as far as the anterior articulated ray of the dorsal. About sixty scales in the lateral line. Six branchiostegals. A brilliant argentine tint over the entire body, though made a little darker along the dorsal region by a greyish or purplish hue. Fins olivaceous, unicolor.

SYN.—*Embiotoca argyrosoma*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1855, 136.

The general form of this species has a more elongated appearance, mayhap, than any of its congeners. It is sub-elliptical in profile, the superior and inferior outlines being regularly convex, slightly depressed upon the head, obliquely ascending along the insertion of the anal towards a rather slender caudal peduncle.

The head is rather small, sub-conical, rounded anteriorly, and contained four times and a half in the total length. The mouth is of but moderate size, its cleft directed slightly upwards; the posterior extremity of the maxillary bone not extending as far as a vertical line drawn in advance of the orbit. The lips are of moderate development. The nostrils are conspicuous, situated towards the upper surface of the head, and nearer to the anterior rim of the orbit than the tip of the snout. The eye is circular and well developed; its horizontal diameter constituting the fifth of the distance between the tip of the snout and the upper edge of the insertion of the pectorals. The opercle is quite large, and much deeper than broad. The sub-opercle is narrow and thin, tapering outwardly and decidedly less conspicuous than the interopercle. The branchiostegals, six on either side, are small and slender.

A vertical line drawn from the origin of the dorsal fin would pass behind the insertion of the pectorals. The base of the spinous portion is less than the two-fifths of the soft portion. The articulated rays being broken off, the precise shape of the fin could not be ascertained. The same is the case with those of the anal; the entire base of the latter is nearly equal to the soft portion of the dorsal, and equal to the length of the head. Its anterior spinous rays are acute and slender. The caudal is deeply furcated, and constitutes about the fifth of the total length. The origin of the ventrals is situated opposite the space between the third and fourth spines of the dorsal; their tips extend nearly as far as the anterior margin of the anal. The pectorals are broad and well developed; their tips extending nearly as far as that of the ventrals.

Br. VI: VI; D IX; A III, 24; C 5, 1, 6, 6, 1, 4; V I, 5; P 18.

The scales are well developed; they are much larger along the middle of the flanks than on the dorsal, caudal, and abdominal regions. In the lateral line they are smaller than in the adjoining series. Six longitudinal rows may be observed between the anterior margin of the dorsal fin and the lateral line, and fifteen rows between the lateral line and the insertion of

the ventrals. The lateral line itself is composed of about sixty scales. The dorsal furrow originates under the ninth spinous ray, extending as far as the middle of the length of the soft portion of that fin. The sheath being composed of but one row of scales. As regards the shape of the scales themselves, those of the lateral line are nearly as long as deep, whilst those on the rest of the body are much deeper than long. Their upper, posterior, and inferior margins are rounded, whilst the anterior margin is obtusely angular. Smaller and irregular scales may, as usual, be observed upon the base of the caudal. On the opercular apparatus and cheeks they are large also, there being three rows of them beneath the orbit. As many as eight scales may be counted in the supratympanic patch, the posterior being the largest.

As to colors, an argentine tint extends over the entire body and sides of the head. The upper surface of the head is brownish purple, which hue may be observed, though much less apparent, along the dorsal region. When the specimens are taken out of the alcohol and exposed for some time to the light, obsolete longitudinal darkish streaks make their appearance on the middle of each row or series of scales. The abdomen is yellowish and the fins yellowish grey or olivaceous.

Specimens about twelve inches in total length were collected at San Francisco, California, by Lieutenant W. P. Trowbridge, United States army. We regret that their state of preservation did not allow making an accurate figure of this species.

The male and female sexes are perfectly alike in every respect, except in the structure of the anterior third of the anal, as alluded to in the other species.

The ovaries of a female, which we have examined, about the size of a large quill, on being opened, the ovarian membranes could be seen containing within their walls an innumerable quantity of immature eggs, very similar to those of *Ennichthys heermanni*, figured on Plate XXVI, fig. 9.

List of specimens.

| Catal. No. | No. of specs. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specim ns. | Collected by— |
|------------|---------------|--------------|-------------------------|-----------------|-----------------------|----------------------|------------------------|
| 547 | 2 | Adult.. | San Francisco, Cal..... | 1853 | Lt. Wm. P. Trowbridge | Alcoholic... | Lt. Trowbridge, U.S.A. |

DAMALICHTHYS, Girard.

GEN. CHAR.—Head well developed. Eyes large. Mouth of medium size; upper jaw protruding considerably beyond the lower. Teeth few in number, short, and sub-conical, disposed upon one single row. Lips of moderate thickness; lower one firmly attached to the symphysis of the jaw. Opercular apparatus very much developed and covered with large scales. Anterior portion of soft dorsal very high. Peduncle of tail slender; caudal fin deeply forked. Anal elongated, its anterior portion the deepest. Ventrals and pectorals proportionally large.

SYN.—*Damalichthys*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1855, 321.

This genus, by its natural affinities, is more closely allied to *Embiotoca* than to any other of the same family. The most striking difference will be found in a much larger head compared to the body. The upper jaw is likewise considerably longer. The anterior portion of the soft dorsal fin is considerably higher, and the peduncle of the tail longer and slenderer. In regard to the scales, it will be found that their vertical diameter is considerably greater than the

horizontal one, particularly on the flanks. The dorsal groove, as in *Embiotoca*, extends to the anterior articulated ray of the dorsal fin, but the sheath above it is much smaller, and formed by one single row of rather small scales. There are no scales on the fins.

DAMALICHTHYS VACCA, Grd.

PLATE XXXIII.

SPEC. CHAR.—Male provided with a sub-pyriform sac upon the anterior third of anal. Branchiostegals five on either side. Ground color greyish olive. Scales with a golden and silvery metallic reflect. Fins unicolor.

SYN.—*Damalichthys vacca*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1855, 321.

The head constitutes a little more than the fourth of the entire length. The snout is protruding and sub-conical; the upper surface of the head is gently declivous, with a slight depression above the orbital region. The eyes are sub-circular in shape, and their horizontal diameter is comprised four times and a half in the length of the side of the head. The posterior extremity of the maxillary does not reach the vertical of the anterior rim of the orbit. The teeth are short and conical on the upper and lower jaw. The opercular apparatus is posteriorly rounded and covered with rather large scales, disposed upon six obliquely vertical rows. The scales on the sub-opercle are smaller, and disposed upon two longitudinal series. There are four sub-concentric rows of scales upon the cheeks, and somewhat smaller than on the opercle. The supratympanic group is composed of about nine scales of the size of those occupying the ventral region. The posterior limb of the pre-opercle is conspicuously developed. The branchiostegals are five in number on either side.

The upper outline of the body is gradually arched from the peduncle of the tail to the occiput. The lower outline is less regular: from the chin to the origin of the anal the curve is considerably depressed, raising rapidly along the base of the same fin. The peduncle of the tail is elongated; its depth equals the two sevenths of the greatest depth of the body, which is the third of the total length.

The origin of the dorsal fin is nearly opposite the anterior extremity of the base of the pectorals. It is gradually rising from the first to the last spine above which the anterior articulated ray rises to twice again the height of that spine. The posterior articulated rays are about the height of the third and fourth spines, that is, the fourth of the anterior ones. The upper margin of that fin forms an open crescent. The rays themselves bifurcate but twice. The caudal is deeply forked, and forming more than the sixth of the entire length. Its rays subdivide five times. The anal has the same general shape as the soft portion of the dorsal; its external margin forming an open crescent, but not so deep anteriorly, for its posterior rays have more than the third of the depth of the anterior ones. Three small spines occupy its anterior margin, which is situated under a vertical line drawn from the seventh articulated ray of the dorsal. Next to the spines we meet with seven undivided rays, followed by twenty-six, which subdivide three times. The base of that fin enters about five times in the whole length, and, though shorter than the soft portion of the dorsal, it extends a little more backwards. A pyriform membranous sack exists upon the base of the undivided rays of the anal; it is anteriorly perforated. The origin of the ventrals corresponds to a vertical line drawn from the fourth dorsal spine. Their extremity, when brought backwards, reaches the anterior articulated ray of the anal. The rays exhibit traces of a division of the third degree. The pectorals are well devel-

aped, and their extremity extends almost as far back as that of the ventrals. Divisions of the fourth degree may be observed towards the extremity of the rays. The formula of the fins we thus express:

Br. V: V; D X, 22; A III, 7 + 26 = 33; C 4, 1, 6, 6, 1, 3; V I, 5; P 20.

The lateral line, composed of sixty-one scales, forms an arch concurrent with the dorsal outline. The scales are rather large, particularly on the flanks; deeper than long, and provided anteriorly with numerous radiating grooves. Their size is much reduced opposite the base of the anal fin. There are seven longitudinal rows of them above the lateral line, and about sixteen beneath it. The scaly blade between the ventral fins is rather short, in the shape of an acute triangle. The naked area behind is rather well developed.

The ground color is greyish olive, dark above and lighter beneath. The scales exhibit a metallic reflect of gold and silver. The fins are unicolor, of the general tint of the region of the body to which they belong, and to which is superadded a purplish red hue.

The species inhabits Puget's Sound, W. T., where the specimen figured was obtained by Dr. George Suckley, U. S. A., who remarks: "Color while fresh—back, silvery blue; belly, same, but lighter; iris, bright copper color. Caught with a spear at the mouth of Steilacoom creek, at its entrance into Puget's Sound. They are good table fish, and are either speared or taken by the hook."

Plate XXXIII, fig. 1, represents the male sex of *Damalichthys vacca*, somewhat reduced in size.

Fig. 2 is a section across the line of greatest depth of the body.

Fig. 3, a scale from the dorsal region.

Fig. 4, a scale from the lateral line.

Fig. 5, a scale from the abdominal region.

List of specimens.

| Catal. No. | No. of specs. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|---------------|--------------|---------------------------------------|-----------------|--------------------|----------------------|-------------------|
| 548 | 1 | Adult. | Ft. Steilacoom, Puget's Sound, Oregon | 1853 | Gov. I. I. Stevens | Alcoholic... | Dr. Geo. Suckley. |

PHANERODON, Girard.

GEN. CHAR.—Head rather small; mouth small; jaws equal. Lips thin, lower one attached by very narrow frenum to the symphysis of its jaw. Pre-maxillaries very protractile. Teeth large and sub-conical, disposed upon a single row on both jaws. Spinous portion of dorsal fin as high as the soft. Anterior articulated rays of anal undivided and preceded by three spinous rays, shorter than the articulated ones. Scales well developed. Lateral line concurrent with the dorsal outline. Scales on the base of caudal rays. Dorsal groove extending from middle of spinous portion of dorsal fin to last third of soft portion. Sheath formed by two rows of scales anteriorly, and one only posteriorly.

SYN.—*Phanerodon*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 153; and, VII, 1855, 321.

A more elongated body, a more slender tail and caudal fin, higher spinous dorsal rays, a lower and longer anal fin, a smaller mouth, even jaws, larger teeth, thinner lips, and a narrower frenum upon the lower lip are as many traits in the organization of this genus by which it may be distinguished from *Embiotoca*.

PHANERODON FURCATUS, Grd.

PLATE XXXIV, Figs. 1—5.

SPEC. CHAR.—General form elongated, rather tapering posteriorly, and very much compressed. Cleft of mouth not extending to the anterior rim of the orbit. Eyes large and circular. Branchiostegals five in number. Caudal slender and deeply forked. About sixty-three scales in lateral line. Yellowish brown above; lighter on the sides; whitish under the throat. Fins yellowish. Margin of dorsal and caudal greyish. A diffused marginal spot upon the anterior portion of anal.

SYN.—*Phanerodon furcatus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 153; and, VII, 1855, 322.

The general form of the body has a rather elongated appearance, posteriorly tapering towards a slender caudal peduncle, which terminates into a slender and deeply forked fin. It is very much compressed. The head, which constitutes about the fifth of the length, is rather small, slightly depressed above the eyes. The snout is abbreviated and rounded; the mouth small, and the teeth, proportionally large, are disposed upon one single row on either jaw; about twelve on the upper and fourteen on the lower, occupying most of the circumference of the mouth. The lips are well developed, but quite thin, and the frenum which unites the lower one to the symphysis of the jaw is exceedingly narrow, and might easily be overlooked. The premaxillaries are very protractile; the jaws are perfectly even when the mouth is closed. The posterior extremity of the maxillaries do not quite reach a vertical line passing immediately in advance of the anterior rim of the orbit. The eye is large, circular, and its diameter comprised about three times and a half in the length of the side of the head, exactly once in advance of its anterior edge. The anterior nostril is placed about midway between the orbit and the extremity of the snout. The branchiostegal rays are five on either side, the inferior one being exceedingly slender. A vertical line drawn from the origin of the dorsal fin intersects the middle of the base of the pectorals. The spinous portion of that fin is gradually rising from the first to the last spine, which is a little shorter than the first articulated ray, whence the fin again diminishes in height towards the last articulated ray. The soft portion is one-third longer on its base than the spinous; the articulated rays are slender, and bifurcate but once beyond the middle of their length. The caudal fin, which is contained about four times and a half in the total length, is deeply forked, and provided upon the base of its rays with small and irregularly arranged scales. The rays divide three times, the central ones only twice. The anal fin is long and low; its base is contained four times in the total length, and, consequently, longer than the base of the soft portion of the dorsal, which enters in the total length about four times and a half. Its external margin is slightly concave upon its middle. The anterior spines are slender and well developed, the third being nearly as long as the last articulated ray. About nine of the anterior articulated rays are undivided; the others bifurcate once like those in the dorsal fin. The tips of the ventrals extend as far as the first anal spine; their insertion is under the vertical line of the third dorsal spine. The articulated rays of these fins bifurcate twice. The pectorals are long and slender, extending backwards to a vertical line which would intersect the fourth articulated ray of the dorsal and the second anal spine. Their rays bifurcate twice.

The formula of the fins is as follows:

Br. V; V; D XI, 24; A III, 9 + 23 = 32; C 3, 1, 6, 6, 1, 2; V I, 5; P 18.

The scales are well developed ; the lateral line, concurrent with the dorsal outline, contains about sixty-three of them. Five longitudinal rows may be counted between the dorsal groove and the lateral line, whilst beneath the latter they number from twelve to fourteen, the uncertainty arising from a sort of irregularity in the longitudinal direction of each row. The largest scales occupy the middle of the flanks ; they are the smallest upon an area opposite the base of the anal fin. The dorsal groove extends from the last dorsal spine to the last fourth of the soft dorsal fin. The sheath above it is formed by one row of scales only. The scales themselves (figs. 3—5) are somewhat longer than deep, convex posteriorly, rounded superiorly and inferiorly, whilst their anterior margin is straight. The radiating furrows are not very numerous.

The ground color is either yellowish brown or olivaceous above, silvery white or light yellow on the sides and under the head. The fins are uniform olivaceous or yellowish, with a darker margin to the dorsal and the caudal. A diffused marginal spot may likewise be observed upon the anterior portion of the anal.

The specimen figured and described was caught in the Bay of San Francisco, California, by Lieutenant Trowbridge.

Two other specimens, a male and a female, about ten inches in total length, were collected by Mr. E. Samuels, who caught them in Tomales Bay, California. There is no differences between the sexes except in the structure of the anterior articulated rays of the anal, as alluded to in *Embiotoca* and others.

The female, on being opened, exhibited an ovarian sheath of the size of a large quill, in which twenty-three young ones were found lying loosely between the ovarian membranes, some with the head towards that of the mother, others in a reverse situation. Their average length is between half an inch and six tenths of an inch. Their general form is compressed, elongated, very slender, tapering very regularly backwards from the head, which is the bulkiest region. The latter is rounded anteriorly, with a large black eye speck. A conspicuous yolk bag is seen at the abdominal region. The ventral fins are just making their appearance under the shape of a tapering hernia. Of the pectorals we could detect no traces, which may have escaped our investigations. The dorsal fin has the same general shape as in the adult ; it raises gradually from a cutaneous ridge to the spinous rays, which increase degree by degree from the anterior one to the posterior, which is as high as the first articulated ones. The anal also resembles that of the adult fish and loses itself, like the dorsal, in a cutaneous ridge along the peduncle of the tail, which is proportionally the same as in the adult. But the caudal, instead of being deeply furcated, is spear-shaped. The rays as well as the vertebrae, apophysis, the bones of the head, all, is in a cellular state, not far from homogeneous.

Plate XXXIV, fig. 1, represents the female sex of *Phanerodon furcatus*, size of life, from the Bay of San Francisco.

Fig. 2 is a section of the body across the line of greatest depth.

Fig 3, a scale from the dorsal region.

Fig. 4, a scale from the lateral line.

Fig. 5, a scale from the abdominal region.

Figs. 3—5 are somewhat magnified.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------|-----------------------|-----------------|----------------------|----------------------|---------------------|
| 555 | 1 | Adult | Presidio, Cal..... | 1853 | Lt. W. P. Trowbridge | Alcoholic | Lt. Trowbridge..... |
| 556 | 2 | do | Tomales Bay, Cal..... | 1855 | Mr. E. Samuels | do | Mr. Samuels..... |

ABEONA, Girard.

GEN. CHAR.—Head of medium size; mouth very small; jaws equal. Lips rather thin; lower one attached by a frenum to the symphysis of the jaw. Premaxillaries protractile. Teeth stoutish, conical, disposed upon one single row on both jaws. Branchiostegals five in number. Spinous portion of dorsal fin higher than the soft; hue of separation between both of these slightly depressed. Articulated rays of anal all dichotomised; spiny rays, three in number, well developed; base of that fin rather short. Scales of moderate size. Lateral line concurrent with the dorsal outline. No scales upon the fins. Dorsal groove extending nearly to the whole base of the fin. Sheath formed by two rows of scales.

SYN.—*Abeona*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1855, 322.

With the general facies of *Amphistichus*, this genus differs from the latter by a much smaller mouth and one row of teeth on the jaws instead of two. Also, by the spinous portion of the dorsal fin, which is higher than the soft portion instead of being lower. The anal, likewise, is much shorter and proportionally deeper. From *Holconotus* it differs by the lower lip, which is attached to the chin instead of being free all round, by the presence of a single row of teeth on the jaws, by a smaller mouth, by a shorter and deeper anal fin provided with more developed spiny rays. From *Embiotoca*, which it most resembles, it is to be distinguished by the spinous portion of the dorsal which is higher than the soft, more developed anal spines, and by the uniformity of all the articulated rays of the latter fin. The teeth are proportionally larger, as are likewise the scales.

ABEONA TROWBRIDGII, Grd.

PLATE XXXIV, FIGS. 6—10.

SPEC. CHAR.—General form sub-elliptical. Head sub-conical; snout abbreviated; mouth small; posterior extremity of maxillary not reaching the vertical of anterior rim of orbit. Eyes large, circular. Branchiostegals five on either side. Forty-one scales in lateral line. Olive or reddish brown above; silvery on the sides and abdomen. Flanks blotched. Fins yellowish, except anal, which is purplish, with its anterior portion spotted.

SYN.—*Holconotus trowbridgii*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 152.

Abeona trowbridgii, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1855, 322.

The body has a rather short appearance, being sub-elliptical in shape and not unlike a small *Pomotis*. Its greatest depth is greater than the third of the entire length, in which the head enters a little over four times. The snout is rather obtuse, terminated by a small mouth, the angles of which not extending to the vertical line intersecting the anterior rim of the orbit. The lips are thin, the lower one being attached by a frenum to the symphysis of the jaw. The teeth are proportionally large, stoutish, and sub-acute. The nostrils are situated towards the upper surface of the snout, nearer to the orbit than the extremity of the latter. The eye is very large, circular in shape, and its diameter contained a little over three times only in the length of the side of the head, and less than once in advance of the orbit. The scales upon the

cheeks and opercle are comparatively large, constituting two sub-concentric rows on the cheeks, and three oblique ones on the opercle. The opercle itself is rather narrow. There are five branchiostegal rays on either side, the lowest of which being exceedingly slender and almost filiform, whilst the others are well developed, flattened, and curved.

The spinous portion of the dorsal is higher than the soft, composed of nine rays, the sixth of which being the highest, whilst the others go diminishing gradually anteriorly and posteriorly, giving to its outline an arched appearance. The soft portion of that same fin, the anterior ray of which is a little higher than the last spine, gradually diminishes in height backwards and extending over a base but a fraction longer than the spinous portion. The rays bifurcate only once. The caudal fin constitutes about the fifth of the entire length; its posterior margin is sub-crescentic, like that of several species of *Embiotoca*. The rays bifurcate twice. The anal is short, but comparatively deep, sub-convex upon its external margin. The spines at the anterior margin are slender and well developed, the first is the shortest of all the rays, but the second is equal to, if not longer than, the posterior articulated rays; the third is still longer than the second. Its base enters about six times and a half in the total length, being less considerably than the base occupied by the articulated rays of the dorsal. The soft rays bifurcate once upon their length. The insertion of the ventrals is under the vertical line of the third dorsal spine; their tips extend a little beyond the anterior margin of the vent. The articulated rays bifurcate twice; their external spine is slender and very acute. The entire base of the pectorals is placed in advance of the anterior dorsal spine, their posterior extremity is made to reach the vertical line of the first or second articulated dorsal ray, when bent backwards alongside of the body. The rays bifurcate twice. The formula of the fins is:

Br. V: V; D IX, 14; A III, 15; C 3, 1, 6, 6, 1, 2; V I, 5; P 16.

The scales are proportionally large, particularly on the flanks. The lateral line, which is concurrent with the dorsal outline, contains about forty-one scales. Four longitudinal rows are found to exist between the latter and the dorsal groove, and twelve to fourteen between the lateral line and the abdominal outline. The scales are usually smaller under the throat, on the abdomen, and opposite the base of the anal fin. No scales exist on either of the fins. The typical scales (figs. 8—10) are deeper than long, almost rounded anteriorly as well as on the other sides; the posterior margin, however, is the most convex.

The ground color is reddish brown above with irregularly interspersed purplish spots of a cloudy aspect. The sides of the head, the lower portion of the flanks are silvery white, and the abdomen yellowish. The dorsal, caudal, pectoral, and anal, are uniform straw color or dull yellow, the latter being moreover provided, upon its anterior margin, with a diffused purplish spot, not represented on the figure. The ventrals, yellowish upon their base, are deep purple on their remaining portion.

The label accompanying this species having unfortunately been lost, the habitat of this species cannot be given more accurately than between San Diego and San Francisco, California.

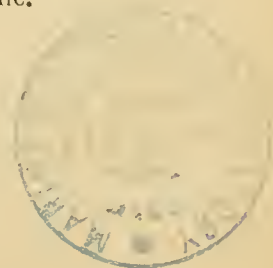
Plate XXXIV, fig. 6, represents the female sex of *Abeona trowbridgii*, size of life.

Fig. 7 is a section across the line of greatest depth.

Fig. 8, a dorsal scale.

Fig. 9, a scale from the lateral line.

Fig. 10, an abdominal scale.



List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------|-----------------|-----------------|-----------------------|----------------------|----------------------|
| 554 | 1 | Adult.. | California..... | 1853 | Lt. W. P. Trowbridge. | Alcoholic. | Lt. Trowbridge |

RHACOCCHILUS, Agass.

GEN. CHAR.—Head of medium size. Mouth moderate, nearly horizontal, with both jaws equal. Lips very fleshy, lower one broad, lobed, and free all around. Premaxillaries very protractile. Teeth few, on the anterior portion of the jaws only, and disposed upon one single row. Spinous portion of dorsal fin lower than the soft. Anterior articulated rays of anal fin simple and preceded by three small spines. Caudal deeply forked. Scales rather well developed; lateral line concurrent with the dorsal outline. No scales upon the fins. Dorsal groove occupying the middle of the fin; sheath formed by two rows of scales.

SYN.—*Rhacochilus*, AGASS. in Amer. Journ. of Sc. 2d series, XVII, 1854, 367.

As the name implies, the lower lip, which is free all around, is fringed or rather cut up upon its margin. The genus is allied to *Embiotoca* by its dentition and the outline of the dorsal fin, differing principally from it by the lower lip not being attached to the symphysis of the jaw, and by the indentations of its margin. The protractility of the snout is much greater also than in *Embiotoca*, but not more so than in *Holconotus*. Like *Embiotoca*, however, this genus exhibits a patch of large scales, isolated amongst the rest, towards the lower portion of the abdomen, though placed further back.

RHACOCCHILUS TOXOTES, Agass.

PLATE XL.

SPEC. CHAR.—General form of body sub-elliptical in profile; nape prominent, frontal line very declivous. Eye large and circular. Posterior extremity of maxillary extending to a vertical line drawn inwardly of the anterior rim of the orbit. Base of anal fin (spinous rays excepted) nearly equal to the base of soft portion of the dorsal. Color, uniform olive above; sides silvery with light longitudinal streaks. Pectorals, dorsal, and caudal dark greyish olive; anal and ventrals dark purple.

SYN.—*Rhacochilus toxotes*, AGASS. in Amer. Journ. of Sc. 2d. ser. XVII, 1854, 367.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 136.

The general form of the body is sub-elliptical in profile, the nape being prominent and the frontal line very declivous, with an occipital depression. The outline of the back, as well as that of the belly, is regular and rather sub-depressed; along the insertion of the anal the outline is rather straight and ascending. The peduncle of the tail is thickish.

The head is of but moderate development, it being contained four times and a half in the total length; it is a little deeper than long upon the line of its greatest depth, which is the occipito-hyoid. The eye is large and circular, its horizontal diameter being contained about four times in the length of the side of the head, and more than once in advance of its anterior margin. The snout is very protractile downwards, and when retracted it is rounded or sub-truncated, terminated by very thick and fleshy lips; the inferior one being free all around and presenting three indentations upon its margin: a median, opposite the symphysis of the jaw, and two somewhat smaller, lateral, one on each side. The teeth are buried in the thickness of

the fleshy gums. The mouth is of moderate size, both jaws being even or else the lower lip projecting slightly beyond the upper. The posterior extremity of the maxillary reaches to a vertical line drawn across the eye ball, about midway between the rim of the orbit and the pupil. The opercle is well developed, irregularly rounded exteriorly; the sub-opercle is small, tapering outwardly and completing the sub-convex edge of the opercular apparatus. The sub-opercle is quite large and stoutish, occupying a prominent place in the apparatus just referred to. The tongue is smooth, sub-pyriform, depressed, pointed anteriorly. The branchiostegals are six on either side, very much flattened and hidden under the opercular apparatus.

The origin of the dorsal fin corresponds with the posterior margin of the insertion of the pectorals; there are eleven spinous rays, increasing gradually in height from the first to the eleventh, giving to that portion of the fin a sub-convex outline. The anterior part of the soft portion of that fin rises above all the spines, but diminishes gradually backwards so that its last rays are not higher than the second spinous one. The base over which the articulated rays extend is one-fifth longer than the base of the spinous portion. The articulated rays, twenty-three in number, the last one being double, subdivide but once upon their extend. The anal fin is preceded anteriorly by three spinous rays, the first one of which is the smallest; the soft portion of the fin resembles, in its outline, the soft portion of the dorsal. Its base, however, is shorter than that of the latter, and while the anterior spine is situated opposite the insertion of the third articulated ray of the dorsal, it yet extends a little further posteriorly. The soft rays, numbering twenty-nine, the last being double and counting as one, are simple as far as the twelfth, the rest subdivide, at first once and posteriorly twice. The caudal is furcated and constitutes a little more than the fifth of the total length; its rays are highly subdivided. The extremity of the ventrals overlap the vent; the rays of which it is composed subdivide but twice. The pectorals, broad and elongated, extend a little further back than the ventrals when bent alongside the body; there is a rudimentary ray upon the upper or external margin of these fins; the ray next to it is simple and much stouter than the rest, which subdivide three times.

Br. VI: VI; D XI, 23; A III, 29; C 5, 1, 6, 6, 1, 4; V I, 5; P 21.

The scales being well developed, twelve longitudinal series are to be observed upon the anterior portion of the back, above the lateral line, and twenty-one series between the lateral line and the insertion of the ventrals. The lateral line itself is concurrent with the dorsal outline. The scales are a little longer than deep, rounded upon their posterior, upper and lower margins, and truncated anteriorly. They are largest upon the middle of the flanks, very small along a narrow band opposite to the base of the anal fin, with a patch of much larger ones, isolated from the rest and situated a little way above the vent. The base of the caudal is covered with irregular scales which are not observed upon the base of the other fins. The cheeks and opercular apparatus are scaly; seven rows of scales may be observed between the orbit and the concavity of the preopercle, the convex limb of which is naked, whilst the opercle, sub-opercle, and interopercle are densely invested with scales, ten or eleven vertical series of which exist on the opercle. A dozen of scales constitute the supratympanic patch. The dorsal groove extends from the seventh spinous ray to the thirteenth or fourteenth articulated ones; the sheath being composed of two rows of scales.

The ground color is of a uniform olive above; the sides are silvery with light longitudinal streaks running along the middle of the scales. The upper surface of the head is of a deep

purple. The dorsal, caudal, and pectorals are dark greyish olive; the rays of the anal and ventrals are olive, whilst their interdigital membrane is purple.

A specimen, fourteen inches in total length, was caught in Tomales Bay, California, by E. Samuels.

Plate XL, fig. 1, represents *Rhacochilus toxotes*, somewhat reduced in size.

Fig. 2 is a scale from the dorsal region.

Fig. 3, a scale from the lateral line.

Fig. 4, a scale from the abdominal region.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------|-----------------------|-----------------|----------------------|----------------------|-------------------|
| 539 | 1 | Adult .. | Tomales Bay, Cal..... | 1855 | Mr. E. Samuels | Alcoholic. | Mr. Samuels |

HYSTEROCARPUS, Gibbons.

GEN. CHAR.—Head is small or of medium size. Mouth small, gape slightly oblique; jaws sub-equal. Lips rather thin; lower one free all round. Premaxillaries quite protractile. Teeth sub-conical, occupying the fore part of the jaws only, and disposed upon one single row. Spinous portion of dorsal much longer and somewhat higher upon its middle than the soft portion. Anterior articulated rays of anal simple, and preceded by three small spines. Caudal fin fureated. Branchiostegals, five on either side. Scales large. Lateral line concurrent with the dorsal outline. No scales upon the fins. Dorsal groove running nearly along the entire base of the fin; sheath formed of one row of scales only.

Syn.—*Hystero carpus*, GIBBONS, in Proc. Acad. Nat. Sc. Philad. VII, 1854, 124.

This genus bears a general resemblance to *Abeona*, *Ennichthys*, and *Holconotus*, by the outline of its dorsal fin, the spinous portion of which is higher upon its middle than the highest articulated rays. It differs, however, from them by that same spinous portion of the fin being much more extended than the soft, which constitutes only a fraction of the entire base or length. From *Ennichthys* and *Holconotus* it furthermore differs by the presence of one single row of teeth upon the jaws, instead of two. The base of the anal fin is also shorter. The anterior articulated rays of the anal are simple, whilst they dichotomise in *Abeona*, *Ennichthys*, and *Holconotus*. Its affinities with *Abeona* are apparently closer, since there is but one series of maxillary teeth; still the lower lip is free all round as is the case in *Ennichthys* and *Holconotus*, whilst it is attached by a frenum to the symphysis of the jaw, as in *Abeona*. From the latter it may yet be distinguished by a shorter caudal peduncle.

HYSTEROCARPUS TRASKII, Gibbons.

PLATE XXVI, FIG. 14.

SPEC. CHAR.—Body sub-elliptical in its profile; nape convex, frontal line depressed. Eye circular, of medium size. Posterior extremity of maxillary extending to a vertical line drawn in advance of the anterior rim of the orbit. In the male the upper regions are dark or purplish brown, unicolor; yellowish olive, spotted with black, on the lower portion of the sides; throat and belly yellowish golden. In the female the back is ash-colored, with irregular black patches, approximating somewhat to interrupted bands, across the sides; belly lemon yellow.

Syn.—*Hystero carpus traskii*, GIBBONS, in Proc. Acad. Nat. Sc. Philad. VII, 1854, 105 & 124.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 136.

This is the only species of the family, so far described, as inhabiting the fresh waters; it is said to occur in the lagoons of the lower part of the Sacramento as well as further up the course of that river. It would appear very remarkable if that family was excluded from the San Joaquin and other rivers of California and Oregon, and the more so, that the marine representatives of this group occur all along the coast from San Diego to Puget's Sound.

The general form of the body, which is very much compressed, is sub-elliptical in its profile, the nape being convex, the dorsal and abdominal outlines regularly arched, whilst the frontal line is depressed immediately above the eye. The greatest depth of the body, corresponding pretty nearly to the middle of its length, is about the third, a little more or less, of the total length. From the origin of the anal the body tapers rather rapidly towards the peduncle of the tail, which is short.

In the adult and pregnant female the outline of the body is very much disfigured; the inferior region, between the origin of the anal fin and the throat, is swollen and convex; the head is turned upwards, rendering its upper surface sub-concave, giving to the mouth a very oblique direction, and to the lower jaw a projecting aspect.

The head is rather small, constituting the fourth of the total length; it is a little longer than deep where deepest. The eye is circular and well developed, approximating the upper surface of the head; its horizontal diameter being contained about three times and a half in the length of the side of the head, and nearly once in advance of the anterior rim of the orbit. The nostrils are conspicuous, nearer the orbit than the tip of the upper jaw, and situated towards the upper surface of the snout. The latter is rounded and sub-conical; the mouth being small, slightly oblique upwards, with the upper jaw protruding somewhat beyond the lower. The lips, though conspicuous, are rather thin; the inferior one being free all round. The posterior extremity of the maxillar bone extends to a vertical line drawn in advance of the anterior rim of the orbit. The teeth are short and sub-conical, inconspicuous, disposed upon one single row. The branchiostegals are slender and short, five on either side. The opercle is vertically elongated, and rather narrow horizontally; the sub-opercle is a thin and narrow piece, quite oblique in its situation. The interopercle is well developed.

The origin of the dorsal fin takes place opposite the upper edge of the insertion of the pectorals. It is composed of sixteen or eighteen spinous rays and ten or eleven articulated ones, the latter occupying about the two-sevenths of the base of that fin. The anterior spinous ray is quite small; the next ones increase in height to the fifth, sixth, and seventh, which are the highest, and higher also than the articulated rays, whilst the remaining ones diminish gradually backwards towards the articulated rays, which rise suddenly above the last spine. The articulated rays themselves are nearly equal amongst themselves, bifurcating but once upon their extend. The origin of the anal is situated opposite the eleventh or twelfth spinous rays. The anterior spine is generally a little larger than the third, but the second is always the longest of the three. The soft portion is composed of ten undivided rays, followed by eleven or twelve bifurcated ones. The rays of the caudal dichotomise three times; the fin itself is furcated, and contained about six times in the total length. The origin of the ventrals takes place under the highest dorsal spine; their tips or extremities reach, and even overlap, the vent to the anterior margin of the anal. The articulated rays sub-divide three times. As to the pectorals, they are of moderate development, for, their extremities do not extend as far

posteriorly as the ventrals, since they remain in advance of a vertical line intersecting the anus. A rudimentary ray may be observed at their upper edge.

| | |
|---------|--|
| Adult ♀ | Br. V: V; D XVII + I, 10; A III, 21; C 3, 1, 6, 6, 1, 4; V I, 5; P 16 + 1. |
| Young ♀ | D XVI, 11; A III, 22; ————— P 16 + 1. |
| Young ♂ | D XVIII, 10; A III, 21; ————— P 17 + 1. |

The scales are large; the lateral line being parallel with the dorsal outline. Six or seven longitudinal series of scales may be observed upon the anterior region of the back, between the origin of the dorsal fin and the lateral line, and thirteen or fourteen series between the lateral line and the insertion of the ventral fins. As usual, they are largest upon the middle of the flanks and quite small and irregular upon a narrow strip opposite the base of the anal fin, and likewise upon the insertion of the caudal. The dorsal groove extends from the highest spinous ray to the fourth or fifth articulated ones; the sheath being composed of but one row of scales. Upon the cheeks we find three series of scales immediately beneath the orbit, and on the opercle four vertical series.

As to the typical scales themselves, they are irregularly sub-elliptical, with the vertical diameter greatest; on the abdominal region of the flanks the anterior margin of each scale appears to be more truncated than upon the back and in the lateral line.

The color of the male sex is uniform dark or purplish brown above, yellowish or olivaceous upon the sides, which are spread over with black spots; the throat and belly being of a yellow or golden hue. In the female, the back is ash colored and the flanks olivaceous, with irregular black patches approximating somewhat to interrupted bands across the sides. These bands or patches are greatly obliterated upon adult individuals. The fins in both sexes are unicolor, greyish black or olive, according to the regions where they occur.

We have examined three specimens of this species: a pregnant female, five inches in total length; an immature female and an immature male, about three inches long.

Sixteen young ones were found within the body of the pregnant female. Their average size is from an inch and a quarter to nearly one inch and a half. All of them had their heads in the same direction as that of the mother, a circumstance for the first time noticed.

The embryos here described are, according to all probabilities, nearly mature, and were nigh coming into the world. Their resemblance to the parent fish is striking. The body, however, is more slender, more elongated, the depth entering about three times and a half in the total length. The eye is proportionally much larger than in the adult. The scales are perfectly developed, there being the same number of longitudinal series as in the full grown fish; the dorsal groove and sheath are present. The cheeks and opercular apparatus are already protected by their scales. The vertical fins differ somewhat from those of the adult: the caudal, in being but slightly concave upon its posterior margin, and the posterior rays of both the dorsal and the anal extending further back, though protruding but very slightly beyond the insertion of the caudal. The same number of spinous rays as in the adult may be seen, and the entire spinous portion is exactly similar.

Upon all these embryos could be seen those black patches approximating to transverse bands, which we have described as characteristic of the female sex. The ground color is of a light olive in all of them also. Thus, at an early period after their escape from parental care, the

sexes do not differ in their coloration, nor indeed is there any trace of those thickened rays upon the anterior third of the anal, and which are so characteristic of the sexes throughout this family of fishes.

They were collected at Fort Reading, California, by Dr. J. F. Hammond, United States Army, and by Dr. John S. Newberry, under Lieutenant R. S. Williamson.

Plate XXVI, fig. 14, represents the embryo of *Hysterocarpus traskii*, size of life.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------|----------------------------|-----------------|--------------------------|----------------------|-------------------|
| 561 | 1 | Adult.. | Fort Reading, California.. | 1855 | Lient. R. S. Williamson. | Alcoholic... | Dr. Newberry..... |
| 562 | 2 | Young | do.....do..... | 1855 | Dr. J. F. Hammond | do..... | Dr. Hammond..... |

HOLCONOTUS, Agass.

GEN. CHAR.—Head well developed. Mouth small; jaws equal; lower one projecting slightly when mouth opens. Lips thin; lower one free all around. Premaxillaries protractile to a considerable extent. Teeth small, slender, sub-conical, slightly curved, disposed upon a double row on the upper jaw and one only on the lower. Spinous portion of dorsal fin higher than the soft. Anterior articulated rays of anal mostly all divided, and preceded by three spines shorter than the other rays. Scales rather large. Lateral line concurrent with the dorsal outline. No scales on the fins. Dorsal groove extending from opposite middle of spinous portion of dorsal fin to beyond the middle of soft portion of same fin. Sheath formed of but one⁶ apparent row of scales, tapering posteriorly.

SYN.—*Holconotus*, AGASS. in Amer. Journ. of Sc. second series, XVII, 1854, 367.—GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1855, 322.

This genus approximates *Ennichthys* by the shape of the dorsal fin and the nature of the lower lip. It is, however, distinguished from the latter in the presence of but one row of teeth on the lower jaw, larger scales on the body, and their entire absence from the fins.

As regards the dorsal fin, there is a slight depression in its outline, which depression corresponds to the point of union between both the spinous and articulated portions; the last spine being a little shorter than the first articulated ray. On a superficial examination, however, the outline of that fin seems to descend regularly from the fourth or fifth anterior spinous ray to its posterior extremity. The first and second anterior spines are always shorter than the articulated rays.

HOLCONOTUS RHODOTERUS, Agass.

PLATE XXXV; PLATE XXXVI, Figs. 1—4; and, PLATE XXVI, Figs. 7 and 8.

SPEC. CHAR.—General form elongated, neither elliptical nor fusiform. Frontal region sub-concave. Head sub-conical; mouth small; posterior extremity of maxillary not quite reaching the vertical of anterior rim of orbit. Eyes rather large and circular. Branchiostegals, five. About forty-four scales in lateral line. Bluish grey or olive above, silvery or yellow upon the sides, with rose colored spots disposed in longitudinal series.

SYN.—*Holconotus rhodoterus*, AGASS. in Amer. Journ. of Sc. second series, XVII, 1854, 368.—GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 141 and 152; and, VII, 1855, 322.

The average size of this species is from five to six inches in total length. The body is very much compressed, elongated, in the shape of either an ellipsis or a contracted spindle, the

back and belly being arched. The greatest depth is about a third of the length; the peduncle of the tail is slender and short.

The head is sub-conical and rather pointed forwardly. It is slightly depressed above the orbit, otherwise its profile would form a regular curvilinear prolongation of the dorsal outline. The mouth is rather small, the premaxillaries moderately protractile, and the lower jaw projecting slightly beyond the upper when the mouth is partially open: otherwise the jaws may be termed equal, the gape of the mouth being somewhat oblique when both jaws are in a retracted state. The posterior extremity of the maxillary does not quite reach a vertical line passing immediately in advance of the orbit. The teeth are of medium development, sub-conical or slightly club-shaped, and occupying the entire circumference of the mouth. On the inner row of the upper jaw they are often so small as to defy observation. The nostrils are nearly equal, situated towards the upper surface of the snout, a little nearer the anterior rim of the orbit than the extremity of the snout. The eye is proportionally large, circular in shape, and its horizontal diameter contained somewhat less than four times in the length of the side of the head, exactly once between the orbit and the end of snout, and a little less than twice between the orbit and the thoracic belt. There are three rows of irregularly imbricated scales on the cheeks, and four or five on the opercle. The branchiostegal rays, five on either side, are small, and concealed under the opercular apparatus.

A vertical line drawn from the origin of the dorsal fin passes immediately behind the base of the pectorals. Nine or ten rays constitute the spinous portion, gradually higher from the first, which is the lowest of all, to the fourth or fifth, which is the highest; thence diminishing again to the last, which is a little shorter than the first articulated ray. The remaining portion of this fin occupies a base nearly double the length of that over which the spines extend. The articulated rays are very slender, and bifurcate but once beyond the half of their depth. The caudal fin is deeply forked, and its rays sub-divide three times upon their length. The anal is long and low, provided anteriorly with three small spines. The anterior articulated rays are not all divided: from four to eight in the female, and six to eleven in the male, are simple; the rest bifurcate once, as in the caudal fin. In the male the simple and divided rays are separated by a triangular space, the undivided ones inclining anteriorly, the bifurcated posteriorly. The origin of the anal is opposite the fifth articulated ray of the dorsal, and extends a little more posteriorly than the latter. The origin of the ventrals is placed under the vertical line of the second or third dorsal spine. The external spine is slender and acute; the articulated rays sub-divide three times. The pectorals are well developed, their extremity reaching the vertical of the second articulated ray of the dorsal, and a little beyond the tips of the ventrals themselves. Partial traces of a bifurcation of the third degree may be observed towards the extremities of their rays.

Formula of the fins:

Br. V: V; ♂ D IX or X, 20 or 21; A III, 8 + 14 = 22; C 3, 1, 6, 6, 1 2; V I, 5; P 19.
 ♀ D IX or X, 19 or 20; A III, 11 + 13 = 24; C 3, 1, 6, 6, 1, 2; V I, 5; P 18 or 19.

The scales are proportionally large; about four rows may be counted above the lateral line and twelve beneath it. The lateral line itself contains from forty to forty-four scales, and runs nearly parallel to the outline of the back. The dorsal groove extends from the highest dorsal spine to about the middle of the length of the articulated portion of the same fin. The sheath

above the groove is composed of two rows of scales anteriorly, tapering into one posteriorly. The supplementary row is often rudimentary, and composed of but few and quite small scales. The scales themselves (figs. 3—5, and 8—10) are deeper than long, rounded upon the posterior, superior, and inferior outlines; sub-linear, and sometimes rounded upon their anterior outline also.

The ground color above is either bluish grey, olive, or purplish blue; the sides and abdomen are silvery, sometimes yellowish. On the middle of the flanks, below the lateral line, there are about ten series of purplish spots corresponding to as many rows of scales, neither extending in advance of the pectorals, nor to the posterior margin of the body. These spots, on a close examination, may be resolved into an accumulation of minute dots, situated on the middle of the scales, sometimes occupying their whole width, when these spots then assume the shape of longitudinal bands. The silvery area between the series of spots may likewise be scattered over with similar minute dots. The thoracic and abdominal regions are yellowish golden. The fins are pale yellow; the spinous portion of the dorsal fin is maculated with blackish, and sometimes a large spot may be observed upon the anterior part of the articulated portion of the same fin. The caudal is greyish.

We have seen individuals in which the lateral spots were so obsolete as not to be apparent on a superficial examination, the sides in this case exhibiting a uniform silvery aspect; whilst in others, particularly of the male sex, the spots assumed such a preponderance over the ground color as to give to the whole body an almost uniform deep purplish blue tint, which would extend even to the abdominal and thoracic regions, as well as over the sides and upper surface of the head. The fins partook more or less of the hue of the body. Others still, with the same deep hue of the spots, exhibited light silvery stripes along the point of union of the rows of scales. The anal and ventrals almost always exhibiting a lighter shade than the other fins.

Sometimes an interruption in the longitudinal direction of the series of spots makes the latter to appear as if disposed upon transverse facias.

When the embryo is from three-quarters to an inch long (Plate XXVI, figs. 7 and 8) the body is elongated, more fusiform than in the adult. The head is rounded anteriorly, and the mouth not open as yet. A vitelline abdominal sac is still present. The spinous portion of the dorsal fin is quite low and its rays, eight in number, increasing slightly in height from the first to the last. The ninth or anterior spine, the lowest in the adult, has not yet made its appearance. The soft portion of the dorsal is proportionally higher than in the adult, and increases in height from forwards backwards. The extremity of the posterior rays extending somewhat beyond the base of the caudal, which is posteriorly rounded instead of being forked as in the adult. The anal, likewise deeper than in the adult, is convex upon its exterior margin, and the tips of its posterior rays may also be observed stretching beyond the base of the caudal. The anterior spiny rays have not yet made their appearance. The ventrals and pectorals are also wanting. The species seems to inhabit the whole western coast of the United States, since no appreciable differences are to be detected on specimens collected at San Diego, San Francisco, California; Shoalwater Bay and Puget's Sound, Oregon.

Plate XXXV, fig. 1, represents the female sex of *Holconotus rhodoterus*, size of life, from the harbor of San Diego, California.

Fig. 2 is a section across the line of greatest depth.

Fig. 3, a scale from the dorsal region.

Fig. 4, a scale from the lateral line.

Fig. 5, a scale from the side of the abdomen.

Fig. 6 represents the male sex of the same species, also the size of life and from the same locality.

Fig. 7 is a section across the line of greatest depth.

Fig. 8, a scale from the dorsal region.

Fig. 9, a scale from the lateral line.

Fig. 10, a scale from the side of the abdomen.

Plate XXXVI, fig. 1, represents a female individual from the bay of San Francisco, California.

Fig. 2, a scale from the dorsal region.

Fig. 3, a scale from the lateral line.

Fig. 4, a scale from the side of the abdomen.

Plate XXVI, fig. 7, represents an embryo, size of life, taken within the body of the parent, from the Bay of San Francisco.

Fig. 8, the same embryo as fig. 7, enlarged about twice.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------------|------------------------------|-----------------|--------------------------|----------------------|------------------------|
| 563 | 4 | Adult.. | San Francisco, Cal..... | 1853 | Lt. R. S. Williamson. | Alcoholic. | Dr. A. L. Heermann .. |
| 564 | 4 | do... | do..... | 1853 | do..... | do..... | do..... |
| 565 | 5 | do... | Presidio, Cal..... | 1853 | Lt. W. P. Trowbridge. | do..... | Lt. Trowbridge |
| 566 | 4 | do... | do..... | 1853 | do..... | do..... | do..... |
| 567 | 8 | do... | Humboldt Bay, Cal..... | 1853 | do..... | do..... | do..... |
| 568 | 4 | do... | do..... | 1853 | do..... | do..... | do..... |
| 569 | 1 | do... | Astoria, Oregon | 1854 | do..... | do..... | do..... |
| 570 | 1 | do... | Cape Flattery, W. T..... | 1854 | do..... | do..... | do..... |
| 571 | 5 | do... | San Diego, Cal..... | 1853 | do..... | do..... | A. Cassidy |
| 572 | 4 | do... | do..... | 1853 | do..... | do..... | do..... |
| 573 | 3 | do... | Ft. Steilacoom, Puget's S'd. | 1853 | Gov. I. I. Stevens | do..... | Dr. G. Suckley..... |
| 574 | 3 | do... | Shoalwater Bay..... | 1853 | do..... | do..... | Dr. J. G. Cooper |
| 575 | 12 | do... | Petaluma, Cal..... | 1855 | Mr. E. Samuels..... | do..... | Mr. Samuels..... |
| 576 | 5 | do... | do..... | 1855 | do..... | do..... | do..... |

ENNICHTHYS, Girard.

GEN. CHAR.—Head of medium size. Mouth large and oblique; lower jaw projecting beyond the upper. Lips thin; lower one free all round. Premaxillaries slightly protractile. Teeth small, slender, and conical, disposed upon a double series on both jaws. Spinous portion of dorsal fin higher than the soft. Anterior articulated rays of anal divided like the rest, and preceded by three small spines lower than the articulated rays. Scales of moderate development. Lateral line concurrent with the dorsal outline. Scales upon the base of caudal and anal. Dorsal groove rather short; sheath formed anteriorly by three rows of scales, tapering posteriorly.

SYN.—*Ennichthys*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1855, 322.

The structure of the dorsal is suggestive of the genus *Holconotus*, but the presence of a double row of teeth on the lower, as well as on the upper jaw, separates altogether both of the genera,

even if the other characters were not deemed of a sufficient value. These consist, chiefly, in the structure of the mouth, the dimension of the eye, the dorsal sheath, and the scales on the base of the caudal. A similar character of scales on the caudal we have observed in *Phanerodon*, but the distinctive marks between the latter and *Ennichthys* are so obvious as not to require enumeration here.

1. ENNICHTHYS MEGALOPS, Grd.

PLATE XXXVII, and, PLATE XXVI, Fig. 10.

SPEC. CHAR.—General appearance gibbous. Dorsal sheath very short. Mouth large and oblique. Eyes very large; circular. Four rows of scales on preopercle. Branchiostegals, six. Eighty-five scales in lateral line. Ash or greyish-brown above. Sides and abdomen dull yellow, or white. A diffused spot upon anterior third of anal. Other fins yellowish. Tip of pectorals blackish, or deep purple.

SYN.—*Holconotus megalops*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 152.

Ennichthys megalops, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1855, 323.

The head constitutes the fourth of the total length, not including the forked portion of the caudal fin. Its upper surface is slightly concave, and the snout rather short. The mouth is above the medium size, its cleft obliquely directed upwards, and the lower jaw projecting beyond the upper. The teeth are numerous and very exiguous, disposed upon a double row on both the upper and lower jaws. The posterior extremity of the maxillaries extend somewhat beyond a vertical line intersecting the anterior rim of the eye. The lips are thin, and the lower one is free all around. The nostrils, situated on the upper surface of the snout, are nearer the eye than the extremity of the upper jaw. The eye is very large, circular; its diameter being contained less than three times in the length of the side of the head, and approximating the cephalic outline above. There are six branchiostegal rays on either side, all well developed. The scales on the cheeks and opercle are large and crowded; the supratympanic patch itself is very conspicuous, and composed of numerous scales.

The body is very much compressed and very deep upon its middle region, tapering rapidly from the origin of the anal backwards. The greatest depth is contained a little over twice and a half in the total length.

The spinous portion of the dorsal fin is composed of nine spines, gradually increasing in height from the first to the sixth, which is the highest; the seventh, eighth, and ninth slightly diminish in size backwards; the anterior articulated ray being to the ninth spine what the latter is to the eighth spine: thus the upper outline of the dorsal descends almost regularly from the sixth spine to the last articulated ray. The base of the soft portion is more than twice that of the spinous; the articulated rays are very slender, bifurcating only once towards the exterior third of their height. The base of the anal is contained about four times in the total length; it is comparatively low, concave upon its middle, and provided anteriorly with three spinous rays, all of which are shorter than any of the articulated rays, which exhibit traces of a division of the second degree. The caudal is slender and forked, contained over five times in the total length, and provided upon its base with small and irregular scales. Divisions of the fourth degree may be observed on some of the longest rays. The insertion of the ventrals is placed a little in advance of a vertical line drawn from the anterior dorsal spine. These fins are broadly developed, rounded externally with highly sub-divided articulated rays upon which a division

of the third degree is well marked. Their external spine is slender and acute. The tip of the longest rays is made to reach and overlap the vent when brought backwards along the abdomen. The pectorals are long and slender; their posterior extremity reaching posteriorly a vertical line scarcely attained by the extremity of the ventrals. Their entire base is placed in advance of a vertical line drawn at the origin of the dorsal fin. The rays sub-divide twice, with traces of a sub-division of the third degree.

The formula of the fins is as follows:

Br. VI: VI; D IX, 27; A III, 36; C 4, 1, 6, 6, 1, 3; V I, 5; P 1, 26.

The scales are of moderate development. The lateral line, which contains about eighty-five of them, is nearly concurrent with the dorsal outline, with a tendency sometimes to assume an appearance rather more gibbous than the back itself. There are seven longitudinal rows of scales between the lateral line and the dorsal groove, and about twenty between that same line and the abdominal contour. The scales (Figs. 3—5) are deeper than long, posteriorly convex, superiorly and inferiorly rounded, and anteriorly nearly straight. The radiating furrows are rather numerous. The dorsal groove is very short, extending from the sixth or seventh dorsal spine to the third or fourth articulated ray; the sheath is formed anteriorly by three and posteriorly by two rows of scales, the inferior rows being smaller than the superior one.

The ground color above is ash or greyish-brown. The sides and the abdomen are dull yellowish or whitish, with a silvery tint. The caudal, dorsal, and anal fins are sulphur yellow at their base, and greyish towards their extremities; the anal, besides, is provided anteriorly with a dark diffused spot. The base of the ventrals is yellow; the rest is deep purple. The pectorals are of a uniform light yellow.

Ten young ones, of an average length of an inch and three or four tenths, were found in the ovaries of the specimen just described. Their general form is elongated, sub-fusiform in profile, already very much compressed. The head is anteriorly rounded, with its upper outline gradually sloping towards the snout. The mouth exhibits its peculiar oblique position. The posterior margin of the caudal is convex; the soft portions of both the dorsal and anal are much higher posteriorly than anteriorly, the reverse of what exists in the adult, and stretching beyond the base of the caudal. The spinous portion of the dorsal is very low, and the spines are gradually ascending from the first to the last. Seven of the latter could be easily detected. The yolk bag is still conspicuously large. The ventral fins have already acquired a certain development as well as the pectorals. The articulated rays of the dorsal and anal fins are all undivided yet, whilst those of the caudal are already bifurcated. The anterior rays of the anal, which correspond to the undivided ones in *Embiotoca*, are more slender and more crowded than the rest. The anal spines are all three visible.

The species inhabit the bay of San Francisco, California, and the coast further north.

Plate XXXVII, fig. 1, represents the female sex of *Ennichthys megalops*, size of life.

Fig. 2 is a section across the line of greatest depth.

Fig. 3, a scale from the dorsal region.

Fig. 4, a scale from the lateral line.

Fig. 5, a scale from the side of the abdomen.

Plate XXVI, fig. 10, represents the young of the same species double its size.

List of specimens.

| Catal. No. | No. of spec | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|-------------|--------------|------------------------|-----------------|---------------------------|----------------------|----------------------|
| 551 | 2 | Adult.. | Presidio, Cal..... | 1853 | Lt. W. P. Trowbridge..... | Alcoholic. | Lt. W. P. Trowbridge |
| 552 | 1 | ..do.... | Humboldt Bay, Cal..... | 1854 |do..... |do..... |do..... |
| 553 | 1 | ..do.... | Astoria, Oregon..... | 1854 |do..... |do..... |do..... |

2. ENNICHTHYS HEERMANNI, Gr d.

PLATE XXXVIII; and, PLATE XXVI, Fig. 9.

SPEC. CHAR.—General form sub-elliptical; snout sub-conical; mouth moderate; posterior extremity of maxillary even with a vertical line intersecting the centre of the pupil. Eyes of medium size. Branchiostegals six. About sixty-two scales in lateral line. Back olivaceous, sides and abdomen silver and golden; flank with indistinct transverse bars or bands. Fins unicolor, yellowish and greyish.

SYN.—*Amphistichus heermanni*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 135.

Ennichthys heermanni, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1855, 323.

The general form of the body is sub-elliptical, rather deep upon its middle. The greatest depth enters about twice and a half in the total length. The back is more regularly arched and the abdominal outline more regular than in *E. megalops*.

The head constitutes the fourth of the total length, leaving out the furcated portion of the caudal fin. Its upper surface is less depressed than in *E. megalops*. The mouth is also much less oblique, hence the extremity of the maxillary extends more backwards, compared to the eye, than in *E. megalops*. The teeth are somewhat stouter than in the latter species. The tongue is large, broad, and thin. The eye is of medium size, sub-circular in shape; their horizontal diameter being contained about four times in the length of the side of the head, exactly once in advance of the anterior rim of the eye and twice posteriorly to it. The cheeks are covered with four sub-concentrical and irregular rows of scales. Six or seven oblique rows may be detected on the opercle. There are six well developed branchiostegal rays on either side.

The spinous portion of the dorsal, formed of nine rays, is highest upon the fourth; the anterior three are the lowest. From the fourth spine the remaining ones gradually diminish to the ninth, which is a little shorter than the anterior articulated ray, thus causing a depression in the upper outline of the entire fin. The base over which the articulated rays extend is not twice the length of that of the spinous portion. Bifurecations of the second degree may be observed upon the middle rays. The base of the anal enters four times and a half in the total length. A row of small scales may be observed over its base. Its external outline is somewhat concave, and anteriorly there are three spiny rays shorter than any of the articulated ones. The latter exhibit traces of a subdivision of the second degree. The caudal constitutes a little less than the fifth of the entire length. The scales occupying its base are proportionally larger than in *E. megalops*. The longest rays subdivide four times. The insertion of the ventrals is situated under the vertical line of the second dorsal spine. The articulated rays of these fins subdivide three times, and the external spine is stout at the base and very acute upon its apex. The pectorals are well developed; their entire base is situated in advance of a vertical line

drawn from the first dorsal spine, and their extremity dots not extend quite as far back as that of the ventrals. The rays are subdivided twice, with traces of a third division.

Br. VI: VI; D IX, 26 + 1; A III, 28 + 1; C, 3, 1, 6, 6, 1, 3; V I, 5; P 1, 26.

The scales are moderately developed; there are sixty-two of them in the lateral line, which is nearly concurrent with the dorsal outline, hence quite arched above the pectorals. Eight longitudinal rows are observed between the lateral line and the dorsal groove, and about twenty-three from the lateral line and the inferior line of the belly. The scales (figs 3—5) are deeper than long, posteriorly convex, superiorly and inferiorly rounded, whilst the anterior margin is somewhat undulated upon a nearly straight line. The dorsal groove extends from opposite the sixth spinous ray to the eleventh articulated one. The sheath is formed anteriorly of three and posteriorly of two rows of scales; the scales in the upper row are much the largest and longest of the three; the inferior row is the shortest and is composed of the smallest scales. Opposite the anterior half of the anal fin there is an area of very small, almost minute, scales; the row running over the base of the rays, again, is a little larger. As usual the scales are larger on the flanks than over the dorsal and sub-thoracic regions.

The ground color is olivaceous above, silver and gold on the sides and abdomen. Traces of dark transverse bars or bands may be observed on the middle region of the body. Scattered blackish spots and dots exist on the dorsal region. The fins appear to be unicolor, some yellowish, others greyish.

A specimen about three inches in total length exhibits the transverse bands more distinctly, nine or ten in number, from the base of the caudal to the thoracic belt. The soft portions of both the dorsal and the anal are proportionally higher than in the adult, and the spinous portion of the dorsal is still lower than the soft, corroborating an observation made by us on the embryo upon the tardy growth of the spiny rays of the fins. The articulated rays of the dorsal and anal fins are all undivided yet, whilst those of the caudal, ventrals, and pectorals, are but once bifurcated. The posterior margin of the caudal having been broken off, we are at a loss to describe its shape.

The ovaries of the specimen above described were found of a very diminutive size. The sheath in which they were contained was not larger than an ordinary quill. A microscopic examination showed distinctly the presence of eggs (Plate XXVI, fig. 9), in a very immature condition, still within the vascular membranes. The protracted immersion of the specimens in alcohol had not changed their general aspect; their contents were somewhat diffused, but a practiced eye could still discern the germinal vesicle, around which the vitelline substance was more condensed than in the remaining space of the sphere.

The species inhabits the Bay of San Francisco, California, and was also observed along the coast further north.

Plate XXXVIII, fig. 1 represents the female sex of *Ennichthys heermanni*, size of life.

Fig. 2 is a section across the line of greatest depth of the body.

Fig. 3, a scale from the dorsal region.

Fig. 4, a scale from the lateral line.

Fig. 5, a scale from the side of the abdomen.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|----------------------------|-----------------|---------------------------|----------------------|--------------------------|
| 549 | 1 | San Francisco, Cal..... | 1853 | Lt. R. S. Williamson..... | Alcoholic. | Dr. A. L. Heermann..... |
| 550 | 1 | Cape Flattery, Oregon..... | 1854 | Lt. W. P. Trowbridge..... | do..... | Dr. John S. Newberry.... |

AMPHISTICHUS, Agass.

GEN. CHAR.—Head rather large. Mouth large; jaws equal. Lips thin, lower one attached by a frenum to the symphysis of lower jaw. Premaxillaries slightly protractile. Teeth stoutish, recurved, conical, and disposed upon a double row on both jaws. Spinous portion of dorsal fin generally lower than the soft and sometimes equal to it in height. Anterior articulated rays of anal divided like the rest and preceded by three spines, the second and third of which being nearly as deep as the first articulated ray. Scales of moderate development. Lateral line concurrent with the dorsal outline. One row of scales along the base of anal. The dorsal groove extends from middle of spinous portion of dorsal fin to about the middle of soft portion of same fin. Sheath formed by two rows of scales anteriorly, tapering into one posteriorly.

SYN.—*Amphistichus*, AGASS. in Amer. Journ. of Sc. 2d series, XVII, 1854, 367.—GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1855, 323.

This genus differs from *Ennichthys*, to which it bears a close affinity, by the conformation of the lower lip, which is united by a frenum to the symphysis of the jaw instead of being free all around. The spinous portion of the dorsal fin is also generally lower, and the dorsal groove and sheath both longer.

A young specimen of this genus we have caused to be represented on Plate XXVI, fig. 13, with a view to illustrate some points in the morphology of the family as well as of the genus. Not being able to refer it with certainty to any of the species of the same genus known to us, we have preferred mentioning it without specific appellation.

1. AMPHISTICHUS ARGENTEUS, Agass.

PLATE XXXIX.

SPEC. CHAR.—General form sub-elliptical, more convex above than below. Snout anteriorly rounded. Posterior extremity of maxillary reaching a vertical line passing behind the pupil. Anterior anal spines rather large. Sixty-eight scales in lateral line. Branchiostegals, six. Bluish grey above, sides silvery with indistinct olivaceous transverse bands. Vertical fins and ventrals olivaceous; pectorals yellowish.

SYN.—*Amphistichus argenteus*, AGASS. in Amer. Journ. of Sc. 2d series, XVII, 1854, 367.—GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 141, 153; and, VII, 1855, 323.

The specimen before us is rather more than eleven inches in total length, in which the head enters about four times. The upper outline is very much convex, the frontal region steep, sloping down towards the snout, with but a slight depression above the orbit. The body, as usual, is very much compressed, its greatest depth being equal to two-fifths of the entire length.

The mouth is rather large, the posterior extremity of the maxillary being even with a vertical line intersecting the posterior rim of the pupil. The front row of teeth are stoutish, conical, slightly curved, occupying the entire circumference of the mouth. The inner row is very exiguous. The lips are not fleshy, though well developed; the lower one is attached to the

jaw by a broad frenum. The nostrils are large and situated close to the anterior rim of the orbit. The position of the eye is quite elevated, being of medium size, sub-circular, having its horizontal diameter comprised a little over four times in the length of the side of the head. The scales on the cheeks are very crowded, disposed without much regularity. On the opercle five rows may distinctly be counted; they are smaller on the sub-opercle. The branchiostegal rays are six on either side and well developed.

A line drawn vertically from the origin of the dorsal fin passes behind the base of the pectorals. The spinous portion is composed of eleven rays, occupying nearly two-fifths of the base of the entire fin. Its upper outline is sloping from the first to the fifth spine, whence it is nearly straight to the eleventh; from the anterior articulated ray backwards it is regularly descending. The articulated rays bifurcate twice. The caudal fin is contained a little more than five times and a half in the total length. Its middle rays exhibit a bifurcation of the fifth degree. The base of the anal enters about four times and a half in the total length. There are three spines at its anterior margin, the second and third nearly as long as the articulated rays. Then, in the male, the fin is separated into two portions by a flattened and sub-triangular ray, anteriorly of which the other rays are swollen and their membrane thickened as in *Embiotoca* and other genera of the same family. The articulated rays, however, are mostly all divided. The rays adjoining the flat triangular one are more or less irregular and exhibit numerous subdivisions. The base of the anal extends a little more backwards than that of the dorsal. The insertion of the ventrals is situated under the vertical line of the third dorsal spine. These fins are broadly developed, extending beyond the vent but not to the anterior margin of the anal, and their rays exhibit a partial bifurcation of the fifth degree. The pectorals are well developed, their extremity reaching the vertical line of the second articulated ray of the dorsal. The rays bifurcate three times with traces of a fourth. The formula of the fins is:

Br. VI: VI; D XI, 24; A III, 7 + 1 + 16 = 24; C 4, 1, 6, 6, 1, 5; V I, 5; P 1, 26.

The scales (figs. 3—5) are of moderate development, deeper than long, rounded upon their superior, posterior, and inferior edges, and sub-truncated anteriorly. Their shape is subjected to great variations in the lateral line and on the abdominal region. This is particularly the case along an area opposite the base of the anal, where they are at the same time much smaller than on any other region. On the other hand, on a vertical area immediately above the triangular spine of that fin they assume a disproportionate size. Along the base of the rays constituting the posterior portion of the same fin, scales may be observed of an elongated shape, forming a double row anteriorly. The lateral line is formed of about sixty-eight scales; seven or eight longitudinal rows may be counted between the latter and the dorsal groove, and about twenty-four rows on the line of greatest depth below the lateral line. The dorsal groove extends from the eighth dorsal spine to about the ninth articulated ray; the sheath above is composed of three irregular series of scales, variable in size, tapering to one row and assuming a more oblong shape.

The ground color above the lateral line is bluish grey or olive, somewhat mottled. The sides are silvery with a golden reflect, particularly on the sides of the head. Irregular and, mayhap, indistinct transverse bands descend along the flanks from the dorsal region. The dorsal, caudal, anal, and ventral fins are olivaceous or yellowish grey. The pectorals are yellowish or straw-color.

The species inhabits the Bay of San Francisco, California.

Plate XXXIX, fig. 1, represents the male sex of *Amphistichus argenteus*, somewhat reduced in size.

Fig. 2 is a transverse section across the line of greatest depth of the body.

Fig. 3 is a scale from the dorsal region.

Fig. 4, a scale from the lateral line.

Fig. 5, a scale from the side of the abdomen.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|-------------------------|-----------------|----------------------------|----------------------|------------------------|
| 557 | I | San Francisco, Cal..... | 1853 | Lt. R. S. Williamson | Alcoholic. | Dr. A. L. Heermann .. |
| 558 | I |do..... | 1853 | Lt. A. W. Whipple |do..... | Dr. C. B. Kennerly.... |
| 559 | I | Presidio, Cal..... | 1853 | Lt. W. P. Trowbridge..... |do..... | Lt. W. P. Trowbridge.. |

2. AMPHISTICHUS SIMILIS, Grd.

PLATE XXXVI, Figs. 5-9.

SPEC. CHAR.—General form regularly sub-elliptical. Snout sub-conical. Posterior extremity of maxillary reaching a vertical line passing in advance of the pupil. Spinous portion of dorsal as high as the soft. Anterior anal spines rather small. Branchiostegal rays, five. Bluish grey above; sides silvery. Dorsal and caudal greyish yellow; anal, ventrals, and pectorals, dull yellowish.

SYN.—*Amphistichus similis*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 135; and, VII, 1855, 323.

This species is very closely allied to the preceding one and, mayhap, not distinct from it. The great disproportion in size between the specimens described, and the fact of their belonging to different sexes, is not calculated to facilitate the comparative study of their specific identity or difference. Thus the more elongated shape of *A. similis* may not be a character constant throughout the entire range of growth. The same remark may be applied to the shape of the snout and the extension of the maxillar bone. Yet the latter trait we find on another specimen one-third larger than the one figured and apparently a male. Now, on both male and female of what we consider as *A. similis*, we find the spinous portion of the dorsal fin of the same height as the soft portion, with a depression in the outline between the two. The latter feature we would consider as a very important character, since we know by the study of the embryo that the spinous portion is of a more tardy development than the soft; now, finding that portion of the fin proportionally higher in a specimen of *A. similis*, much smaller than *A. argenteus*, we were necessarily led to draw a specific distinction between the two. The anal spines, we are inclined to think, are more developed in the male than in the female of the same species, and consequently the value of this character is to be subjected to renewed observations on a more complete series of individuals. We find but five branchiostegal rays on either side in *A. similis*, whilst *A. argenteus* has six of them.

The base of the anal enters exactly five times in the total length. The caudal constitutes less than the fifth of the length. The origin of the ventrals is situated under a vertical line

drawn from the origin of the dorsal, and the same line would pass immediately behind the base of the pectorals. The tips of both the pectorals and ventrals are posteriorly even. The diameter of the eye is contained less than four times in the length of the side of the head.

The articulated rays of the dorsal and anal fins bifurcate once towards their tip. Those of the caudal and ventrals are divided three times, and those of the pectorals twice, with traces of a sub-division of a third degree on some of the tertiary branches.

The formula of the fins is—

Br. V: V; D X, 24; A III, 29; C 4, 1, 6, 6, 1, 3; V I, 5; P 1, 24.

The origin of the dorsal groove is situated beneath the eighth dorsal spine, extending to about the middle of the soft portion of the same fin.

The scales (figs. 7-9) are but very little deeper than long. The lateral line is concurrent with the dorsal outline; the scales of which it is composed number about sixty-six.

The ground color is bluish grey above; the sides being silvery. The dorsal and caudal fin are greyish yellow; the anal, the ventrals, and the pectorals, dull yellowish.

The species inhabits the bay of San Francisco, where the specimen figured has been collected.

Plate XXXVI, fig. 5, represents the female sex of *Amphistichus similis*, size of life.

Fig. 6 is a section across the line of greatest depth of the body.

Fig. 7, a scale from the dorsal region.

Fig. 8, a scale from the lateral line.

Fig. 9, a scale from the side of the abdomen.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|-------------------------|-----------------|---------------------------|---------------------|-------------------------|
| 560 | 1 | San Francisco, Cal..... | 1853 | Lt. R. S. Williamson..... | Alcoholic. | Dr. A. L. Heermann..... |

APPENDIX TO THE EMBIOTOCIDS.

In June, 1854, appeared a paper by Dr. Gibbons, of San Francisco, California, entitled "Description of Four New Species of Viviparous Fishes, from Sacramento River and the Bay of San Francisco," which was soon followed by another, under the title of "Description of New Species of Viviparous Marine and Fresh-water Fishes, from the Bay of San Francisco, and from the River and Lagoons of the Sacramento."* The following genera and species are referred to:

| | |
|---------------------------|--------------------------|
| Holconotus agassizii, | Cymatogaster larkinsii, |
| Holconotus gibbonsii, | Cymatogaster pulchellus, |
| Holconotus fuliginosus, | Cymatogaster ellipticus, |
| Hysterochrysurus traskii, | Hyperprosopon argenteus, |
| Micrometrus aggregatus, | Hyperprosopon arcuatus, |
| Micrometrus minimus, | Mytilophagus fasciatus, |
| Pachylabrus variegatus. | |

Neither of the above papers had come to my knowledge at the time I wrote the first descriptions of the species illustrated in the foregoing monograph. In my subsequent researches upon the fishes of this curious family, I have endeavored to identify the species thus named by Dr. Gibbons, and it is much to my regret that the task has proved too ungrateful. There is no possibility to arrive at a truthful conclusion, unless Dr. Gibbons himself should take the trouble to label a series of specimens of such species as he has described, and send them to the Smithsonian Institution for ulterior comparison.

There being but one species inhabiting the fresh waters of the Sacramento river, and having had specimens of the same, I have referred them to *Hysterochrysurus traskii*.

No doubt that several of the marine species will prove identical with those described by Prof. Agassiz, as well as by myself.

* Proceedings of the Academy of Natural Sciences of Philadelphia, VII, 1854, 105 and 122.

ORDER IV.

PHYSOSTOMI, OR MALACOPTERI.

The fishes of this Order are all so-called Malacopterians, that is to say, fishes whose fins are composed of soft and articulated rays. They have but one dorsal fin, properly so called, which, in some families, possesses a spine at its anterior margin. Sometimes, also, we observe a fatty fold of the skin near the peduncle of the tail—the so-called adipose fin. The ventrals, when extant, are abdominal in their positions, and sometimes also provided with a spine upon their external margin. The swimming or air bladder has an air duct through which it communicates with the throat.

SYN.—*Physostomi*, MÜLL. in *Wieg.* Archiv für Naturg. I, 1845, 131.

Malacopteri, OWEN, Lect. Comp. Anat. Vetebr. 1846, 48.

There are two tribes, or else sub-orders of Physostomians, representing the abdominal Malacopterygians (*Malacopterygii abdominales*), and the apod Malacopterygians (*Malacopterygii apodes*) of Cuvier's classification.

SUB-ORDER I.

APODES.

The ventral fins are wanting. The pectoral fins themselves are not always present. The body is elongated, eel-like in its general aspect. The dorsal and anal fins are oftentimes continuous with the caudal.

SYN.—*Apodes*, LINN. Syst. Nat. ed. XII, 1766.—OWEN, Lect. Comp. Anat. Vertebr. 1846, 48.—Bd. Iconogr. Encycl. II, 1850, 203.

Malacopterygii apodes (in part), MÜLL. in *Wieg.* Archiv für Naturg. I, 1843, 328.

Physostomi apodes s. anguillares, MÜLL. in *Wieg.* Archiv für Naturg. I, 1845, 131 & 136.

We are not aware that any apod malacopterians, as understood under this heading, have so far been noticed along the Pacific coast of the United States. They seem to be wanting even in the fresh waters of California and Oregon.

SUB-ORDER II.

ABDOMINALES.

The ventral fins are inserted under the abdomen, about midway between the base of the pectorals and the origin of the anal; sometimes anteriorly to the middle of that distance, sometimes posteriorly.

SYN.—*Abdominales*, LINN. Syst. Nat. ed. XII, 1766.—OWEN, Lect. Comp. Anat. Vertebr. 1846, 48.—Bd. Iconogr. Encycl. II, 1850, 203.

Malacopterygii abdominales, MÜLL. in *Wieg.* Archiv für Naturg. I, 1843, 317.

Physostomi abdominales, MÜLL. in *Wieg.* Archiv für Naturg. I, 1845, 131 & 136.

The members of this sub-order are much more numerous than those of the preceding one; still, all the families are not represented in the waters, whether fresh or salt, of the Western States and Territories.

Family SILURIDAE, Bonap.

The body is covered with a naked skin, or else protected with bony shields, being always scaleless. The margin of the upper jaw is formed exclusively by the premaxillar bones, whilst the maxillaries are reduced to mere vestiges situated behind the former, or else transformed into barbels stretching beyond the angle of the mouth. All the members of this family are provided with tentacular barbels, varying in number according to the genera. The gill covers or opercular apparatus consists of three bones only: the subopercle being wanting. The handle-like appendage of the thoracic belt (epicoracoid), observed in the rest of the osseous fishes, is also wanting, or exists as a mere process of the said thoracic belt or arch. Their tympanic apparatus is composed of two pieces less than in most of the osseous fishes. There are no pseudobranchiae or accessory gills. The swimming or air bladder exists in most of them and is connected with the organ of hearing through a chain of small auditive bones. The pyloric appendages are wanting. The stomach has the form of a sack. In many we observe a very stout and serrated bony ray at the exterior edge of the ventral fins. Many, also, are provided with an adipose fin besides a true dorsal fin, at the anterior margin of which a strong bony ray is likewise often observed.

SYN.—*Siluridae*, BONAP. Sagg. distr. meth. anim. vertebr. 1831, 114.—DEKAY, New Y. Fauna, IV, 1842, 177.—STORER,

Synops. 1846, 148 —AGASS. Lake Superior, 1850, 278.

Siluroideae, RICHARDS. Faun. Bor. Amer. III, 1836, 132.

Siluroides, CUV. Règn. Anim. II, 1817, 199; 2d ed. II, 1829; &, ed. illustr. Poiss. 239.—CUV. & VAL. Hist. nat.

Poiss. XIV, 1839, 310.

Siluroidei, (AGASS.), MÜLL. in Wieg. Archiv für Naturg. 1843, I, 317

For years past this family has been, on our part, the subject of special investigations, with a view of publishing its monograph as the second of our "Contributions to the Natural History of the Fresh water Fishes of North America." We regret that circumstances will not permit us giving in the following pages a full synopsis of all the species so far determined by us.

No siluroid has as yet been found in the fresh waters of California, Oregon and Washington Territories; neither have they been observed in the salt waters of their coasts.

PIMELODUS, Linn.

GEN. CHAR.—Head smooth like the body. Bands of card or velvet-like teeth upon the jaws; palate toothless. Four pairs of barbels: a maxillar pair, which is the longest, and two pairs under the chin, which are longer than the fourth pair arising from the edge of the postnasal aperture. Opercular apparatus smooth; gill openings continuous under the throat. One dorsal fin provided anteriorly with a spine; an adipose dorsal, opposite to which is the anal; the ventrals being intermediate between the latter and the dorsal fin, properly so called. Pectoral and ventral fins provided upon their external edge with a spine.

SYN.—*Pimelodus*, LINN. Syst. Nat. ed. X, 1758, 304 —GMEL. Linn. Syst. Nat. ed. XIIIa, I, iii, 1788, 1353.—CUV. Règn.

Anim. II, 1817, 200; 2d ed. II, 1829; &, ed. illustr. Poiss. 239.—RICHARDS. Faun. Bor. Amer. III, 1836,

133.—CUV. & VAL. Hist. nat. Poiss. XIV, 1839, 323.—DEKAY, New Y. Faun. IV, 1842, 180.—STORER,

Synops. 1846, 150.—AGASS. Lake Super. 1850, 279.

The genus *Pimelodus*, as here restricted, is yet composed of numerous species, of which two divisions might be made. On the one hand the body is short and thickish, and the head

developed in the same proportions, with a caudal fin rounded, truncated, or sub-truncated; on the other hand the body is slender and elongated, the head assuming the same appearance, the caudal fin being more or less deeply furcated. *Pimelodus catus* would typify the first division, and *Pimelodus furcatus* the second division.

1. PIMELODUS CATULUS, G r d.

PLATE XLI, FIGS. 4—6.

SPEC. CHAR—Head very much depressed, constituting a little less than the fourth of the total length. Jaws equal; mouth of medium size. Eye rather small, sub-circular; its diameter entering about six and a half times in the length of the side of the head, and four times over the interocular space. The base of the anal enters five times in the total length. Caudal posteriorly sub-truncated, and constituting the sixth of the total length. Pectoral spines serrated upon their inner and outer aspects.

Before we allude any further to the zoölogical traits characteristic of the present species, we have a few words to say respecting the accompanying figures: the snout is less acute than in fig. 4; the upper jaw ought not to project beyond the lower one; the postnasal barbels are once again as long as represented on fig. 5; the mental (chin) barbels are longer than exhibited in fig. 6, since both pairs extend beyond the edge of the gill membrane, which forms the posterior outline of said fig. 6; and, finally, the mouth hardly shows in a view from beneath, so that the same ought not to be seen on the same fig. 6, and, if at all exhibited, it ought to extend to the very base of the maxillar barbels, that is, a good deal larger than apparent on that figure.

The body is deeper than long, being compressed along its entire length, more so, however, posteriorly than anteriorly. The head is longer than broad, very much depressed, broader than deep even at the occipital region; it constitutes somewhat less than the fourth of the whole length. In a view from above (fig. 5) the snout appears regularly rounded and rather narrower than a section across the occiput. The jaws are of equal length, and the mouth, although well developed, is but of medium size, when compared to other species, its nearest allies. The eyes are rather small, sub-circular in shape; their horizontal diameter entering about six times and a half in the length of the side of the head, and four times on the interocular space above. The maxillar barbel extends beyond the gill aperture, and somewhat, also, beyond the insertion of the pectoral fins. The nasal barbel and those situated under the chin have already been alluded to; they are, comparatively, quite elongated.

The anterior margin of the dorsal fin is equidistant between the extremity of the snout and the adipose; the spine is missing upon the specimen figured, it having accidentally been broken off; the fin itself is quite narrow and high. The caudal, which constitutes the sixth of the total length, is posteriorly truncated or sub-concave. As to the anal, it is rather deep and of but moderate length, its base entering five times in the total length; the tip of its posterior rays, in being inclined backwards, extend somewhat further back than the posterior edge of the adipose. The ventrals are broad and short, being inserted nearer the anterior edge of the anal than the base of the pectorals; their extremities extend to the origin of the anal, and hence overlap the vent. The pectorals are of moderate development, the spine at their external margin being finely serrated on its outer as well as on its inner aspect.

D I, 6; A 22; C 6, 1, 8, 7, 1, 6; V 8; P I, 9.

Needless to say that the skin is smooth, since it is so in all the species of the genus. The lateral line is nearly straight from the supra-scapular region to the base of the caudal, being, anteriorly, nearer the dorsal than the ventral outline.

The upper regions are greenish brown, whilst the inferior regions are whitish. The fins are olivaceous, at least the rays, for, the interradiial membrane has a proclivity towards a black tint, which is particularly conspicuous on the anal, and but slightly on the ventrals and pectorals.

References to the figures.—Plate XLI, fig. 4, represents *Pimelodus catulus*, size of life. Fig. 5 is an outline of the same, seen from above. Fig. 6 represents the head from beneath.

List of specimens.

| Catal. No. | No. of spec. | Sex. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|-------|---------------------------|-----------------|----------------------|----------------------|----------------------|
| 926 | 1 | ♀ | Fort Smith, Arkansas ---- | 1853 | Lt. A. W. Whipple .. | Alcoholic. | Dr. Geo. G. Shumard. |
| 927 | 5 | ----- | -----do----- | 1853 | -----do----- | -----do----- | -----do----- |

2. PIMELODUS FELINUS, G r d .

SPEC. CHAR.—Head very much depressed, entering four and a half times in the total length. Mouth large; jaws equal. Eye moderate, sub-circular; its diameter being comprised about six times in the length of the side of the head, and about thrice on the interocular space. Dorsal spine slender, posteriorly serrated. Base of anal fin entering four times and one-third in the total length. Caudal rounded off posteriorly, forming the sixth of the total length. Pectoral spines serrated upon their inner and outer edges.

This species is closely allied to the preceding one, from which it chiefly differs by a wider mouth, a broader head, a longer and less deep anal fin, and the rounded off caudal fin. The anterior aspect of the pectoral spine is less conspicuously serrated than in the species just alluded to. On the other hand, the maxillar teeth are more developed, and the patches which they constitute are larger also.

The maxillar barbel extends beyond the insertion of the pectoral; the post-nasal barbel is long and slender, and those under the chin being also quite developed, since both pairs, when stretched, extend beyond the edge of the gill membrane.

D I, 6; A 25; C 7, 1, 8, 7, 1, 8; V 8; P I, 8.

The upper regions are of a uniform chocolate brown tint, whilst the inferior regions are dull white.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimens. | Collected by— |
|------------|--------------|----------------------------------|-----------------|--------------------|------------|----------------------|-------------------|
| 924 | 1 | Trib. of Gypsum creek, Canadian. | 1853 | Lt. A. W. Whipple. | XV. | Alcoholic. | H. B. Möllhausen. |
| 925 | 2 | Coal creek, Ark.----- | 1853 | -----do----- | VI. | -----do----- | -----do----- |

3. PIMELODUS ANTONIENSIS, G r d .

SPEC. CHAR.—Head quite depressed, nearly wedge-shaped, constituting about the fourth of the total length. Upper jaw longest; mouth large. Eye small, sub-elliptical; its diameter entering about eight times in the length of the side of the head, and somewhat over four times in the interocular space. Dorsal spine slender, slightly serrated posteriorly. Base of anal fin somewhat longer than the head. Caudal fin posteriorly rounded, forming a little less than the sixth of the total length. Pectoral spine serrated upon its inner edge. Reddish brown above; whitish beneath.

This species belongs to that division of the genus in which the body assumes a rather short and contracted appearance as well as the head. It reminds us of *P. catus*, *P. catulus*, and *P. felinus*, and such like. The nasal barbel is proportionally long and slender, extending considerably beyond the orbit. The external pair of submaxillar barbels is much longer than the inner pair, and stretches considerably beyond the gill apertures. The anal fin is quite elongated and rounded or convex upon its external margin. The rays are as follows:

Br. VIII: VIII; D I, 6; A 26; C 8, 1, 8, 8, 1, 7; V 8; P I, 9.

The specimen before us measures about seven inches in total length, and an inch and a half as its greatest depth. It is of a uniform reddish brown above, and of a dull white beneath.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected | Whence obtained. | Orig. No. | Nature of specimen. | Collected by— |
|------------|--------------|--------|------------------------|----------------|--------------------|-----------|---------------------|-----------------------|
| 923 | I | Adult. | Near San Antonio, Tex. | 1853 | Lt. A. W. Whipple. | 10 | Alcoholic. | Dr. C. B. Kennerly... |

4. PIMELODUS AILURUS, Grd.

PLATE XLIV.

SPEC. CHAR—Head large, broad and depressed, constituting the fourth of the total length. Mouth large and wide; lower jaw the longest; maxillar barbel extending somewhat beyond the edge of the gill aperture. Eye small and sub-elliptical. Dorsal and pectoral fins interiorly serrated. Base of anal fin entering about five times and a half in the total length. Caudal fin somewhat emarginated posteriorly. Dark reddish brown above; whitish beneath.

This species is rather stoutly built, having a large head, thick and contracted body. It is somewhat related to *P. coenosus*, differing from it by a larger head and an emarginated caudal fin. The lower jaw, which protrudes beyond the upper one, appears also to be a distinguishing feature between the two species. The nasal barbel stretches somewhat beyond the orbit when laid over the head. The insertion of the ventral fins is equidistant between the tip of the snout and the insertion of the caudal fin. The base of the adipose fin is placed opposite the posterior half of the anal.

Br. IX: IX; D I, 6; A 22; C 7, 1, 8, 7, 1, 8; V 8; P I, 8.

The upper region of the head and body is of a dark reddish brown, sometimes almost black, whilst the inferior region is pale white, sometimes of a dirty yellowish.

References to the figures.—Plate XLIV, fig. 1, represents *Pimelodus ailurus*, somewhat reduced in size. Fig. 2, being an outline of a view from above. Fig. 3, exhibiting the under surface of the head.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|--------|--|----------------|----------------------|----------------------|-------------------|
| 904 | I | Adult. | Lake Amelia, near Fort Snelling, Minnesota. | 1853 | Gov. I. I. Stevens.. | Alcoholic. | Dr. Geo. Suckley. |
| 905 | I | Adult. |do..... | 1853 |do..... |do..... |do..... |

5. PIMELODUS LUPUS, G r d .

SPEC. CHAR.—Body subfusiform, compressed; head depressed, broader than deep, anteriorly tapering, and constituting the fourth of the total length. Mouth moderate size, upper jaw the longest. Maxillar barbel extending to about the middle of the pectoral fin. Eye sub-elliptical, of medium size, its diameter entering nearly seven times in the length of the side of the head, and about three times in the interocular space. Dorsal spine very obtusely denticulated towards its upper extremity; pectoral spine very conspicuously so. Caudal fin moderately furcated. Base of anal fin shorter than the head, and contained nearly five times in the total length. Blackish brown above, dull white or light slate colored beneath.

This species resembles somewhat *P. vulpes* (figured in the Rep. to the U. S. and Mexican Boundary Commission) in its general physiognomy, differing, however, from the latter by a proportionally shorter head. It belongs to that division of the genus in which the body and head assume a rather slender appearance. It is, however, more compactly built than most of its allies. The rays of the fins are:

Br. VII: VII; D I, 6; A 24; C 10, 1, 8, 7, 1, 10; V 8; P I, 9.

The insertion of the ventrals is nearly equidistant between the extremity of the snout and the insertion of the caudal. These fins themselves are broad, overlapping the vent and reaching the anterior margin of the anal when stretched backwards alongside the abdomen. The nasal barbels are slender, and do not extend as far as the posterior rim of the orbit.

The upper region is dark brown with a metallic reflect, the head beneath being dull white and the abdomen light bluish or slate colored.

List of specimens.

| Catal. No. | No. of specs. | Age. | Locality. | When collected | Whence obtained | Nature of spec. | Collected by— |
|------------|---------------|---------|-------------------------------|----------------|------------------|-----------------|-----------------|
| 915 | 1 | Young | From Indianola to Nueces... | 1854 | Capt. John Pope. | Alcoholic..... | Capt. Pope..... |
| 916 | 3 | Adult.. | Head waters of the Rio Pecos. | 1854 |do..... |do..... |do..... |

6. PIMELODUS OLIVACEUS, G r d .

PLATE XLI, FIGS. 1—3; and PLATE XLII.

SPEC. CHAR.—Body sub-fusiform, compressed. Head very much depressed and tapering, constituting about the fifth of the whole length. Mouth small; upper jaw the longest. Maxillar barbel extending to the middle of the pectoral fin. Eye large, sub-elliptical; its diameter contained five times and a half in the length of side of head, and about twice on the interocular space. Dorsal spine very finely serrated posteriorly; pectoral spine very strongly so. Caudal fin deeply furcated. Olive-brown above; olive-white beneath.

The body and head have a rather slender appearance. It is allied to *P. coelurescens*, from which it appears to differ by several minor characters, which we must refrain for the present to express comparatively in words, not having before us the specimens of the typical *P. coelurescens*, preserved in the museum of the Smithsonian Institution, but not available at the time these pages were passing through the press. We have counted the rays upon specimens from the Yellowstone river, and found them to be as follow:

Br. VII: VII; D I, 6; A 26; C 10, 1, 8, 7, 1, 9; V 8; P I, 8.

The nasal barbel is slender and rather short, and when stretched along the surface of the head not extending as far posteriorly as the hinder rim of the orbit, but averaging about between the latter and the pupil.

An olivaceous tint pervades throughout, rather brownish above and whitish beneath.

References to the figures.—Plate XLl, fig. 1, represents, size of life, a specimen of *Pimelodus olivaceus*, caught in the Yellowstone river. Fig. 2 is a view from above. Fig. 3, the head seen from beneath.

Plate XLII represents the same species, size of life, from Fort Pierre, Nebraska. The mouth as delineated in fig. 3 is a good deal too small, by a mistake of the draughtsman. The anal and adipose fins in fig. 1 are likewise somewhat incorrectly drawn.

List of specimens.

| Catal. No. | No. of specs. | Age. | Locality. | When collected | Whence obtained. | Orig'l No. | Nature of specs. | Collected by— |
|------------|---------------|-------------|----------------------------------|----------------|------------------------------|------------|------------------|----------------------|
| 906 | 5 | Ad'lt & Y'g | Fort Pierre, Nebraska. | 1853 | Dr. John Evans | | Alcoholic | Dr. Evans. |
| 907 | 2 | Adult | Milk river, Missouri | 1853 | Gov. I. I. Stevens | | do. | Dr. Geo. Suckley. |
| 908 | 1 | do. | Yellowstone, Nebraska. | 1854 | Col. A. Vaughan | | do. | Dr. F. V. Hayden |
| 909 | 6 | Young | Near the mouth of Poteau river. | 1853 | Dr. G. G. Shumard | | do. | Dr. G. G. Shumard |
| 910 | 1 | do. | Arkansas river, near Fort Smith. | 1853 | do. | | do. | do. |
| 911 | 1 | do. | Nebraska | 1856 | Mr. Walker | 12 | do. | Mr. Walker |

Family CYPRINIDÆ.

With a few exceptions¹ the mouth is but little cleft, and the jaws weak and toothless, the upper one being formed exclusively by the premaxillaries, behind which the maxillaries are situated. The inferior pharyngeal bones are armed with quite large teeth, the upper pharyngeals being wanting. The base of the cranium, which corresponds to the inferior pharyngeals, exhibits a process of the skull, in most cases covered with a horny plate. The body is generally elongated, covered with scales, cycloid in structure². One dorsal fin, occasionally provided at its anterior margin with a stout and strong spiny ray, but there is no adipose. The stomach has no cul-de-sac (*cæca*), and pyloric appendages are also wanting. The swimming or air bladder is in most cases divided into an anterior and a posterior portion, and is furthermore connected with the organ of hearing through a chain of so-called auditive bones. The external surface of the swimming or air bladder is remarkable for the tail-like distribution of its blood vessels. There are four complete branchial arches, the accessory gills (pseudo-branchiæ) varying according to the genera; sometimes they are gill-like, comb-like, or even glandulous, in which latter case they are covered by the mucous membrane of the branchial apertures; at others they appear to be entirely missing.

SYN.—*Cyprins*, Cuv. Rêgn. Anim. II, 1817, 190.

Cyprinoides, Cuv. Rêgn. Anim., 2d ed. II, 1829; and, ed. Illustr. Poiss. 214.—Cuv. & Val. Hist. nat. Poiss. XVI, 1842, 1.

Cyprinidæ, BONAP. Sagg. distr. anim. vertebr. 1831, 113.—DE KAY, New Y. Fauna, IV, 1842, 188.—STORER, Synops. 1846, 154.

Cyprinoideæ, RICHARDS. Faun. Bor. Amer. III, 1836, 109.

Cyprinoidæi (Agass.), MÜLL. in Weigm Archiv. für Naturgesch. I, 1843, 319.

We had contemplated giving more copious details respecting the species of this family than

¹ *Ptychocheilus* and *Clinostomus*.

² Except *Aulopyge* and *Meda*, which are scaleless.

we are able now to offer to our readers. Although years have already been devoted to this report, the subject is one of such magnitude that justice could not be done to it in all its parts. But as already stated, such families as are now briefly passed in review will be taken up *seriatim* hereafter. A good deal is to be added to the Iconography of this family, and many corrections are demanded upon several of the accompanying figures.

TRIBE OF CYPRINA.

Of the two genera of this group or tribe, whichever called, that have come to our knowledge within the territory, the ichthyic fauna of which we have now under investigation, one is provided with a buccal or rather maxillar barbel (*Mylocheilus*), whilst the other has none (*Mylopharodon*). The presence or absence of barbels, therefore, does not seem of primary import here. The teeth are of the molar kind (*Dentes molares*) of the grinding type (*D. masticatorii*), without grooves or ridges, and are disposed upon two permanent—and a third, deciduous—rows, thus: 3 | 2 | 5—5 | 2 | 3. The ventrals are inserted in advance of the anterior margin of the dorsal.

SYN.—*Cyprini*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 168.

MYLOCHEILUS, Agass.

GEN. CHAR.—Head elongated and sub-conical, rounded upon the snout, which overlaps the lower jaw. The mouth is sub-terminal, horizontal, of medium size, and provided at its angle with a maxillar barbel. The eye is well developed; the isthmus rather narrow. The body is elongated, lanceolated, compressed, sub-fusiform in profile. Pectoral fins slenderer than the ventrals, the latter being inserted under the anterior portion of the dorsal. Caudal fin furcated. Scales of medium size, longer than deep, with radiating grooves upon their posterior section only. The lateral line follows the middle of the flanks. The pharyngeal bones are stoutish, expanded upon their convexity, with the inferior limbs very short. The teeth are inserted upon a very much inclined plan, raised from the surface of the bone itself, from below upwards. They are disposed upon two permanent rows of five and two, and a third deciduous row of three in the thickness of the gum: 3 | 2 | 5—5 | 2 | 3. They are of the molar kind of the grinding type, but without grooves and ridges.

SYN.—*Mylocheilus*, AGASS. in Amer. Journ. of Sc. 2d series, XIX, 1855, 229.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 169.

We are acquainted so far with but two genera of this tribe within the limits of the United States, both being peculiar to the western slope of the Rocky mountains.

1. MYLOCHEILUS CAURINUS, Grd.

PLATE XLVI, FIGS. 1—4.

SPEC. CHAR.—Head entering four times and three quarters in the total length. Snout rounded and sub-conical, though rather blunt. Posterior extremity of maxillary extending to a vertical line drawn across the posterior rim of the hind nostril. Diameter of the eye contained five times and a half in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Anterior basal edge of ventrals situated opposite the third developed ray of the dorsal. Base of anal fin contained twelve times in the total length. Brownish black above; yellowish gold beneath. Two lateral darker bands, the inferior one not extending quite so far back as the vent.

SYN.—*Cyprinus (Leuciscus) caurinus*, RICH. Faun. Bor. Amer. III, 1836, 304.

Mylocheilus caurinus, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 169.

This species has much of the general appearance of the following two, more, perhaps, of *M. fraterculus* than *M. lateralis*. The most prominent difference resides in the pharyngeal bones being less expanded upon the superior limb, which is much more developed also. The inferior

limb is also more slender. The head is more elongated, more conical than in *M. lateralis*, and larger than in *M. fraterculus*. The mouth is larger than in either of the two species just alluded to. The fins are well developed; the dorsal and anal both are deeper than long; their formula reads:

D 2, 8 + 1; A 2, 8 + 1; C 8, 1, 9, 8, 1, 7; V 1, 9; P 17.

The scales are sub-elliptical, somewhat smaller on the abdominal region than on the dorsal region.

References to the figures.—Plate XLVI, fig. 1, represents *Mylocheilus caurinus*, size of life. Fig. 2, a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catal. No. | Correspond'g No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|----------------------------|--------------|-------|---------------------|-----------------|----------------------|----------------------|-----------------------|
| 213 | 2770 | 12 | Adult | Astoria, O. T. | 1855 | Lt. W. P. Trowbridge | Alcoholic. | Lieut. Trowbridge ... |

2. MYLOCHEILUS LATERALIS, Agass. & Pick.

PLATE XLV, FIGS. 5—8.

SPEC. CHAR.—Head constituting the fifth of the total length. Snout sub-conical. Posterior extremity of the maxillary extending to a vertical line drawn across the hind nostril. Diameter of the eye entering five times and a half in the length of the side of the head. Anterior margin of dorsal fin equi-distant between the extremity of the snout and the insertion of the caudal. Base of anal fin contained fourteen times in the total length.

SYN.—*Mylocheilus lateralis*, AGASS. & PICK. in Amer. Journ. of Sc. 2d ser. XIX, 1855, 231.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 169.

Although the dorsal and anal are both deeper than long, the length of the latter is proportionally less than in the preceding and the following species. The fins present the general aspect, with a few differences in the number of the rays:

D 1, 8 + 1; A 1, 9; C 8, 1, 9, 8, 1, 9; V 1, 10; P 19.

The scales exhibit, also, the same general characters; their anterior margin, however, appears to be more irregular; hence their outline assumes a somewhat less elliptical form.

References to the figures.—Plate XLV, fig. 5, represents *Mylocheilus lateralis*, size of life. Fig. 6, a scale from the dorsal region. Fig. 7, a scale from the lateral line. Fig. 8, a scale from the abdominal region.

List of specimens.

| Catal. No. | Correspond'g No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|----------------------------|--------------|-------|---|-----------------|--------------------------|----------------------|------------------------|
| 212 | 2769 | 3 | Adult | Fort Steilacoom, Puget's Sound, Wash. Ter. | 1853 | Gov. I. I. Stevens. | Alcoholic. | Dr. Geo. Suckley. |

3. MYLOCHEILUS FRATERCULUS, Grd.

PLATE XLV, FIGS. 1—4.

SPEC. CHAR.—Head entering five times and a half in the total length. Snout sub-conical. Posterior extremity of maxillary reaching a vertical line intersecting the nostrils. Diameter of the eye contained five times in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Base of anal fin contained twelve times in the total length.

SYN.—*Mylocheilus fraterculus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 169.

This species is closely allied to the preceding one by the shape of its pharyngeal bones, differing from it by a more slender body, much smaller head, and a larger eye. The dorsal and pectoral fins are likewise smaller, but there is no appreciable differences in the number of the rays.

D 1, 8 + 1; A 2, 9; C 7, 1, 9, 8, 1, 7; V 1, 10; P 19.

The scales are also irregular in their outline, and proportionally deeper. They appear to be a good deal smaller on the abdominal region than on the dorsal region.

References to the figures.—Plate XLV, fig. 1, represents *Mylocheilus fraterculus*, size of life. Fig. 2, a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catal. No. | Correspond'g No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|----------------------------|--------------|--------|------------------|-----------------|-----------------------|----------------------|-----------------------|
| 211 | 2768 | 3 | Adult. | Monterey, Cal... | 1855 | Lt. W. P. Trowbridge. | Alcoholic. | Lieut. Trowbridge ... |

MYLOPHARODON, Ayres.

GEN. CHAR.—Head sub-conical and tapering. Snout overlapping the lower jaw. Mouth rather deeply cleft, with its gape horizontal; no maxillar barbel. The eye is small or moderate. The isthmus is narrow. Body elongated, subfusiform, compressed. Pectoral fins smaller than the ventrals, the latter being inserted in advance of the anterior margin of the dorsal. Caudal fin furcated. The scales are rather small, exhibiting radiating furrows upon their posterior section only; the lateral line running below the middle of the flanks. The teeth are disposed upon an external deciduous row of two or three, and two permanent rows of two and four or five, thus: 2 | 2 | 5—5 | 2 | 2, or 3 | 2 | 4—4 | 2 | 3. The crown is quite compressed.

SYN.—*Mylopharodon*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 35.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 169.

This genus is most closely related to *Mylocheilus*. The species which it includes are remarkable for their elongated body, their sub-conical and tapering head, their deeply-cleft mouth; the ventrals being inserted in advance of the anterior margin of the dorsal, the caudal furcated, and the isthmus narrow. But *Mylopharodon* has no barbels upon either maxillaries or the angle of the mouth. The pharyngeal bones are likewise stoutish, but the inferior limb is more elongated than in *Mylocheilus*, though a little smaller than the upper limb. We observe the same system of dentition; but the crown of the teeth is much more compressed than in *Mylocheilus*.

1. MYLOPHARODON CONOCEPHALUS, Grd.

PLATE XLVI, FIGS. 5—8.

SPEC. CHAR.—Head sub-conical. Posterior extremity of maxillar bone not extending as far as the anterior rim of the orbit. Eye well developed. Pectoral and ventral fins of moderate size. Vertical fins well developed. Anal and dorsal much deeper than long. Base of anal entering twelve times and a half in the total length. Brown above; whitish beneath.

SYN.—*Gila conocephala*, B. & G. in Proc. Acad. Nat. Sc., Philad. VII, 1854, 134.

Mylopharodon conocephalus, GRD. in Proc. Acad. Nat. Sc., Philad. VIII, 1856, 169.

There was but one specimen of this species collected, about seven inches and a half in length. Its general shape is sub-fusiform, compressed; the back slightly convex from the nape to the posterior margin of the dorsal fin. The head is sub-conical and contained exactly four times in the length, the caudal fin excluded. The mouth is comparatively large, although the posterior extremity of the maxillar bone does not quite extend to the anterior rim of the eye; the snout being prolonged, and the cleft of the mouth nearly horizontal. The eye is sub-circular and its diameter contained five times and a half in the length of side of head. The anterior margin of the dorsal is nearer the end of snout than to the tip of the central rays of the caudal. The furcated caudal participates of the slender appearance of the body. The origin of anal is situated behind the base of the dorsal. The insertion of the ventrals is situated in advance of the anterior margin of dorsal; their tip reaching the anus.

D 2, 9; A 2, 9; C 8, 1, 9, 8, 1, 9; V 1, 9; P 16.

The scales are sub-circular and of medium size; the lateral line forms an open curve along the sides, the convexity of which is downwards.

The upper regions of body and head are brown; the sides yellowish; and the abdomen whitish.

References to the figures.—Plate XLVI, fig. 5, represents *Mylopharodon conocephalus*, size of life. Fig. 6 is a scale from the dorsal region. Fig. 7, a scale from the lateral line. Fig. 8, a scale from the abdominal region.

List of specimens.

| Catal. No. | Correspond'g No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|----------------------------|--------------|--------|-----------------------|-----------------|-----------------------|---------------------|---------------------|
| 243 | 2795 | 1 | Young. | Rio San Joaquin, Cal. | 1853 | Lt. R. S. Williamson. | Alcoholic. | Dr. A. L. Heermann. |

2. MYLOPHARODON ROBUSTUS, Ayres.

PLATE XLVII.

SPEC. CHAR.—Upper surface of head very declivous; snout tapering, almost wedge-shaped. Posterior extremity of maxillary extending to a vertical line drawn across the anterior rim of the orbit. Eye of medium size. Pectoral and ventral fins broad and stout. Anal nearly as large as the dorsal. Ground color olivaceous, darker above than below.

SYN.—*Mylopharodon robustus*, AYRES, in Proc. Cal. Acad. Nat. Sc., I, 1855, 33.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 169.

This species is closely allied to the preceding one. The head is contained four times and a half in the total length. The diameter of the eye entering nearly eight times in the length

of the side of the head. The anterior margin of the dorsal is nearer the tip of the central rays of the caudal than the extremity of the snout. The base of the anal enters but eleven times in the total length. The insertion of the anal is comparatively more anterior than in *M. conocephalus*, and that of the ventrals also. We count the rays as follows:

D 2, 8 + 1; A 2, 8 + 1; C 6, 1, 9, 8, 1, 6; V 1, 9; P 18.

The dorsal scales appear to be sub-circular, deeper than long; whilst those of the lateral line and of the abdominal region are longer than deep and somewhat irregular in their outline.

The largest specimen, from which the accompanying figure was made, measures eighteen inches and a half in total length.

The one received from Dr. Ayres is smaller, measuring but sixteen inches. Both were purchased in the market of San Francisco, and are reported as having been caught in the San Joaquin river.

References to the figures.—Plate XLVII, fig. 1, represents *Mylopharodon robustus*, reduced in size. Fig. 2 is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catal. No. | Corres. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|-----------------------|--------------|----------|------------------------|-----------------|----------------------------|------------|---------------------|-----------------------|
| 244 | 2796 | 1 | Adult. | San Francisco, Cal --- | 1855 | Lt. R. S. Williamson ----- | | Alcoholic. | Dr. John S. Newberry. |
| 934 | ----- | 1 | ---do--- | ---do----- | 1856 | Dr. W. O. Ayres----- | 1 | ---do--- | Dr. W. O. Ayres ---- |

TRIBE OF CATOSTOMI

The distinguishing characters of the suckers or Catostomi as a peculiar group consist, in the first place, in the structure and position of the mouth, which is surrounded with large and fleshy lips, situated under the protruding snout, and in the absence of barbels. The pharyngeal bones are sickle-shaped, varying in the curvature of the dental portion and also in the inferior branch. The teeth are numerous, disposed upon one single series; the inferior ones being longest, the others diminishing in size upwards. To use the expression of Heckel, the teeth are pectiniform (*Dentes pectiniformis*), that is, arranged like a comb. The anterior margin of the dorsal fin is situated in advance of the insertion of the ventrals.

Modifications of these characters, associated with others, will furnish the means of distinguishing the genera.

SYN.—*Catostomi*, AGASS. in Amer. Journ. of Sc., 2d series, XIX, 1855, 73.—GRD. in Proc. Acad. Nat. Sc. Philad., VIII, 1856, 170.

The scarcity of materials at our command will compel us to give a very brief diagnosis of the generic characters to be assigned to *Carpiodes*.

CARPIODES, Rafin.

GEN. CHAR.—Mouth rather small, inferior, protractile, tubuliform when protracted, surrounded by narrow lips, transversely folded. Lower jaw shorter than the upper.

SYN.—*Carpiodes*, RAFIN. Ichthyol. Ohiens., 1820, 56.—AGASS. in Amer. Journ. of Sc. and Arts, second series, XIX, 1855, 74.

The above are the only characters which we have so far been able to detect as properly belonging to *Carpiodes*, leaving aside the pharyngeal bones and the teeth. In *Bubalichthys* “the mouth opens obliquely downwards and forwards, the lower jaw being nearly as long as the upper. The lips are small and granulated.” In *Ictiobus* “the mouth opens directly forwards, and is large and round. The lips are small, smooth and thin.” Whatever else has been said concerning generic differences between these three genera we have not found them to apply strictly. But, as already stated, we lack materials, for the present, and must defer to a future opportunity the revision of this curious group of fishes.

CARPIODES DAMALIS, Grd.

PLATE XLVIII, FIGS. 1—4.

SPEC. CHAR.—Head constituting the fifth part of the total length. Eye sub-circular, its diameter being contained four times and a half in the length of the side of the head. Angle of the mouth reaching a vertical line drawn in advance of the pupil. Insertion of ventral fins opposite the seventh ray of the dorsal. Caudal posteriorly concave. Dorsal fin superiorly concave. Lower fins moderately developed. Scales deeper than long, grooved on all sides. Reddish brown above; silvery beneath.

SYN.—*Carpiodes damalis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 170.

I have before me a specimen of this species measuring seven inches and three-quarters in total length. The greatest depth of the body is contained about three times and a half in that length, whilst the head constitutes the fifth part of it. The dorsal is much longer than high anteriorly; its anterior margin is nearer the end of the snout than the insertion of the caudal fin, which is posteriorly concave. The origin of the ventrals is situated opposite the fifth developed ray of the dorsal, the seventh in the series. The pectorals are small. The branchiostegals are three on either side.

Br. III: III; D 27; A 10; C 4, 1, 8, 8, 1, 3; V 10; P 16.

The anterior two rays, in both the dorsal and anal fins, are rudimentary, as also the exterior one in the ventrals.

The eye is sub-circular, its diameter being contained four times and a half in the length of the side of the head. The snout is sub-conical. A line drawn perpendicularly to the angle of the mouth would pass in advance of the pupil. The sub-opercle is largely developed, and contrasts greatly with its reduced size in *C. (L.) tumidus*, figured in the report of the United States and Mexican Boundary Survey.

The scales are very large; thirteen lateral rows may be counted from the anterior margin of the dorsal to the insertion of the ventrals. They are somewhat higher than long, with radiating furrows all around, more numerous upon the anterior section than elsewhere. The lateral line undergoes a slight fall upon the thorax, then runs straightway to the base of the caudal along the eighth row of scales under the anterior margin of the dorsal.

References to the figures.—Plate XLVIII, fig. 1, represents, size of life, *Carpiodes damalis*. Fig. 2, a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catal. No. | Corr. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|---------------------|--------------|--------|---|-----------------|-----------------------|---------------------|---------------------|
| 178 | 2742 | 1 | Adult. | Milk river, affluent of Upper Missouri. | 1853 | Gov. I. I. Stevens... | Alcoholic. | Dr. Geo. Suckley... |
| 178 | 2742 | 12 | Young |do..... | 1853 |do..... |do..... |do..... |
| 179 | ..... | 1 | ..... | Fort Pierre, Neb..... | 1854 |do..... |do..... | Dr. Jno. Eva s..... |

MOXOSTOMA, Rafin

GEN. CHAR.—The body is elongated, compressed; the head small; the mouth small also, opening obliquely forwards and downwards. The lips are small and transversely ridged; the inferior one being slightly bilobed. The anterior margin of the dorsal is situated in advance of the insertion of the ventrals. The dorsal fin itself is either higher than long, or else its length is equal to its height, varying somewhat according to the sexes, as well as the anal, which is, however, always deeper than long. The shaft of the pharyngeal bones constitutes a very open curve, the convex margin of which is regular and entire. The teeth themselves are very much compressed, strongly curved inwardly, and much larger inferiorly than superiorly.

SYN.—*Moxostoma*, RAFIN. Ichth. Ohiens. 1820, 54.—AGASS. in Amer. Journ. o Sc. 2d series, XIX, 1855, 84.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 170.

The most striking character by which this genus may be recognized amongst the other cyprinoids, it must be conceded, is the absence of that lateral line possessed by almost every fish. In other respects it resembles *Ptychostomus* and *Catostomus*, from which it, however, differs by the structure of the pharyngeal bones and the teeth.

The scales are longer than deep, and so very much imbricated that they appear deeper than long. They are furrowed upon their anterior and posterior sections; the grooves being much more numerous posteriorly than anteriorly, giving often the body a striated appearance.

MOXOSTOMA CLAVIFORMIS, Grd.

PLATE XLVIII, FIGS. 5—9.

SPEC. CHAR.—Head constituting the fifth of the total length. Mouth rather small; lips conspicuously plaited or ridged. Eye moderate sized, circular; its diameter contained about four times in the length of the side of the head. Anterior margin of dorsal fin nearer the snout than the base of the caudal. Ventrals inserted opposite the fifth ray of the dorsal. Caudal fin posteriorly concave. Anal fin narrow and deep. Scales much longer than deep, very much imbricated. Yellowish brown, rather dusky along the dorsal region.

SYN.—*Moxostoma claviformis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 171.

Its general outline has a club-shaped appearance, a trait, though more or less generical, is especially characteristic here. The largest specimens which we have examined are four inches in total length, and in all probability not very immature. The greatest depth, taken across the pectoral region, is contained four times and a half in the total length, in which the head enters five times. The eye is circular and moderate in development, contained a little over four times in the length of the side of the head. The upper margin of the dorsal fin is sub-convex; its anterior margin is nearer the tip of the snout than the insertion of the caudal fin. The caudal is concave posteriorly; the anal narrow and deep. The ventrals are inserted opposite the fifth ray (or third developed one) of the dorsal, and their tips do not extend as far back as the tips of the posterior rays of the dorsal fin when bent along the dorsal line.

D 13 ; A 10 ; C 4, 1, 8, 8, 1, 3 ; V 9 ; P 15.

The scales are sub-elliptical in general shape, presenting no grooves upon their lateral sections, but few upon the anterior section, and numerous posteriorly upon that section of the scale that is exposed.

The color is yellowish brown, lighter beneath than above, where a dusky hue sometimes prevails. The sides and inferior surface of the head are likewise rather yellowish olive.

References to the figures.—Plate XLVIII, fig. 5, represents *Moxostoma claviformis*, size of life. Fig. 6, an outline from above. Fig. 7, a section of the body, taken across the line of greatest depth. Fig. 8, a scale from the dorsal region. Fig. 9, a scale from the abdominal region.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimen. | Collected by— |
|------------|--------------|----------------|--|-----------------|-------------------|-----------|---------------------|-------------------|
| 165 | 5 | Adult & Young. | Coal Creek, tributary of south fork of Canadian river. | 1853 | Lt. A. W. Whipple | VI | Alcoholic. | H. B. Möllhausen. |

PTYCHOSTOMUS, Agass.

GEN. CHAR.—Head short and stout. Mouth protractile and directed downwards. Transverso folds or ridges upon the lips. Inferior lip but slightly lobed. Body sub-fusiform, elongated, covered with well developed scales, as large anteriorly as posteriorly.

SYN.—*Ptychostomus*, AGASS. in Amer. Journ. of Sc. 2d series, XIX, 1855, 88.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 172.

Resembles *Catostomus* in its general appearance. The height of the dorsal may be either equal to its length or somewhat higher than long. The wing-like expansions of the pharyngeals is anything but characteristic of this genus. The conspicuous lateral line will at once distinguish it from *Moxostoma*. The mouth is much more protractile, and directed more downwards than in the latter mentioned genus.

PTYCHOSTOMUS HAYDENI, Grd.

PLATE XLIX, FIGS. 1—4.

SPEC. CHAR.—Body sub-fusiform. Head contained five times and a half in the total length. Eye sub-circular, moderate sized; its diameter entering five times in the length of the side of the head. Dorsal fin higher than long; its anterior margin being much nearer the tip of the snout than the insertion of the caudal. The latter is furcated. Insertion of ventral fins situated opposite the middle of the dorsal. Anal much deeper than broad. Pectoral moderate sized. Scales longer than deep, furrowed upon their anterior and posterior sections.

SYN.—*Ptychostomus haydeni*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 172.

The head is contained five times and a half in the total length. The body is sub-fusiform, very regular in its outline. The eye is sub-circular and moderate in its development; its diameter being contained five times in the length of the side of the head. The opercle is largely developed, whilst the sub-opercle is small, a character which is more or less generical. The dorsal fin is somewhat higher than long; its upper margin is sub-concave, its anterior margin being nearer the tip of the snout than the base of the caudal. The caudal is furcated.

The origin of the ventrals is situated in advance of the middle of the dorsal. The tips of the pectorals reach a vertical line drawn from the origin of the dorsal.

D 15 ; A 10 ; C 4, 1, 8, 8, 1, 3 ; V 10 ; P 17.

There are two rudimentary rays at the anterior margin of both the dorsal and the anal, and one at the exterior margin of the ventrals ; these are all summed up in the formula. Thirteen rows of scales may be counted between the origin of the ventrals and the anterior margin of the dorsal ; the scales themselves are longer than deep, provided with radiating furrows upon their anterior and posterior sections, the margin of which is irregularly convex. The lateral line runs through the median row of scales.

References to the figures.—Plate XLIX, fig. 1, represents, size of life, *Ptychostomus haydeni*, from the Yellowstone river. Fig. 2, a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens

| Catal. No. | Corresponding No. of teeth | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|----------------------------|--------------|--------|-------------------------------|-----------------|---------------------|---------------------|------------------|
| 172 | 2759 | 2 | Adult. | Yellowstone river..... | 1854 | Col. A. Vaughan. | Alcoholic. | Dr. F. V. Hayden |
| 173 | | 1 | ..do.. | Missouri river at Fort Pierre | 1854 | Gov. I. I. Stevens. |do.... | Dr. John Evans. |

ACOMUS, Girard.

GEN. CHAR.—The head is very elongated; the lips being papillated and the lower one very deeply cleft. The dorsal fin is higher than long, and the scales are much smaller upon the anterior region of the body than posteriorly. The pharyngeals are gently arched and not expanded; the teeth, compressed and bituberculated, the inner projection conspicuous; the outer one obsolete though existing.

SYN.—*Acomus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 173.

The lips being papillated and the inferior one cleft as in *Catostomus*, the distinction between this genus and the one just alluded to consists chiefly in a more elongated head and the disproportion in the size of the scales of the anterior and posterior region of the body. The pharyngeal bones and teeth will also afford some structural peculiarities, enabling us to discriminate between the species belonging to either of these two genera.

1. ACOMUS GENEROSUS, GRD.

SPEC. CHAR.—Head constituting the fifth of the total length; mouth moderate sized; lips rather small, covered with uniform granules. Eye small, sub-circular; its diameter entering five times in the length of the side of the head. Anterior margin of dorsal fin equi-distant between the extremity of the snout and the insertion of the caudal. Extremities of ventrals not reaching the vent; their origin taking place under the posterior third of the dorsal. Olivaceous above, blotched with blackish; yellowish olive beneath. Fins unicolor.

SYN.—*Catostomus (Acomus) generosus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 174.

It is a rather short and contracted species, particularly when compared to *A. griseus*. The head constitutes about the fifth of the total length. The lips are less developed than in *A. griseus*, and the tubercles uniform throughout. The eye is moderate sized and sub-circular; its diameter entering five times in the length of the side of the head. The anterior margin of the dorsal fin is equi-distant between the tip of the snout and the insertion of the caudal fin. The

scales are larger than in *A. griseus*, especially those on the anterior portion of the body. The lateral line runs nearly straight along the middle of the flanks to the base of the caudal.

The color of the dorsal region and sides of the body is olivaceous, obscurely dark blotched; the inferior regions being unicolor, yellowish olive. All the fins assume the latter tint.

List of specimens.

| Catal. No. | No. of pec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|-------------|---------------------------|-----------------|--------------------------|---------------------|--------------------------|
| 256 | 3 | Cotton-wood creek, Utah.. | I 4 | Lieut. E. G. Beckwith .. | Alco olic ... | Lieut. E. G. Beckwith .. |

2. ACOMUS GRISEUS, Grd.

PLATE XLIX, FIGS. 5—9.

SPEC. CHAR.—Head constituting the fifth of the entire length. Mouth moderate sized. Granules of lower lip largest close to the mouth. Eye small, sub-elliptical; its longitudinal diameter entering about seven times in the length of the side of the head. Anterior margin of dorsal fin equi-distant between the extremity of the snout than the insertion of the caudal. Extremities of ventrals not reaching the vent, their origin taking place under the posterior third of the dorsal. Greyish brown above; whitish or yellowish beneath.

SYN.—*Catostomus (Acomus) griseus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1856, 174.

The body is slender, gracefully fusiform in its outline, the head forming the fifth of the entire length. The longitudinal diameter of the eye is contained seven times in the length of the side of the head in the adult, and five times in the young. The anterior margin of the dorsal is equi-distant between the tip of the snout and the insertion of the caudal fin. The ventrals are inserted opposite the posterior third of the dorsal. The anal is slender.

D 13; A 10; C 6, 1, 8, 8, 1, 5; V 10; P 16.

The scales are elliptical in their outline, exhibiting radiating furrows upon their entire periphery. In the lateral line they assume various sizes and shapes.

The color of the upper regions is greyish brown; the inferior regions being whitish or yellowish. The dorsal and caudal are olivaceous; the anal and ventrals yellowish, whilst the pectorals are greyish above and yellowish beneath.

References to the figures.—Plate XLIX, fig. 5, represents *Acomus griseus*, size of life. Fig. 6 is a scale from the dorsal region. Figs. 7 and 8, scales from the lateral line. Fig. 9, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--|-----------------|--------------------|---------------------|--------------------|
| 259 | 2805 | 2 | Sweetwater Fork of Platte river, Nebraska. | 1853 | J. S. Bowman | Alcoholic.... | J. S. Bowman |

3. ACOMUS LACTARIUS, Grd.

PLATE L.

SPEC. CHAR.—Head constituting somewhat less than the fifth of the total length. Mouth small; lips well developed, covered with uniform granules. Eye large, sub-circular; its diameter entering five times in the length of the side of the head. Anterior margin of dorsal fin somewhat nearer the insertion of the caudal than the extremity of the snout. Insertion of ventrals situated opposite the posterior half of the dorsal; their tip extending to the vent. Greyish brown above; greyish white beneath.

SYN.—*Catostomus (Acomus) lactarius*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 174.

It is closely allied to the preceding species, from which it differs by a stouter head, larger eyes, and larger scales on the body. The scales are longer than deep, sub-quadrangularly elliptical, with radiating furrows upon their anterior and posterior sections alone; a trait of structure by which they may readily be distinguished from those of the preceding species. The upper margin of the dorsal fin is concave, whilst it is nearly straight in *A. griseus*.

D 13; A 10; C 4, 1, 8, 8, 1, 5; V 11; P 17.

The color is greyish brown above, and greyish white beneath. The fins being greyish olive.

References to the figures.—Plate L, fig. 1, represents *Acomus lactarius*, size of life. Fig. 2, a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region. Fig. 5, the young of the same species.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------|---|-----------------|---------------------|---------------------|---------------------|
| 257 | 2804 | 2 | Adult. | Milk river, affluent of Upper Missouri. | 1853 | Gov. I. I. Stevens. | Alcoholic.. | Dr. Geo. Suckley... |
| 258 | ..... | 5 | Young. | do | do | do | do | do |

CATOSTOMUS, Lesu.

GEN. CHAR.—Head moderately elongated. Lips papillated; lower one deeply cleft. The dorsal fin is generally longer than high, and the size of the scales nearly equal anteriorly and posteriorly. The pharyngeals are provided with a little expansion inferiorly; the teeth being compressed, with the inner projection of the crown alone developed.

SYN.—*Catostomus*, LESU. in Jour. Acad. Nat. Sc. Philad. I, 1817, 89.—RAFIN. Ichth. Ohieus. 1820, 53.—Cuv. Règn. Anim. 2d ed. II, 1829; &, ed. illustr. Poiss. 220.—STORER, Rep. Fish. Mass. 1839, 83; Synops. 1846, 166; &, Hist. Fish. Mass. in Mem. Amer. Acad. New S. V, 1855, 290.—DEKAY, N. Y. Faun. IV, 1842, 196.—HECK. in Russeg. Reisen, I, II, 1842, 1022.—Cuv. & VAL. Hist. nat. Pois. XVII, 1844, 418.—AGASS. Lake Sup. 1850, 356; &, in Amer. Journ. Sc. 2d ser. XIX, 1855, 92.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 174.

As characterized above, this genus contains yet numerous species, and, what is very curious, it includes several species from the western slope of the Rocky mountains, together with those originally known in the eastern States.

1. CATOSTOMUS OCCIDENTALIS, Ayres.

SPEC. CHAR.—Head constituting less than the fifth of the total length. Eye of medium size; mouth rather small; labial papillae small and rather inconspicuous. Isthmus very broad. Dorsal fin longer than high; its anterior margin nearly equidistant between the extremity of the snout and the insertion of the caudal. The anterior margin of the ventrals corresponds to the middle of the dorsal, and is nearer the extremity of the snout than the tip of the lower lobe of the caudal. Posterior extremity of anal fin reaching the rudimentary rays at the inferior lobe of the caudal, which is moderately emarginated. Scales moderate. Upper regions of a greyish lead tint; beneath of a soiled yellow or white.

SYN.—*Catostomus occidentalis*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1854, 18.—AGASS. in Amer. Journ. of Sc. 2d Ser. XIX, 1854, 91.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 174.

This species has been described under the same name almost simultaneously by two different naturalists, one in the west, the other in the east. It is brought to the market of San Francisco, and said to be quite common in the Sacramento and San Joaquin rivers. The largest specimen we have examined measures twelve inches and a half; we have counted the rays of the fin as follow:

D 2, 13 + 1; A 2, 8; C 7, 1, 8, 8, 1, 6; V 1, 11; P 18.

The scales are moderate sized, somewhat longer than deep, posteriorly round, anteriorly obtuse angled and laterally linear. Numerous radiating grooves may be observed upon the anterior and posterior sections.

List of specimens.

| Catal. No. | Corresponding No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|-----------------------------|--------------|--------|---------------------|-----------------|-----------------------|---------------------|-----------------------|
| 241 | 2794 | 2 | Adult. | San Francisco, Cal. | 1855 | Lt. R. S. Williamson. | Alcoholic. | Dr. John S. Newberry. |

2. CATOSTOMUS LABIATUS, Ayres.

SPEC. CHAR.—Head constituting the fifth of the total length. Eye small. Mouth of medium size; labial papillae conspicuously developed. Dorsal fin higher than long; its anterior margin nearer the extremity of the snout than the base of the caudal. Pectoral fins quite elongated and well developed. Insertion of ventrals situated opposite the posterior third of the base of the dorsal, and nearer the extremity of the snout than the tip of the lower lobe of the caudal. Posterior extremity of anal fin extending to the rudimentary rays of the caudal. The scales are large. The upper regions are black, the lower half of the sides clouded black and yellow, whilst the belly and the inferior surface of the head are yellow, almost unicolor.

SYN.—*Catostomus labiatus*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 32.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 175.

Is easily distinguished from the preceding species by its dorsal fin, which is higher than long, its larger mouth, larger lips, and more conspicuous labial papillae. The eye is smaller, since its diameter enters somewhat over seven times in the length of the head. We count the rays as follow:

D 2, 11 + 1; A 1, 8; C 4, 1, 9, 8, 1, 5; V 1, 10; P 17.

The scales are large, deeply imbricated, longer than deep, sub-elliptical in their outline, laterally almost linear, with numerous radiating grooves upon their anterior and posterior sections, extending even sometimes to the lateral sections with a proclivity of being directed towards the anterior margin.

The color is dark blackish brown above, becoming lighter on the sides, which are blotched;

the inferior surface of the head and abdomen being yellowish or whitish. The specimen before us measures fifteen inches in total length.

List of specimens.

| Catal No. | Corresponding No. of teeth | No. of spec. | Age | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|-----------|----------------------------|--------------|--------|--------------------|-----------------|-----------------------|---------------------|-----------------------|
| 239 | 2792 | 1 | Adult. | Klamath lake, Cal. | 1855 | Lt. R. S. Williamson. | Alcoholic. | Dr. John S. Newberry. |

3. CATOSTOMUS MACROCHEILUS, G r d .

SPEC. CHAR.—Head constituting the fifth of the total length. Eye of medium size. Mouth large, provided with large lips and conspicuous labial papillae. Isthmus very broad. Dorsal fin much longer than high; its anterior margin nearly equidistant between the extremity of the snout and the insertion of the caudal. Insertion of ventrals situated opposite the anterior third of the dorsal, and nearer the extremity of the snout than the tip of the lower lobe of the caudal. Posterior extremity of the anal extending beyond the rudimentary rays of the caudal, which is posteriorly crescent-shaped. Scales rather large. Bluish black above; whitish beneath.

SYN.—*Catostomus macrocheilus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 175.

This species is very different from the preceding two; the head is larger and more elongated; the mouth larger, and hence much larger lips, covered with large papillae. The scales which cover the body are larger than in *C. occidentalis*, and smaller than in *C. labiatus*. The head constitutes the fifth of the total length; the horizontal diameter of the eye is contained nearly six times in the length of the side of the head. The head itself is sub-quadrangularly pyramidal, anteriorly truncated with the upper edge of the snout projecting. The anterior margin of the dorsal is a little nearer the end of the snout than the insertion of the caudal fin; its upper margin is concave; its base enters over six times and a half in the total length. The anal is well developed, for, its tip extends beyond the base of the caudal. The ventrals are inserted in advance of the middle of the dorsal. The pectorals are large and elongated.

D 2, 14 + 1; A 1, 8; C 5, 1, 8, 8, 6; V 11; P 18.

The scales are nearly as deep as long, irregularly rounded, well imbricated, with radiating grooves upon their anterior and posterior sections. The specimen observed measures sixteen inches in total length.

The dorsal region above the lateral line is bluish black; a darker broad streak may be traced along and below the lateral line, over the side of the head across the orbit. The rest of the flank is of a metallic yellow, which extends similarly over the side of the head, the inferior surface of which, as well as the abdomen, are whitish.

List of specimens.

| Catal No. | Corresponding No. of teeth | No. of spec. | Age | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|-----------|----------------------------|--------------|--------|-----------------|-----------------|-----------------------|---------------------|--------------------------|
| 240 | 2793 | 1 | Adult. | Astoria, Oregon | 1854 | Lt. W. P. Trowbridge. | Alcoholic. | Lt. Trowbridge |

4. CATOSTOMUS SUCKLII, Grd.

PLATE LI.

SPEC. CHAR.—Head constituting the fifth of the entire length. Eye small. Mouth rather small; lips moderately developed, covered with conspicuous papillae. Isthmus of medium width. Dorsal fin as high as long; its anterior margin somewhat nearer the insertion of the caudal fin than the extremity of the snout. Insertion of ventrals a little in advance of the middle of the dorsal, and equi-distant between the extremity of the snout and the fork of the caudal. Posterior extremity of anal extending beyond the rudimentary rays of the caudal. Greyish olive above; yellowish olive beneath.

SYN.—*Catostomus sucklii*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 175.

The head forms the fifth of the entire length. It is sub-quadrangular, the upper surface rather sloping towards the blunt snout. The eye is small and sub-elliptical; its horizontal diameter being contained somewhat over five times in the length of the side of the head. The anterior margin of the dorsal fin is equi-distant between the tip of the snout and the insertion of the caudal. Its height is equal to its length, and its upper margin is slightly concave. The posterior margin of the caudal is deeply emarginated, crescent-shaped. The insertion of the ventrals is situated somewhat in advance of the middle of the dorsal fin.

D 2, 12; A 2, 8; C 5, 1, 8, 8, 1, 4; V 10; P 18.

The scales are large and but a little smaller anteriorly than posteriorly; they are sub-elliptical in shape, longer than deep, with their anterior and posterior margins irregular, exhibiting radiating grooves upon the anterior and posterior sections. The upper regions are greyish olive, and the inferior regions yellowish olive. The young being of a darker and less yellowish tint.

References to the figures.—Plate LI, fig. 1, represents the adult *Catostomus sucklii*, size of life. Fig. 2 is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region. Fig. 5 is the young of the same species.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|---------|-----------------------------|-----------------|---------------------|---------------------|--------------------|
| 175 | 2739 | 2 | A. & Y. | Milk river, Upper Missouri. | 1853 | Gov. I. I. Stevens. | Alcoholic. | Dr. Geo. Suckley.. |

TRIBE OF CHONDROSTOMI.

The characters of *Chondrostomi*, as derived chiefly from the American representatives, consist in the absence of barbels; in the position of the mouth, which is generally overhung by the upper jaw, and sometimes both jaws are equal. The pharyngeal teeth are of the grinding type (*Dentes masticatorii*) and cultriform kind (*Dentes cultriformes*), disposed upon a single series, with one exception only, and that occurs occasionally in *Campestoma*. I say *occasionally*, because in the majority of cases there is also but one single row in the latter genus. *Exoglossum* is removed from this group, of which it has none of the characters, except the absence of barbels.

SYN.—*Chondrostomi*, AGASS. in Amer. Journ. of Sc. 2d series, XIX, 1855, 91.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 175

This group has to include a much greater number of genera and species than was formerly anticipated. But, as a group, it must be based upon characters very different from those derived from the structure of the mouth. Indeed, those cartilaginous maxillar sheaths so prominent in *Chondrostoma*, *Chondrochylus*, *Chondrorhynchus* and *Lavinia*, gradually become less and less conspicuous, until we find but a thin pelicle, such as occurs in other groups of the same family.

DIONDA, Girard.

GEN. CHAR.—Head sub-conical or sub-pyramidal. Mouth small, its gape somewhat arched; snout overlapping the lower jaw. Angle of the mouth not extending as far as the orbit. The eyes are large, moderate sized, or small. The isthmus is rather wide. Insertion of ventrals situated under the anterior margin of the dorsal or posterior to it. Caudal furcated. Pharyngeal bones stout, lower limb or branch as long as the upper. The teeth are of the cultriform kind, of the grinding type, compressed, not hooked; four are observed upon a single row, thus: 4—4.

SYN.—*Dionda*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 176.

Resembles *Hyborhynchus*, from which it differs by a smaller and more pointed head, a smaller mouth, though constructed upon the same plan as in *Hyborhynchus*, that is, the lower jaw being thin, flat and rounded upon its periphery. The body is more slender and elongated, the snout more protruding. The scales are either large, or else of moderate size, and the lateral line follows more or less the middle of the flanks. The dorsal fin is higher than long, and shorter than in *Hyborhynchus*, and the anterior ray is more closely united to the next. The insertion of the ventrals is always situated posteriorly to the anterior margin of the dorsal, or under it, never in advance of it. The pharyngeal bones are stouter than in *Hyborhynchus*, the lower branch or limb has the same length as the upper; both are more curved, thus rendering the convexity of that bone more conspicuous; it is expanded as usual. The teeth are similar to those of *Hyborhynchus*, being, however, not quite so compressed and not hooked.

This genus is closely allied to *Campostoma*, and since our *Diondae* are, generally speaking, small fishes, we should not be surprised at hearing that some of the species of *Campostoma*, while yet immature, could not always be easily distinguished from them, for, the mouth is, properly speaking, not smaller than in *Campostoma*.

As to the genus *Campostoma* itself, it is treated of in the "Ichthyology to the United States and Mexican Boundary Survey," where three species are figured and described. Several species of *Dionda* are likewise illustrated in the same report.

1. DIONDA EPISCOPA, Grd.

SPEC. CHAR.—Body slender and sub-fusiform. Head sub-conical, blunt anteriorly, constituting the fifth of the total length. Eye large and sub-circular. Gape of mouth slightly arched, its angle not extending as far as a vertical line drawn in advance of the orbit. Caudal fin entering five and a half times in the total length. Insertion of ventrals situated somewhat posteriorly to the anterior margin of the dorsal. Scales large deeper than long. Blackish brown above, yellowish white beneath, spread all over with dark dots; a black streak from the snout across the orbit to the base of the caudal, where a black spot is likewise observed.

SYN.—*Dionda episcopa* GRD., in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 177.

The body is slender and graceful, sub-fusiform in profile, compressed, with the back slightly arched. The largest specimens observed measuring about three inches and a quarter. The head is large, forming about the fifth of the total length. The eye is large and sub-circular; its diameter being contained three times and a half in the length of the side of the head: once

in advance of the orbit. The fins are of but moderate development; the insertion of the ventrals is situated a little posteriorly to the anterior margin of the dorsal. The formula of the rays read as follows:

D 2, 8; A 2, 8; C 8, 1, 9, 8, 1, 7; V 8; P 14.

The scales are large, deeper than long, with radiating furrows upon their posterior section only; the lateral line following the middle of the flanks.

The dorsal region is blackish brown; a black streak is observed along the flanks, just above the lateral line, extending from a black spot at the base of the caudal, to the extremity of the snout. The inferior region is yellowish white; minute black dots being spread all over the body.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Sex. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|------|-----------------------------|-----------------|------------------|---------------------|-----------------|
| 45 | 2658 | 12 | ♂ ♀ | Head waters of Rio Pecos... | 1854 | Capt. John Pope. | Alcoholic | Capt. Pope..... |

2. *DIONDA PAPALIS*, Gr d.

SPEC. CHAR.—Body anteriorly thickish, sub-fusiform. Head sub-conical, abbreviated, forming a little more than the fifth of the total length. Eye sub-circular. Gape of the mouth slightly arched; its angle not reaching a vertical line drawn in advance of the orbit. Caudal fin entering five times and a half in the entire length. Insertion of ventrals situated under the anterior margin of the dorsal. Scales moderate, deeper than long.

SYN.—*Dionda papalis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 178.

The head in this species is rather small, but rounded off upon the snout; it forms a little more than the fifth of the entire length. The eye is sub-circular; its diameter entering four times in the length of the side of the head. The body is thickish anteriorly, sub-cylindrical, tapering posteriorly. The dorsal and anal fins are proportionally well developed. The caudal is furcated; the ventrals are inserted under the anterior margin of the dorsal. The scales are moderate sized, deeper than long. The coloration has been altered to a uniform black subsequently to its immersion in alcohol with sundry other specimens.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------------------------------------|-----------------|------------------|---------------------|-----------------|
| 39 | 2653 | 2 | Delaware creek, trib. of Rio Pecos.. | 1854 | Capt. John Pope. | Alcoholic | Capt. Pope..... |

3. *DIONDA PLUMBEA*, Gr d.

PLATE LII, FIGS. 21—25.

SPEC. CHAR.—Body elongated, sub-fusiform, compressed. Head sub-pyramidal, anteriorly blunt, constituting the fifth of the total length. Gape of mouth slightly arched, its angle not extending as far as a vertical line drawn in front of the orbit. The eye is large, sub-circular. The caudal fin enters about six times in the total length. Insertion of ventrals situated slightly backwards of the anterior margin of the dorsal. Scales moderate sized, deeper than long. Greyish brown above; whitish or yellowish beneath, with a black spot at the base of the caudal.

SYN.—*Dionda plumbea*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 178.

Besides the other peculiarities of structure above alluded to, this species may readily be distinguished from all its congeners by its scales being the smallest so far observed in the genus. The diameter of the eye does not enter quite four times in the length of the side of the head: once, in advance of the anterior rim of the orbit. The isthmus is rather wide and the opercle quite developed. The scales themselves are somewhat variable in their aspect, those of the back and belly being nearly as long as deep, though posteriorly attenuated; whilst in the lateral line they are deeper than long and sub-elliptical; radiating furrows existing upon the posterior section alone.

The color is greyish above and whitish or yellowish beneath; the base of the caudal fin exhibits a black spot. The sides and under surface of the head being silvery.

References to the figures.—Plate LII, fig. 21, represents *Dionda plumbea*, size of life. Fig. 22 is a section of the body across the line of its greatest depth. Fig. 23, a scale from the dorsal region. Fig. 24, a scale from the lateral line. Fig. 25, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor'g No. of teeth | No. of spec. | Locality. | When collected | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|---|----------------|-------------------|------------|---------------------|----------------------|
| 35 | 2649 | 1 | Head waters of Canadian river (Llano Estacado). | 1853 | Lt A. W. Whipple. | VIII. | Alcoholic. | H. B. Möllhausen.... |

4. DIONDA SPADICEA, G r d .

PLATE LII, FIGS. 26—30.

SPEC. CHAR.—Body slender and sub-fusiform, compressed. Head sub-conical, constituting about the sixth of the total length. Gape of mouth very slightly arched, its angle not reaching a vertical line drawn in advance of the orbit. Eye moderate, sub-circular. Caudal entering about five times in the total length. Insertion of ventrals situated under the anterior margin of the dorsal. Scale moderate sized, somewhat longer than deep. Reddish brown above; dull whitish beneath, with a black spot at the base of the caudal.

SYN.—*Dionda spadicea*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 178.

The head and body by their slender appearance give this species the general aspect of the preceding one. The head, however, is more conical and the eye smaller, the diameter of the latter entering four times in the length of the side of the head. The scales are somewhat larger than in *D. plumbea*, being also longer than deep, anteriorly sub-truncated, posteriorly rounded, with radiating furrows upon the posterior section alone. The color is reddish brown above and whitish beneath; the base of the caudal exhibiting a black spot.

References to the figures—Plate LII, fig. 26, represents *Dionda spadicea*, size of life. Fig. 27 is a section of the body across the line of greatest depth. Fig. 28, a scale from the dorsal region. Fig. 29, a scale from the lateral line. Fig. 30, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Locality. | When collected. | Whence obtained | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|------------------------|-----------------|--------------------|---------------------|----------------------|
| 34 | 2648 | 3 | Fort Smith, Ark. ----- | 1853 | Lt. A. W. Whipple. | Alcoholic. | H. B. Möllhausen.... |

5. DIONDA GRISEA, G r d.

PLATE LIII, FIGS. 6—10.

SPEC. CHAR.—Body rather deep upon its middle; greatest depth nearly equal to the length of the head. Head sub-conical and slender, contained five times and a half in the total length; snout tapering; gape of mouth nearly horizontal, its angle being far from reaching a vertical line drawn in advance of the orbit. Eye moderate, sub-circular. Caudal fin entering nearly five times and a half in the total length. Insertion of ventrals situated somewhat posteriorly to the anterior margin of the dorsal. Scales moderate sized, deeper than long. Reddish ash above; olivaceous beneath; fins unicolor.

The species is closely allied to *D. plumbea* and *D. punicea*, differing from both of them by a more slender and tapering head; the snout being, however, blunt as in all the species of the same genus. The diameter of the eye enters four times in the length of the side of the head. The scales are very different from those of *D. punicea*, in being deeper than long, in which respect they resemble more those of *D. plumbea*, from which they may be distinguished in being less tapering posteriorly.

The color is of a uniform reddish ash above; yellowish or olivaceous beneath; the fins being unicolor.

References to the figures.—Plate LIII, fig. 6, represents *Dionda grisea*, size of life. Fig. 7 is a section of the body across the line of greatest depth. Fig. 8, a dorsal scale. Fig. 9, a scale from the lateral line. Fig. 10, a scale from the abdominal region.

List of specimens.

| Catal. No. | No of spec. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|-------------|--------------------------------------|-----------------|----------------------|------------|---------------------|---------------------|
| 931 | 5 | Twenty miles west of Choctaw Agency. | 1853 | Lt. A. W. Whipple .. | XVI. | Alcoholic. | H. B. Möllhausen .. |

HYBORHYNCHUS, A g a s s .

GEN. CHAR.—Head rather short, upper surface depressed; snout abruptly truncated and rounded. The mouth is of medium size, subterminal, its gape being horizontal, the lower jaw flattened and thin, rounded upon its periphery and slightly overlapped by the snout. The angles of the mouth do not reach a vertical line drawn in advance of the orbit. The eyes are large; the isthmus is of moderate width. Anterior ray of dorsal fin shorter than the second. The insertion of the ventrals is situated opposite the anterior margin of the dorsal, in advance or posteriorly to it. The caudal is furcated. The scales are large, higher than long, with radiating furrows upon their posterior section only; the lateral line follows the middle of the flanks. The pterygeal bones are slender, and more so upon the inferior limb, which is longer than the upper and curved backwards and sideways, whilst the upper limb is gently curved inwards. The convexity of the same bone is expanded. The teeth are of the cultriform kind of the grinding type, very much compressed, slightly hooked, and consequently provided with quite a narrow grinding surface. Their disposition is upon a single row of four: 4—4.

SYN.—*Hyborhynchus*, AGASS. in Amer. Journ. of Sc. 2d ser. XIX, 1855, 222.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 179.

The species of this genus, like those of the preceding one, are, generally speaking, of small size, not exceeding four inches in total length. *H. notatus* is the largest of the hitherto known species, and we regret that both space and time did not permit its being included in this report.

1. HYBORHYNCHUS PERSPICUUS, Grd.

PLATE LII, FIGS. 16—20.

SPEC. CHAR.—Head constituting about the fifth of the total length. Eye sub-elliptical, its diameter entering three times in the length of the side of the head. Greatest depth of the body nearly equal to the length of the head. Caudal fin entering five times and a half in the total length. Insertion of ventrals situated under the anterior margin of the dorsal. Scales anteriorly sub-truncated. Reddish brown above, sulphur yellow beneath; lateral line minutely dark spotted. A black spot at the base of the caudal, and at the anterior margin of the dorsal also.

SYN.—*Hyborhynchus perspicuus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 179.

The head is contained five times and a quarter in the total length, instead of constituting the sixth part of it, as in *H. notatus*. The mouth and eye, both, are a good deal larger than in the latter species. The horizontal diameter of the eye, which is sub-elliptical, is contained about three times in the length of the side of the head: less than once in advance of the orbit. The insertion of the ventrals is situated immediately under the anterior margin of the dorsal. The caudal fin is more deeply furcated than in *H. notatus*.

D 2, 9; A 2, 7; C 10, 1, 9, 8, 1, 8; V 9; P 14.

There is a very minute rudimentary ray at the anterior margin of both the dorsal and anal, followed by a second, about half the height of the fin.

The scales are much deeper than high, anteriorly sub-truncated, with radiating furrows upon the posterior section only. The lateral line is nearly median from head to tail, being but slightly deflexed at its anterior initial point.

The upper region and the flanks are reddish brown; the abdomen exhibiting a sulphur yellowish tint. The lateral line is dotted with greyish purple, more distinct towards the base of the caudal, upon which a dark spot exists. The fins are yellowish; a black spot being observed upon the anterior margin of the dorsal below the middle of the height. The upper portion of the dorsal and the external margin of the caudal are greyish.

References to the figures.—Plate LII, fig. 16, represents *Hyborhynchus perspicuus*, size of life. Fig. 17 is a section of the body across the line of its greatest depth. Fig. 18, a scale from the dorsal region. Fig. 19, a scale from the lateral line. Fig. 20, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|---------------------------------|-----------------|--------------------|---------------------|---------------------|
| 144 | 2722 | 22 | Arkansas river near Fort Smith. | 1853 | Lt. A. W. Whipple. | Alcoholic. | Dr. Geo. G. Shumard |

2. HYBORHYNCHUS TENELLUS, Grd.

SPEC. CHAR.—Head entering about five times and a half in the total length. Eye large, sub-circular; its diameter being contained somewhat over three times in the length of side of head. Greatest depth of the body less than the length of head. Caudal fin constituting about the sixth of the total length. Insertion of ventrals situated somewhat in advance of the anterior margin of the dorsal. Reddish brown above; yellowish beneath.

SYN.—*Hyborhynchus tenellus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 179.

It is more slender and more compressed than even *H. perspicuus*. The head is very much depressed, sub-conical, hence appearing quite small; it is contained five times and a half in the

total length. The eye and the mouth are proportionally large. The insertion of the ventrals is situated somewhat in advance of the anterior margin of the dorsal fin. The scales are the largest among the hitherto known species of the genus. The color is uniform reddish above and on the sides; yellowish beneath. A black spot exists at the base of caudal fin; otherwise the fins are unicolor.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------------------------------------|-----------------|-------------------|------------|---------------------|-------------------|
| 143 | 2721 | 4 | Twenty miles west of Choctaw Agency. | 1853 | Lt. A.W. Whipple. | XVI. | Alcoholic. | H. B. Möllhausen. |

3. HYBORHYNCHUS PUNICEUS, Grd.

PLATE LII, FIGS. 1—5; and, FIGS. 11—15.

SPEC. CHAR.—Head constituting the fifth of the total length. Eye sub-circular; its diameter entering three times and a half in the length of the side of the head. Greatest depth of body less than the length of the head. Caudal fin entering six times in the total length. Insertion of ventrals situated somewhat posteriorly to the anterior margin of the dorsal. Scales rounded upon their anterior edge. Uniformly pale red, lighter beneath than above; fins olivaceous.

SYN.—*Hyborhynchus puniceus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 179.

By its general aspect this species is intermediate between *H. perspicuus* and *H. tenellus*, being however, distinguished from either of these by a more developed opercular apparatus and smaller scales. The latter are much deeper than long, sub-elliptical, their posterior edge forming a more closed curve than the anterior edge, which is equally rounded, radiating furrows being observed upon the posterior section only. The color is of a uniform pale red, lighter beneath than above; the fins being likewise unicolor, of an olivaceous tint.

References to the figures.—Plate LII, figs. 1 and 11, represent *Hyborhynchus puniceus*, size of life: fig. 1 from Llano Estacado; and, fig. 11, from Antelope creek. Figs. 2 and 12 are sections of the body across the line of greatest depth. Figs. 3 and 13 are scales from the dorsal region. Figs. 4 and 14, scales from the lateral line. Figs. 5 and 15, scales from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--|-----------------|------------------|------------|---------------------|---------------------|
| 146 | 2724 | 1 | Llano Estacado..... | 1853 | Lt. A.W. Whipple | ----- | Alcoholic. | H. B. Möllhausen. |
| 145 | 2723 | 2 | Antelope creek, tributary of Canadian river. | 1853 | -----do----- | VIII. | -----do----- | Dr. C. B. Kennerly. |

4. HYBORHYNCHUS CONFERTUS, Grd.

PLATE LIX, FIGS. 11—15.

SPEC. CHAR.—Head constituting the fifth of the total length. Eye sub-circular; its diameter entering nearly four times in the length of the side of the head. Greatest depth of the body more than the length of the head. Caudal fin entering five times in the total length. Insertion of ventral fins situated opposite the anterior margin of the dorsal. Scales rounded upon their anterior edge also. Pale reddish above; yellowish beneath. A black spot at the anterior margin of the dorsal. Peduncle of tail with a dark streak along its middle.

SYN.—*Hyborhynchus confertus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 179.

This species has a short and contracted appearance, resembling somewhat a diminutive *Moxostoma*. The opercular apparatus acquires also a considerable development. Its body is covered with scales rather larger than those of *H. puniceus*, although smaller than the other hitherto known species of its genus. They are much deeper than long, convex upon the anterior as well as posterior edge, and provided with radiating furrows upon their posterior portion alone.

The color is of a pale reddish tint above, and yellowish beneath; a black spot being observed at the anterior margin of the dorsal. A dark narrow streak is seen on the middle of the caudal region.

References to the figures.—Plate LIX, fig. 11, represents *Hyborhynchus confertus*, size of life. Fig. 12, a section of the body across the line of greatest depth. Fig. 13, a dorsal scale. Fig. 14, a scale from the lateral line. Fig. 15, a scale from the abdominal region.

List of specimens.

| Catal No. | Corr. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimen. | Collected by— |
|-----------|---------------------|--------------|------------------|-----------------------------------|-----------------|---------------------------|-----------|---------------------|------------------|
| 147 | 2725 | 20 | Adult and young. | Hurrah creek, trib. of Rio Pecos. | 1853. | Lieut. A. W. Whipple. . . | XII | Alcoholic. | H. B. Möllhausen |

PIMEPHALES, Rafin.

GEN. CHAR.—Body sub-fusiform when seen in profile, compressed, however, as usually. The head is large, short, and the snout very blunt. The mouth is small, slightly arched, and terminal; the jaws being even. The eye is of moderate development. The isthmus is proportionally wide. The dorsal fin is somewhat higher than long, provided anteriorly with a rather thick and undivided, short and hard ray. Caudal fin posteriorly emarginated. The origin of the ventrals takes place either immediately opposite the anterior margin of the dorsal, or else a little posterior to it. The scales are rather large, a good deal deeper than long, and the lateral line, after a slight deflection along the thoracic region, follows the middle of the flanks to the base of the caudal fin. The pharyngeal bones are of moderate stoutness, gently arched, the upper and lower limb nearly equal though the upper is more curved; the convex portion is regularly dilated or expanded. The teeth are of the cultriform kind of the grinding type, very slightly hooked, compressed, with a narrow grinding surface, and disposed upon one single row of four: 4—4.

SYN.—*Pimephales*, RAFIN. Ichth. Ohiens. 1820, 52.—STORER, Synops. 1846, 166.—AGASS. in Amer Journ. of Sc. 2d series, XIX, 1855, 220.—GRD in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 180.

The type of this genus, *P. promelas*, is not uncommon in several of the small tributaries of the Ohio river. It would have added a great deal of interest to this report had we had the opportunity of giving a good figure and a minute description of this fish. We hope the time is not far remote when we shall be prepared to complete our reserches upon the fresh water fishes of North America.

1. PIMEPHALES MACULOSUS, Grd.

SPEC. CHAR.—Body rather short, deep, and compressed; greatest depth equal to one-fourth of the total length, whilst the head constitutes the fifth part of it. Eye moderate and circular; its diameter entering four times in the length of the side of the head. Angle of the mouth not extending as far as a vertical line drawn in advance of the orbit. Extremities of ventrals overlapping the vent, and reaching the anterior margin of the anal. Scales much deeper than long, and larger on the peduncle of the tail than anteriorly. Yellowish brown with black blotches.

SYN.—*Pimephales maculosus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 180.

It is a stouter fish than *P. promelas*, both in body and head. The latter is almost round. The anterior margin of the dorsal is equidistant between the extremity of the snout and the last scales upon the base of the caudal fin. The origin of the ventrals is situated a little posterior to the anterior margin of the dorsal. The scales are larger also than in *P. promelas*; they are vertically sub-elliptical, much deeper than long. Upon a yellowish brown ground color there are large and irregular black blotches covering more than half the entire surface of the body. The fins are yellow upon their bases and tips, and black upon their middle. The external margin of the ventrals and pectorals being of a pure white.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimen. |
|------------|--------------------|--------------|--------|------------------------------|-----------------|-----------------------------|-----------|---------------------|
| 153 | 2729 | 1 | Adult. | Sluice of Arkansas river.... | 1853 | Lieut. E. G. Beekwith | 6 | Alcoholic.. |

2. PIMEPHALES FASCIATUS, Grd.

SPEC. CHAR.—Body anteriorly stoutish; its depth being contained five times in the total length, in which the head enters four times and a half. Eye moderate and circular; its diameter entering somewhat more than four times in the length of the side of the head. Posterior extremity of maxillar bone not extending as far as a vertical line drawn in advance of the orbit. Extremities of ventrals stretching beyond the anterior edge of the anal. Scales deeper than long, elliptical. Brown, fasciated with black.

SYN.—*Pimephales fasciatus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 180.

This species has the general aspect of *P. maculosus*, differing, however, from it chiefly by the proportional length of the head and depth of the body, and by the position of the ventrals, which are inserted under the anterior margin of the dorsal fin. The scales are smaller also.

The ground color is brown, with transverse black fasciae. The dorsal fin is provided with two black spots, one anteriorly, the other posteriorly. The other fins being unicolor, with the exception of the pectorals, which are greyish upon their external margin.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------|---------------------------|-----------------|--------------------------|---------------------|-----------------------|
| 151 | 1 | Adult. | Yellowstone river | 1853 | Col. A. Vaughan..... | Alcoholic.. | Dr. F. V. Hayden..... |
| 932 | 2 | Young. | Milk river, Missouri | 1853 | Gov. I. I. Stevens |do | Dr. Geo. Suckley..... |

HYBOGNATHUS, Agass.

GEN. CHAR.—General form elongated, rather slender and compressed. The head is sub-conical, the snout overlapping the lower jaw, which is thin and flat, provided upon its symphysis with a small tubercle. The mouth being small, sub-terminal, and directed horizontally forwards; its angles do not reach the anterior rim of the orbit. The eyes are well developed. There is a narrow isthmus. Anterior ray of dorsal longest. Insertion of ventrals situated posteriorly to the anterior margin of the dorsal. Caudal furcated. The scales are large, deeper than long; the lateral line following the middle of the flanks. Pharyngeal bones very much bent, with a dilatation upon the convexity, whilst the upper branch is bent inwards, so as to simulate a curve concave from above. The teeth are of the cultriform kind, of the grinding type, very compressed and slightly hooked, and provided with a very narrow grinding surface; they are disposed upon a single row of four: 4—4.

SYN.—*Hybognathus*, AGASS. in Amer. Journ. of Sc. 2d ser. XIX, 1855, 223.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 181.

This genus is not exclusively limited to the waters of the western States and Territories, for we are already acquainted with a species (*H. regius*) which inhabits the fresh waters of the Potomac river, and is brought to the Washington market, where it is called "smelt." It exists also in the neighborhood of Baltimore, where it is known under the name of "gudgeon." It grows to a larger size than any of its congeners with which we are so far acquainted. Another species, found in Lake Champlain, is described in the "Natural History of New York" under the name of *Luciscus nitidus*.—(See Proc. Acad. Nat. Sc. Philad. VIII, 1856, 210.)

1. HYBOGNATHUS ARGYRITIS, Grd.

PLATE LIII, FIGS. 5—8.

SPEC. CHAR.—Body sub-fusiform in profile. Head sub-conical, contained five times and a half in the total length. Eye large and sub-circular. Anterior margin of dorsal fin nearer the extremity of the snout than the base of the caudal. Insertion of ventrals equidistant between the two points just alluded to in reference to the dorsal. Caudal fin entering four times and a half in the total length. Scales anteriorly sub-truncated. Olivaceous brown above, yellowish beneath, with a silvery streak along the middle of the flanks. Fins unicolor, greyish olive.

SYN.—*Hybognathus argyritis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 182.

The largest specimens observed are three inches and a half in total length. This species seems to come nearest to *H. nuchalis*, Agass., than any of the following ones. The eye, however, is quite large, sub-circular in shape; its diameter entering a little short of four times in the length of the side of the head. The snout is rather pointed, and the mouth larger than in the species enumerated further on. The branchiostegal rays, three on either side, are very much developed, expanded or flattened though very thin, and overlapping each other. The formula of the fins is as follows:

Br. III: III; D 2, 8; A 2, 8; C 7, 1, 9, 8, 1, 6; V 1, 8; P 14.

The anterior margin of the dorsal and anal have each two rudimentary rays, and the ventrals, one. The scales are much deeper than long, anteriorly sub-truncated, with radiating furrows upon their posterior section only.

References to the figures.—Plate LIII, fig. 5, represents *Hybognathus argyritis*, size of life. Fig. 6, a scale from the dorsal region. Fig. 7, a scale from the lateral line. Fig. 8, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|----------------------------------|-----------------|----------------------------|---------------------|--------------------------|
| 87 | 2688 | 7 | Milk river, Missouri | 1853 | Gov. I. I. Stevens | Alcoholic . | Dr. Geo. Suckley |
| 86 | 2687 | 35 | Arkansas river, near Fort Smith. | 1853 | Lt. A. W. Whipple | do | Dr. Geo. G. Shumard . . |

2. HYBOGNATHUS EVANSI, Grd.

SPEC. CHAR.—Body sub-fusiform in profile. Head sub-conical, thickish, contained about five times in the total length. Eye moderate sized, sub-circular. Anterior margin of dorsal fin equidistant between the extremity of the snout and the base of the caudal. Insertion of ventrals being situated posteriorly to the anterior margin of the dorsal; is therefore nearer the base of the caudal than the extremity of the snout. Caudal fin constituting the fifth of the total length. Scales anteriorly truncated. Reddish brown above; silvery on the flanks and beneath.

SYN.—*Hybognathus evansi*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 182.

In its general aspect this species is shorter than any of its known congeners. It may easily be distinguished from the preceding one by a much stouter head, more protruding snout, shelving inwards and downwards, small mouth, smaller eye; the diameter of the latter entering almost four times and a half in the length of the side of the head. The opercle is as long as deep, sub-quadrangular, slightly emarginated behind, as in the rest of the species.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|-------------------------------------|-----------------|------------------------|---------------------|------------------------|
| 88 | 2689 | 4 | Ft Pierro, Nebraska | 1853 | Dr. John Evans . | Alcoholic . | Dr. Evans |
| 90 | | 4 | Sweet Water, Platte river | 1852 | J. S. Bowman | do | J. S. Bowman |

3. HYBOGNATHUS PLACITUS, Grd.

SPEC. CHAR.—Body sub-fusiform in profile. Head sub-conical, contained about five times and a half in the total length. Eye moderate sized, sub-circular. Anterior margin of dorsal fin nearer the extremity of the snout than the base of the caudal, whilst the insertion of the ventrals is nearly equidistant between the same points. Scales anteriorly rounded. Greyish brown above, silvery on the flanks, and dull metallic white beneath.

SYN.—*Hybognathus placitus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 182.

The general form of the body is intermediate between *H. argyritis* and *H. evansi*. The snout is thickish, but less so than in *H. evansi*; the mouth is also smaller. The eye is circular; its diameter being contained over four times in the length of the side of the head. The scales are also larger than in *H. evansi*, rounded upon their anterior margin and, as usual, exhibiting radiating furrows upon their posterior section only.

The color is greyish brown above; the middle of the flanks being greyish silver, whilst the inferior region is dull metallic whitish or yellowish.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimeu. | Collected by— |
|------------|--------------|--|-----------------|---------------------|---------------------|-------------------|
| 89 | 5 | Sluice of Arkansas near Fort Makee.... | 1853 | Lt. E. G. Beckwith. | Alcoholic. | Lt. Beckwith..... |

ORTHODON, Girard.

GEN. CHAR.—Head sub-conical, attenuated towards the snout. The mouth is below the medium size, terminal, oblique, both jaws being even; a knob or tubercle upon the symphysis of the lower jaw. Eye of medium size. Isthmus small. Body sub-fusiform. The ventrals are inserted behind the anterior margin of the dorsal fin. The caudal is furcated. The scales are small, longer than deep; the lateral line is sub-medial, being somewhat depressed along the middle of the abdomen. The pharyngeal bones are thin, vertically elevated, or rather broad in the vertical direction, bent as usual, and widening towards the upper and inner limb, so as to be broadest there. The lower branch is much narrower. The teeth are of the coniform kind of the grinding type, compressed, lanceolated, erect, very slightly bent inwardly. They are disposed upon a single row of five, thus: 5—5, the upper ones being quite raised above the edge of the bone.

SYN.—*Orthodon*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 182

The general aspect of the body reminds us of *Gila*, but the insertion of the ventral fins is different. The scales have analogues in other genera. The knob at the symphysis of the lower jaw seems to indicate some affinity with *Hybognathus*, in which the same trait exists. The pharyngeal teeth are widely different from all those of the American cyprinoids, so far as observed.

ORTHODON MICROLEPIDOTUS, GRD.

PLATE LIII, FIGS. 1—4.

SPEC. CHAR.—Head moderate, its upper surface flattened and declivous towards the snout, which is obtusely wedge-shaped. Mouth moderate, broad; posterior extremity of maxillary extending to a vertical line intersecting the nostril. Isthmus very narrow. The anterior margin of the dorsal is placed somewhat in advance of the insertion of the ventrals. Peduncle of tail slender: base of caudal fin dilated. Pectorals slender; ventrals broad. Greyish brown above, whitish or yellowish beneath.

SYN.—*Gila microlepidota*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 21.

Orthodon microlepidotus, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 182.

The head constitutes a little more than the fifth of the total length; and so does the caudal fin. The eye is large and sub-circular; its diameter entering about five times in the length of the side of the head. The dorsal fin is somewhat higher anteriorly than long; its origin is nearly equidistant between the extremity of the snout and the insertion of the caudal, perhaps nearer the latter than the former; its upper margin is sub-concave. The anal is likewise deeper than long, and sub-concave upon its inferior edge. The ventrals are somewhat larger than the pectorals.

D 3, 11; A 3, 8 + 1; C 10, 1, 9, 8, 1, 10; V 1, 10; P 19.

The scales are very small, longer than deep, sub-elliptical in their outline, and furrowed upon their entire periphery, exhibiting transverse vacuolae upon the lines of growth of the posterior section. The lateral line, from the supra-tympanic region, bends itself downwards so as to be nearer the abdominal than dorsal outline, becoming again medial along the peduncle

of the tail to the caudal fin. The specimen figured and described is twelve inches and a half in total length.

References to the figures.—Plate LIII, fig. 1, represents *Orthodon microlepidotus*, somewhat reduced in size. Fig. 2, a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------|----------------------|-----------------|------------------------|---------------------|-----------------------|
| 206 | 2764 | 1 | Adult. | San Francisco, Cal.. | 1855 | Lt. R. S. Williamson.. | Alcoholic | Dr. John S. Newberry. |

ALGANSEA, Girard.

GEN. CHAR.—The head is sub-conical, more or less pointed, though rounded upon its periphery. The mouth being of medium size, slightly oblique upwards, its angles never extending beyond the anterior rim of the orbit; the jaws themselves terminate evenly. The eye is of moderate development. There is a narrow isthmus between the gill openings. The body short and stoutish, quite compressed, covered with scales of medium or of large size, the lateral line being sub-medial, slightly deflexed upon the middle of the abdomen. The fins are rather moderate in development; the origin of the ventrals is situated opposite to the anterior margin of the dorsal, the posterior margin of the latter never reaching the anterior margin of the anal. The caudal fin is emarginated posteriorly. The pharyngeal bones are moderately strong; the upper and lower branches nearly of equal strength, though the lower is somewhat longer than the upper. The convexity is strongly marked and dilated. The teeth are of the cultriform kind of the grinding type, disposed upon a single row of four or five, as follows: 4—4 or 5—5. The uppermost stand boldly out above the surface of the bone.

SYN.—*Algansea*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 182.

The typical species of this genus (*A. tincella*) is Mexican; it is figured and described in the Report of the United States and Mexican Boundary Commission. It differs widely from the three following species found within the limits of the United States.

1. ALGANSEA BICOLOR, Grd.

SPEC. CHAR.—Head contained four times and a half in the total length. Eye of moderate size; its diameter entering four times and a half in the length of the side of the head. Posterior extremity of the maxillary extending to a vertical line drawn across the nostrils. Anterior edge of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Insertion of ventral fins is somewhat in advance of the anterior margin of the dorsal, and nearer the base of the caudal than the extremity of the snout. Scales large. Back and sides of a metallic bluish black tint, intermingled, upon the lower half of the flanks, with a golden hue. The inferior region is pure white or yellow. Fins bluish grey at their base, olivaceous at their periphery.

SYN.—*Algansea bicolor*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 183.

The body is thickest anteriorly, and tapers backwards; the nape is slightly swollen. The head enters about four times and a half in the total length. The ventrals are inserted a little in advance of the anterior margin of the dorsal. Of all the species hitherto known of this genus, the one here referred to has the largest scales, five rows of which may be counted from the origin of the ventrals to the lateral line, and nine from the lateral line to the anterior margin of the dorsal: in all fifteen rows. They are deeply imbricated, nearly as deep as long, anteriorly sub-truncated, with a few radiating grooves upon their posterior section only. The rays of the fins are as follows:

D 1, 9; A 1, 9; C 6, 1, 9, 8, 1, 7; V 9; P 16.

The back and sides are of a metallic bluish black, intermingled on the lower half of the flank with a golden hue. The inferior surface is white, contrasting with the color of the back. The base of the fins is bluish grey, whilst their periphery exhibits an olivaceous tint.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|---------------------------|-----------------|------------------------|---------------------|-----------------------|
| 192 | 2750 | 1 | Klamath lake, Oregon..... | 1855 | Lt. R. S. Williamson.. | Alcoholic. | Dr. John S. Newberry. |

2. ALGANSEA OBESA, Grd.

SPEC. CHAR.—Head contained four times and a half in the total length. Eye rather small; its diameter entering nearly six times in the length of the side of the head. Posterior extremity of the maxillar bone corresponding to a vertical line drawn behind the nostrils. Anterior margin of the dorsal fin nearer the insertion of the caudal than the extremity of the snout. Insertion of ventrals nearer the base of the caudal than the extremity of the snout. Scales moderate, Bluish grey above; yellowish beneath; sides greyish. Fins greyish olive.

SYN.—*Algansea obesa*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 183.

This is a very corpulent species, covered with scales of moderate development, and so far, the smallest in the genus. The depth is contained about three times in the length, the caudal fin excluded. There are eight longitudinal rows of scales between the origin of the ventrals and the lateral line, and fourteen rows above it to the anterior margin of the dorsal: in all twenty-three rows. The scales themselves are either somewhat longer than deep, or else as deep as long, anteriorly sub-truncated, rounded upon the remaining three margins, and provided with radiating furrows upon their posterior section only. The following is the formula of the fins:

D 2, 9; A 2, 8; C 7, 1, 9, 8, 1, 6; V 9; P 16.

The color of the dorsal region is of a bluish grey; the sides being greyish, whilst the abdomen is yellowish. The fins are greyish olive, darker at their base than upon their periphery.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------|--------------------|-----------------|-----------------------|---------------------|--------------------|
| 193 | 2751 | 1 | Adult. | Humboldt river.... | 1852 | J. S. Bowman..... | Alcoholic. | J. S. Bowman..... |
| 194 | 2752 | 1 | ..do.. | ? | 1853 | Lt. E. G. Beckwith... |do..... | Lt. Beckwith |

3. ALGANSEA FORMOSA, Grd.

SPEC. CHAR.—Head contained four times in the total length. Eye moderate sized; its diameter entering five times in the length of the side of the head. Posterior extremity of the maxillar bone corresponding to a vertical line drawn behind the nostrils. Anterior margin of dorsal fin equidistant between the extremity of the snout and the insertion of the caudal. Insertion of ventrals nearer the extremity of the snout than the base of the caudal. Scales moderate. Greenish brown above; yellowish or whitish beneath, sometimes with small scattered black spots. Fins greyish olive.

SYN.—*Algansea formosa*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 183.

A very graceful and well proportioned fish as regards body and head. The latter is rather slender and conical, constituting the fourth of the total length, in which the greatest depth

enters nearly five times. The origin of the ventrals is situated under the anterior margin of the dorsal, as in *A. obesa*. The scales are next in size to those of *A. bicolor*. Seven rows are found between the origin of the ventrals and the lateral line, and ten above it, making eighteen rows in all. They are somewhat longer than deep, resembling in shape those of the foregoing two species: the radiating grooves, however, are more numerous. The formula of the fins is also much alike:

D 2, 8; A 2, 8; C 6, 1, 9, 8, 1, 5; V 9; P 14.

Metallic greenish brown above and on the sides; beneath yellowish or whitish, scattered over with small black spots. The fins are greyish olive.

This species was collected in Mercede and Mohave rivers, by Dr. A. L. Heermann, under Lieut R. S. Williamson, and is very closely allied to *Lavinia gibbosa*, Ayres (Proc. Cal. Acad. Nat. Sc. 1, 1855, 20), but since I have no specimens of the latter, and that those before me measure but five inches and a half, I feel reluctant to attempt an identification.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|-----------------------------|-----------------|------------------------|---------------------|----------------------|
| 196 | 2754 | 5 | Mercede river, California.. | 1853 | Lt. R. S. Williamson.. | Alcoholic. | Dr. A. L. Heermann.. |
| 197 | 2755 | 5 | Mohave river..... | 1853 |do..... |do..... |do..... |

LAVINIA, Girard.

GEN. CHAR.—The body is very much compressed, deep, sub-fusiform in outline, covered with well developed scales; the lateral line forming an open curve, convex downwards, nearer the abdominal outline than the back. The fins are well developed; the insertion of the ventrals is situated either in advance of the anterior margin of the dorsal, or immediately under it. The posterior margin of the dorsal approximates more or less the anterior margin of the anal. The caudal is deeply furcated, rounded upon its insertion, and provided with numerous well marked rudimentary rays above and below. The head is rather small. The cleft of the mouth is situated altogether anteriorly to the orbit; it is of medium size, the upper jaw overlapping the lower one, which is either rounded or truncated upon its symphysis. There are no buccal barbels. The eye is of moderate size; a narrow isthmus separates the gill openings. The pharyngeal bones are strongly curved, the upper branch directed inwards and downwards, the inferior one slightly arched backwards, with the convexity dilated. The teeth are of the cultriform kind of the grinding type, and disposed upon one single series of five, thus: 5—5, with a sharp terminal point.

SYN.—*Lavinia*, GRD in Proc. Acad. Nat. Sc. Philad. VII, 1854, 137; &, VIII, 1856, 184.

Acrocheilus, AGASS. in Amer. Journ. of Sc. 2d ser. XIX, 1855, 96.

This genus, together with *Orthodon* and *Algansea*, includes some of the largest species of *Chondrostomi* so far observed in the fresh waters of North America, comparing well, in that respect, with *Chondrostoma* and allied genera of the Old World.

LAVINIA ALUTACEA,* (*Acrocheilus alutaceus*, Ag. & Pick.) from Willamette Falls and Walla-Walla river, and collected by the United States Exploring Expedition, we have had no opportunity to examine.

* Proc. Acad. Nat. Sc. Philad. VIII, 1856, 184.

1. LAVINIA EXILICAUDA, B. & G.

PLATE LIV, FIGS. 1—4.

SPEC. CHAR.—Body very compressed, quite deep upon its middle; peduncle of tail rather slender. Head small; eye moderate; posterior extremity of maxillary not reaching the anterior rim of the orbit. Isthmus small. Insertion of ventral fins situated in advance of the anterior margin of the dorsal. Pectorals rather small. Caudal deeply furcated. Reddish brown above, silvery grey on the sides, the scales being minutely dotted upon their margin. Beneath yellowish.

SYN.—*Lavinia exilicauda*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 137.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 184.

Lavinia compressa, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 21.

The body is compressed, swollen upon its middle and tapering towards both extremities. The tail is more particularly attenuated. The greatest depth in advance of the dorsal is contained about four times in the length, which is eleven inches, and in which the head enters five times and a half. The mouth is very small; its angle being far from reaching the anterior margin of the orbit. The eye is circular and rather below the medium size; its diameter being contained nearly six times in the length of the side of the head. The isthmus is very small; the branchiostegal rays are three on either side. The anterior margin of the dorsal is equidistant between the extremity of the snout and the tip of the central rays of the caudal, which latter fin is deeply furcated. The base of the anal is longer than that of the dorsal but considerably lower, particularly upon its posterior third. The insertion of the ventrals is placed in advance of the anterior margin of the dorsal. The pectorals are rather small.

D 2, 12; A 2, 14 or 15; C 7, 1, 8, 8, 1, 7; V 1, 10; P 17.

The scales are rounded, somewhat longer than deep, and very thin, with radiating furrows upon their posterior section only. The lateral line, in which there are about sixty scales, forms an open curve on the abdomen with a downwards convexity much nearer the insertion of the ventrals than the base of the dorsal fin.

The color is reddish brown above, silvery grey on the sides, the scales being provided with minute crowded dots upon their margin. Beneath yellowish with the scales unicolor. The fins being yellowish grey.

References to the figures.—Plate LIV, fig. 1, represents *Lavinia exilicauda*, somewhat reduced in size. Fig. 2 is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------|-------------------------|-----------------|------------------------|---------------------|-----------------------|
| 207 | 2765 | 2 | Adult. | Sacramento river, Cal. | 1853 | Lt. R. S. Williamson.. | Alcoholic. | Dr. A. L. Heermann.. |
| 208 | ..... | 2 | Young | Posa creek, Cal..... | 1853 |do..... | ...do.... |do..... |
| 209 | 2766 | 2 | Adult. | San Joaquin river, Cal. | 1855 |do..... | ...do.... | Dr Jno. S. Newberry.. |

2. LAVINIA HARENGUS, Grd.

SPEC. CHAR.—Body compressed, subfusiform in profile, and gradually tapering towards the peduncle of the tail. Head constituting the sixth of the total length; diameter of the eye entering about five times in the length of the side of the head. Mouth moderate; posterior extremity of maxillar bone, nearly even with a vertical line drawn before the orbit. Anterior margin of dorsal fin nearer the base of the caudal than the extremity of the snout. Insertion of ventrals nearly equidistant between the extremity of the snout and the base of the caudal fin. Caudal moderately furcated.

SYN—*Lavinia harengus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 184.

This species is intermediate between *L. exilicauda* and *L. alutacea*. The most characteristic feature consists in the general shape of the body and the relative position of the dorsal and anal fins, which are wider apart. The size of these fins being nearly the same, and if any appreciable difference be observable, the anal would be found somewhat larger than the dorsal. The number of the rays in the various fins is as follow :

D 1, 10; A 2, 10; C 9, 1, 9, 8, 1, 8; V 1, 10; P 16.

The dorsal and anal are the only fins presenting differences of some specific value. The specimens before us are in a mutilated condition, inasmuch as the scales are all fallen. The dorsal region seems to have been of a much deeper hue than the lower half of the sides, which are whitish, as well as the belly, contrasting with the rather dark hue of the dorsal region.

List of specimens.

| Catal. No. | Cor. No. of | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|-------------|--------------|--------|-----------------------|-----------------|------------------------|---------------------|------------------------|
| 210 | 2767 | 1 | Adult. | Monterey Plains, Cal. | 1854 | A. S. Taylor, Esq..... | Alcoholic. | A. S. Taylor, Esq..... |

TRIBE OF POGONICHTHI.

This fourth group is less uniform, if the teeth are taken into account. The latter belong to the hooked types, with or without grinding surface (*Dentes uncinato-submolares* and *uncinato-subconici*), of the raptorial (*Dentes raptatori*) and prehensile (*D. prehensiles*) kinds chiefly; in most cases disposed upon a double series. But all its representatives are provided with buccal or maxillar barbels; and the upper jaw, in projecting more or less beyond the lower, gives the mouth an inferior position, although not so decided as in the group of *Catostomi*, except in some species of the genus *Argyreus*, in which the snout is rather elongated and conical, and which suggested the name of *Rhinichthys*. In the species from the Pacific range, a thin cartilaginous pellicle is observed upon the jaws: illustrating what has already been stated, that the cartilaginous lips are not sufficient to characterize the group of *Chondrostomi*. Of course, it is in the latter where that character assumes its greatest development.

This group or tribe was distinguished for the first time, without any name being affixed to it, in the "Proc. of the Acad. of Nat. Sc. of Philad. VIII, 1856, 184."

ARGYREUS, Heck.

GEN. CHAR.—Snout more or less protruding beyond the lower jaw, thus giving the mouth an inferior position. The mouth itself is rather small, surrounded with quite narrow and smooth lips, covered with a deciduous cartilaginous pellicle in the western species, and provided upon its angle with a small barbel, sometimes very conspicuous. The angle of the mouth not extending as far as the anterior rim of the orbit. The gill openings are separated beneath by a very wide isthmus. The insertion of the ventrals is situated in advance of the anterior margin of the dorsal fin, which is higher than long. The caudal is fureated. The scales are small, longer than deep. The pharyngeal bones are quite narrow, and stouter above than below. The teeth are of the hooked type without grinding surface, strongly hooked and disposed thus: I | 4—4 | 2, that is, upon two rows, four in the outer row, and one or two in the inner row.

SYN.—*Argyreus*, HECK. in Russeg. Reisen, I, II, 1842, 1040.—GRD. in Storer, Hist. Fishes of Mass. in Mem. Amer. Acad. New S. V, 1855, 287; and, in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 185.

Rhinichthys, AGASS. Lake Sup. 1850, 353.

Heckel includes in this genus two species which are generically distinct, *Cyprinus atronasus*, Mitch., and *Cypr. rubripinnis*. Mus. Par. MS. But *Cyprinus rubripinnis* is identical with *Leuciscus cornutus*; and since *Leuciscus cornutus* is to enter the genus *Plargyrus* of Rafinesque, *Cyprinus atronasus* remains as the type of the genus *Argyreus*, which again is identical with *Rhinichthys*. It must be recollected, however, that the teeth figured by Heckel under the name of *Argyreus rubripinnis* are those of *Plargyrus cornutus*.

In its external appearance the genus *Argyreus* resembles *Campostoma*, especially in the shape of the head and protrusion of the snout, and also in the situation of the mouth. The natural affinities of these two genera, however, are sufficiently remote to warrant the respective position we have assigned to them in two different groups of the family to which they belong.

1. ARGYREUS DULCIS, GRD.

PLATE LIV, FIGS. 5—8.

SPEC. CHAR.—Head well developed, constituting the fourth of the length, caudal fin excluded. Mouth large, and barbel conspicuous; lips fleshy. Eye small, sub-circular, its diameter entering six times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the extremity of the snout and the tip of the middle rays of the caudal. Insertion of ventral fins somewhat nearer the angle of the mouth than the base of the caudal. Color greyish yellow above; yellowish white beneath; sides sprinkled with an indistinct silvery band.

SYN.—*Argyreus dulcis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 185.

The largest specimens observed measured about three inches and a half in total length. The snout is more prominent than in *A. atronasus*, and less so than in *A. nasutus*. The head is well developed, constituting the fourth of the length, the caudal fin excluded. The eye is quite small and subcircular, its horizontal diameter entering six times in the length of the side of the head: a little over twice in advance of its anterior rim. The mouth is larger than in most of its congeners, and the barbel much more conspicuous. The dorsal fin, as usual, is higher than long, but its upper margin is slightly convex. Its anterior margin is nearer the extremity of the snout than the insertion of the caudal fin. The latter constitutes a little less than the fifth of the entire length. The anal is somewhat shorter than the dorsal, but its depth is less than the height of the latter.

D 10; A 9; C 4, 1, 9, 8, 1, 5; V 8; P 13.

The dorsal region is greyish yellow; the sides yellowish, with an indistinct silvery band; beneath yellowish white. The dorsal region, including the upper part of the flanks, is spread over with black specks, sometimes observed beneath the silvery band also.

References to the figures.—Plate LIV, fig. 5, represents *Argyreus dulcis*, size of life. Fig. 6, a scale from the dorsal region. Fig. 7, a scale from the lateral line. Fig. 8, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|-------------|--|-----------------|----------------------|---------------------|---------------------|
| 52 | 2665 | 9 | Adt. & y'g. | Sweetwater, tributary of Platte river, Nebr. | 1853 | J. S. Bowman | Alcoholic.. | J. S. Bowman |
| 53 | ..... | 1 | Young. | Cottonwood creek, Utah. | 1854 | Lt. E. G. Beckwith . | do | Mr. Kreuzfeld |

2. ARGYREUS NUBILUS, Grd.

SPEC. CHAR.—Head rather small, constituting the fifth of the entire length. Mouth small, and barbel inconspicuous; lips cartilaginous. Eye moderate sized, sub-circular; its diameter entering five times in the length of the side of the head. Anterior margin of dorsal fin nearer the extremity of the snout than the tip of the middle rays of the caudal. Insertion of ventral fins equi-distant between the angle of the mouth and the base of the caudal. Blackish brown above; dirty or dull white beneath.

SYN.—*Argyreus nubilus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 186.

This is a very characteristic species. The head is very small, and the body, fusiform in shape and compressed, is thick and swollen upon its middle. The tail again is rather slender. The snout is sub-conical, though not more protruding than in the preceding species; the mouth is a good deal smaller than in the latter, and its barbels less conspicuous. The head constitutes about the fifth of the entire length. The eye is moderately developed and sub-circular in shape; its horizontal diameter is contained about five times in the length of the side of the head. The dorsal, caudal, and anal fins are of but moderate development, the pectorals and ventrals being rather small.

D 2, 8; A 2, 7; C 5, 1, 9, 8, 1, 6; V 8; P 12.

The number of rays in the fins does not materially differ from that of the preceding species; in both, the anterior two rays of the dorsal and anal fins are mere rudiments.

The scales are sub-ovoid in their outline, with radiating furrows upon their entire periphery.

The color above is blackish brown, with a purplish hue along the middle of the flanks; the inferior regions are of a soiled white or yellowish brown. The upper surface of the head and upper half of the sides, including the eye, is deep black; inferiorly it is whitish or yellowish white.

Specimens four inches in total length were observed.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|-------|--------------------------------------|-----------------|---------------------|---------------------|------------------|
| 51 | 2664 | 2 | Adult | Fort Steilacoom, Puget's Sound, W.T. | 1853 | Gov. I. I. Stevens. | Alcoholic. | Dr. Geo. Suckley |

POGONICHTHYS, Girard.

GEN. CHAR.—The body is fusiform and elongated, compressed, covered with large and uniform scales, and provided with a conspicuous lateral line deflexed upon the middle of the abdomen. The dorsal fin is higher than long; the ventrals are inserted in advance of the anterior margin of the dorsal or behind it. The caudal is furcated. The head is of moderate size or else small, either rounded or flattened upon its upper surface. The snout being more or less protruding beyond the lower jaw, the mouth assumes a somewhat inferior position, although opening horizontally forwards. The mouth itself is of medium size, provided at its angle with a barbel inserted upon the anterior edge of the posterior extremity of the maxillary. The eye is of moderate development. The isthmus is quite narrow. The pharyngeal bones are proportionally stout, the inferior limb being, however, slender, slightly arched and expanded upon its symphysis. About the height of the third tooth the convexity suddenly expands, tapering off towards the extremity of the upper branch, which is slightly bent inwardly downwards. The teeth are well developed, very much compressed upwards and hooked. They are of the prehensile kind, of the hooked type, with a grinding surface, somewhat inclined backwards, and disposed upon a double row of two and four: 2 | 4—4 | 2.

SYN.—*Pogonichthys*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 136; &, VIII, 1856, 187.

This genus is allied to *Gobio*, from which it differs by a narrow isthmus, and especially by its teeth, which are of the prehensile kind, with a grinding surface, whilst those of *Gobio* are of the raptorial kind, without grinding surface.

1. POGONICHTHYS INAEQUILOBUS, B. & G.

PLATE LVI, FIGS. 1—4.

SPEC. CHAR.—Head forming a little less than the fifth of the total length; snout rounded, sub-conical, thickish; gape of mouth nearly horizontal; lower jaw shorter than the upper. Posterior extremity of maxillary bone scarcely even with a vertical line drawn in front of the orbit. Anterior margin of dorsal fin somewhat nearer the extremity of the snout than the insertion of the caudal. Insertion of ventrals placed posteriorly to the anterior margin of the dorsal; their origin being nearly equidistant between the extremity of the snout and the base of the caudal. Lobes of the caudal fin unequally developed; upper one the longest. Greyish brown above; yellowish beneath.

SYN.—*Pogonichthys inaequilobus*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 136.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 188.

The general form is very regular, sub-fusiform and compressed. The total length of the specimen described is about ten inches, of which the head forms a little less than the fifth part. The eye is sub-circular; its diameter being comprised about five times in the length of the side of the head. The mouth is of medium size; its cleft does not quite extend to a vertical line drawn in advance of the orbit. A barbel, about an eighth of an inch, may be observed at the angle of the mouth. The origin of the dorsal fin is equidistant between the extremity of the snout and the first rudimentary rays of the caudal. The caudal is long and deeply furcated; its upper lobe projecting beyond the lower, although the structure of that fin is perfectly homocercal. The anal is inserted at some distance behind the dorsal. The insertion of the ventrals is situated somewhat behind the origin of the dorsal, and consequently a little nearer the rudimentary rays of the caudal than to extremity of snout. The pectorals are moderate sized.

D 2, 9; A 2, 9; C 8, 1, 9, 8, 1, 7; V 1, 9; P 17.

The scales are large; fifty-six of these may be counted in the lateral line, which, upon the abdomen, approximates more the ventral than the dorsal outline. They are moderate sized, somewhat longer than deep, anteriorly sub-truncated, posteriorly rounded, with radiating furrows upon their posterior section only.

The upper regions of the head and body are greyish brown; the sides and abdomen yellowish. The fins partake of the color of the region of the body to which they belong.

References to the figures.—Plate LVI, fig. 1, represents *Pogonichthys inaequilobus*, size of life. Fig. 2 is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimen. | Collected by— |
|------------|--------------|--------|---|-----------------|---------------------------|-----------|---------------------|----------------------|
| 182 | 1 | Adult. | San Joaquin river, Cal..... | 1853 | Lt. R. S. Williamson..... | | Alcoholic. | Dr. A. L. Heermann. |
| 183 | 8 | A.&Y. | Petaluma, Cal..... | 1855 | E. Samuels..... | 138 | ...do.... | E. Samuels..... |
| 242 | 1 | Adult. | Sacramento river, near Fort Reading, Cal. | 1855 | Lt. R. S. Williamson..... | | ...do.... | Dr. John S. Newberry |

2. POGONICHTHYS SYMMETRICUS, B. & G.

SPEC. CHAR.—Head constituting the fifth of the total length. Snout rounded and sub-conical. Gape of mouth somewhat arched; lower jaw shorter than the upper. Posterior extremity of the maxillary corresponding to a vertical line drawn behind the nostrils. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Insertion of ventrals placed in advance of the anterior margin of the dorsal, and somewhat nearer the insertion of the caudal than the tip of the snout. Lobes of caudal fin equally developed. Dark greyish brown or blackish above; yellowish golden beneath.

SYN.—*Pogonichthys symmetricus*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 136.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 188.

The specimens before us being in a rather poor state of preservation, a description of the species can hardly be drawn with accuracy. The size of the largest one is about four inches and a half in total length; the profile of the body is sub-fusiform, very much compressed, and gracefully elongated. The head constitutes the fifth of the total length. The eye is large, its diameter being contained less than four times in the length of the side of the head. The lobes of the caudal fin are symmetrical. The anterior margin of the dorsal is equidistant between the extremity of the snout and the tip of the central rays of the caudal. The lateral line forms a gentle curve, convex downwards, upon the middle of the abdomen, and nearer the insertion of the ventrals than the base of the dorsal. The insertion of the ventrals is situated in advance of the anterior margin of the dorsal, a character which will at once enable us to distinguish this species from *P. inaequilobus*.

The scales are moderate, longer than deep, anteriorly sub-truncated, posteriorly rounded, with radiating furrows upon their posterior section only.

The upper regions are dark greyish or blackish brown, whilst the inferior regions are of a yellowish golden tint, the upper part of the sides being mottled with yellow and the lower part dotted with black. The dorsal and caudal are greyish olive; the other fins, greyish orange.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|-------------|---------------------------------------|-----------------|-------------------------|---------------------|-------------------------|
| 191 | 2749 | 5 | Fort Miller, San Joaquin valley, Cal. | 1853 | Lt. R. S. Williamson... | Alcoholic. | Dr. A. L. Heermann..... |

3. POGONICHTHYS ARGYREIOSUS, GRD.

SPEC. CHAR.—Head constituting the fifth of the total length. Snout sub-conical; gape of mouth nearly horizontal; lower jaw shorter than the upper. Posterior extremity of maxillar bone reaching a vertical line drawn at the anterior rim of the orbit. Anterior margin of dorsal fin equidistant between the extremity of the snout and the insertion of the caudal. Insertion of ventrals somewhat behind the anterior margin of the dorsal, and nearer the base of the caudal than the tip of the snout. Lobes of caudal fin equally developed. Rufous brown above; silvery beneath.

SYN.—*Pogonichthys argyreiosus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 154; & VIII, 1856, 188.

This species is allied to *P. inaequilobus*; it is, however, distinct from the latter by the structure of the caudal, which is equilobed like that of *P. symmetricus*. The head is contained five times in the total length, which, in the specimen before us, is about three inches and three quarters. The eye is large, sub-elliptical, and its horizontal diameter contained a little over three times in the length of the side of the head. The body is compressed, regularly fusiform in its outline. The insertion of the ventrals is situated somewhat behind the anterior margin of the dorsal. The pectorals and ventrals are rather small.

D 1, 9; A 2, 8; C 6, 1, 9, 8, 1, 5; V 1, 9; P 16.

The scales are moderate sized, as deep as long, anteriorly sub-truncated, posteriorly rounded, with radiating grooves upon their posterior section only. The lateral line is conspicuous and slightly bent downwards upon the abdomen.

The dorsal region is rufous brown; the sides and belly being shining silvery. Minute blackish dots are scattered all over, more densely on the dorsal region. A double series of these spots may be traced along the course of the lateral line. The dorsal and caudal fins are greyish yellow; the pectorals, ventrals, and anal, light yellow.

List of specimens.

| Catal. No. | Cor'g N. of tecth. | No. of spec | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|-------------|--------------------|-----------------|-------------------------|---------------------|--------------------------|
| 190 | 2748 | 2 | Presidio, Cal..... | 1853 | Lt. W. P. Trowbridge... | Alcoholic. | Lt. W. P. Trowbridge ... |

4. POGONICHTHYS COMMUNIS, Gr d.

PLATE LV.

SPEC. CHAR.—Head forming a little less than the fifth of the total length, its upper surface is quite depressed in the adult. Snout rounded, depressed, and quite protruding. Gape of mouth nearly horizontal; lower jaw shorter than the upper. Posterior extremity of the maxillary extending to a vertical line drawn in front of the orbit. Anterior margin of dorsal fin much nearer the extremity of the snout than the base of the caudal. Insertion of ventrals placed somewhat posteriorly to the anterior margin of the dorsal, their anterior basal edge being nearer the tip of the snout than the insertion of the caudal. Lobes of caudal fin equally developed. Reddish grey above; whitish or yellowish beneath, with metallic reflects. Fins yellowish olive.

SYN.—*Pogonichthys communis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 188.

This species is the most characteristic of the genus, by its small and flattened head and the large scales which cover the body. The mouth is larger in proportion than in any of its congeners; in large specimens the snout overlaps entirely the lower jaw, in which respect it resembles *Gila elegans* most remarkably. The barbel at the angle of the mouth is very conspicuous. The eye is rather small and circular; its diameter entering about seven times in the length of the side of the head. The fins are all well developed; the external rays of the pectorals extend beyond the usual termination of these fins in other species; their posterior edge being falciform.

D 2, 8 + 1; A 2, 8 + 1; C 7, 1, 9, 8, 1, 8; V 1, 8; P 18.

The scales are large, somewhat longer than deep, except in the lateral line, where they appear to be as deep as long. They are anteriorly sub-truncated, posteriorly rounded, provided with radiating furrows upon their posterior section only.

The dorsal region is reddish grey or greyish red, according to circumstances ; the rest of the body is whitish yellow or yellowish golden, the fins being unicolor.

We have examined numerous specimens of this species, as exhibited by the following list :

References to the figures.—Plate LV, fig. 1, represents *Pogonichthys communis*, size of life, Fig. 2 is an outline of the head seen from below showing the shape of the mouth. Fig. 3, an outline of the fish seen from above. Fig. 4, a dorsal scale. Fig. 5, a scale from the lateral line. Fig. 6, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor'g No. of teeth. | No of specs. | Age. | Locality. | When collected | Whence obtained. | Nature of specimens. | Collected by— |
|------------|---------------------|--------------|---------|---|----------------|---------------------|----------------------|-----------------------|
| 181 | 2743 | 24 | A. & Y. | Milk river, upper Mo. | 1853 | Gov. I. I. Stevens. | Alcoholic .. | Dr. Geo. Suckley..... |
| 184 | 2744 | 1 | Young | Sweet Water fork of Platte river. | 1852 | J. S. Bowman.... |do..... | J. S. Bowman..... |
| 185 | ..... | 12 | Adult. | Fort Union, Mo. riv. | 1852 | E. J. Denig..... |do..... | E. J. Denig..... |
| 186 | ..... | 10 | A. & Y. | Milk river, 125 miles above Fort Union. | 1853 | Gov. I. I. Stevens. |do..... | Dr. Geo. Suckley..... |
| 187 | 2745 | 1 | Adult. | Fort Pierre, Neb.... | 1853 |do..... |do..... | Dr. John Evans..... |
| 188 | 2746 | 5 | ..do.. | Yellowstone riv..... | 1853 | Col. A. Vaughan .. |do..... | Dr. F. V. Hayden..... |
| 189 | 2747 | 8 | A. & Y. | Above Fort Union.. | 1853 | Gov. I. I. Stevens. |do..... | Dr. Geo. Suckley..... |

GOBIO, Cuv.

GEN. CHAR.—Head sub-conical, with the snout rather thick and obtuse, overlapping the lower jaw, thus giving the mouth a somewhat inferior position. The latter, however, is directed forwards; it is large, and provided with a well developed barbel upon the posterior extremity of the maxillar bone. The eye is of moderate development. The isthmus is wide. The body is elongated, sub-cylindrical. The dorsal and anal both are rather narrow fins. The insertion of the ventrals takes place under the anterior margin of the dorsal, or a little behind it. The caudal is furcated. The scales are large, and the lateral line nearly median. The pharyngeals are gracefully curved, the upper and lower branches tapering, the convexity very slightly expanded. The teeth are slender, sub-cylindrical upon their base, compressed above, of the raptorial kind of the hooked type, without grinding surface, and disposed upon a double series of one, two, or three, and three, four, or five, as follows : 3 | 5—5 | 2, or 2 | 4—4 | 1, &c., &c.

SYN.—*Gobio*, Cuv. R \acute{e} gn. Anim. II, 1817, 193 ; 2d ed. II, 1829 ; &, ed. Illustr. Poiss. 218.—Cuv. & Val. Hist. nat. des Poiss. XVI, 1842, 298 —HECK. in *Russeg. Reisen*, I, II, 1842, 1028.—DE KAY, New Y. Faun. IV. 1842, 394.—STORER, Synops. 1846, 155.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 188.

This genus may be distinguished from *Leucosomus* by a more protruding snout, much more developed maxillar barbel, narrower dorsal and anal fins, and finally by its pharyngeal teeth, which are more strongly hooked.

1. GOBIO GELIDUS, Grd.

U. S. & MEX. BOUNDARY FISHES, PLATE XXIX, FIGS. 5—9.

SPEC. CHAR.—Head constituting the fifth of the entire length in which the caudal fin enters but four times and a half. Eye small, sub-elliptical, its horizontal diameter entering four times in the length of the side of the head. Body slender and tapering ; the anterior margin of the dorsal fin is nearer the extremity of the snout than the insertion of the caudal. Tip of pectorals reaching to the base of the ventrals ; tip of ventrals overlapping the vent, not extending quite to the anterior margin of the anal. Yellowish brown, with a silvery, superiorly dusky, streak along the middle of the flanks.

SYN.—*Gobio gelidus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 188

This species is most graceful in its general appearance; its well developed vertical fins must contribute a great deal towards rendering its movements swift. The body and head are very slender and elongated; the head forming about the fifth of the total length. The snout is rather prominently developed, tapering. The eye is small, compared to *G. fluviatilis*, resembling more, in that respect, *G. cataractæ*, from which, however, this species can readily be distinguished by the position of its ventral fins, which are inserted under the anterior margin of the dorsal, whilst they are placed in advance of it in *G. cataractæ*. The caudal is longer than the head; the dorsal and anal being likewise well developed. The ventrals and pectorals are slender and elongated.

D 1, 8 + 1; A 1, 8 + 1; C 6, 1, 9, 8, 1, 5; V 8; P 14.

The scales are deeper than long, anteriorly sub-truncated, posteriorly rounded, with radiating furrows upon their posterior section only.

The color is yellowish brown, lighter beneath than above. A silvery streak may be observed along the middle of the flank, superiorly margined with a dusky area, terminating into a blackish spot upon the insertion of the caudal fin.

References to the figures.—It is accidentally that the original drawings of *Gobio gelidus* and *G. aestivalis* were transposed at the time the plates went to the engraver; the former to the United States and Mexican Boundary Survey, the latter to the U. S. P. R. R. Explorations and Survey.

Plate XXIX, fig. 5, (U. S. & Mex. Boundary Report) represents *Gobio gelidus*, size of life. Fig. 6, head from beneath, showing the outline of the mouth. Fig. 7, a scale from the dorsal region. Fig. 8, a scale from the lateral line. Fig. 9, a scale from the abdominal region.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|-----------------------|-----------------|------------------------|---------------------|----------------------|
| 80 | 2 | Milk river, Upp. Mo.. | 1853 | Gov. I. I. Stevens.... | Alcoholic..... | Dr. George Suckley.. |

2. GOBIO VERNALIS, G r d.

SPEC. CHAR.—Head contained about five times and a half in the entire length, in which the caudal fin enters four times. Eye large, sub-circular; its diameter entering three times and a half in the length of the side of the head. Body sub-fusiform, rather thick anteriorly; anterior margin of dorsal fin nearer the extremity of the snout than the insertion of the caudal. Tip of pectorals not extending as far as the origin of the ventrals; tip of ventrals extending to the anterior edge of the vent. Yellowish brown; sides silvery.

SYN.—*Gobio vernalis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 189.

The largest specimens which we have seen of this species measure about three inches and a quarter in total length. It resembles *Alburnops* in its general appearance. The head is short, the snout blunt and rounded. The posterior extremity of the maxillar bone corresponding to a vertical line drawn across the anterior rim of the orbit. The eye is large; its diameter being contained three times and a half in the length of the side of the head. The body is fusiform, thickest anteriorly, tapering posteriorly. The caudal fin is long and deeply furcated; it constitutes nearly the fourth of the entire length, whilst the head enters in the latter nearly five times and a half.

D 1, 9; A 1, 9; C 6, 1, 9, 8, 1, 5; V 8; P 13.

The color is uniform yellowish brown, with a silvery streak along the middle of the flanks. The opercular apparatus and cheek are highly silvery.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|-------|---------------------------------|-----------------|--------------------|---------------------|--------------------|
| 78 | 2683 | 10 | Adult | Arkansas river, near Ft. Smith. | 1853 | Lt. A. W. Whipple. | Alcoholic. | Dr. G. G. Shumard. |

LEUCOSOMUS, Heck.

GEN. CHAR.—The body is elongated, sub-fusiform, compressed. The head is stout, conical, either abruptly truncated or tapering off. In either case, the mouth is large, subterminal, and the upper jaw slightly protruding beyond the lower. A small barbel upon the maxillary, near the angle of the mouth. Eyes of medium size. Insertion of ventrals a little in advance of the anterior margin of the dorsal. Caudal furcated. Scales large, somewhat longer than high; lateral line following the middle of the flanks. Pharyngeal bones stontish, sickle-shaped; the inferior branch rather slender, the convexity having a slight expansion tapering off towards the tip of the upper branch. The teeth are sub-conical, compressed and strongly hooked, of the raptatorial kind, of the hooked type, without grinding surface. They are disposed upon a double row of four and two in the following manner: 2 | 4—4 | 2; sometimes 2 | 5—4 | 3, and even 1 | 4—4 | 2.

SYN.—*Leucosomus*, HECK. in *Russeg. Reisen*, I, II, 1842, 1042.—GRD. in *Proc. Acad. Nat. Sc. Philad.* VIII, 1856, 189.

Cheilonemus, Bd.—GRD. in *Storer, Hist. Fishes, Mass.* in *Mem. Amer. Acad. New S. V.* 1855, 288.

The genus *Cheilonemus*, Bd., is strictly synonymous with *Leucosomus*; the latter differs from *Semotilus* by the presence of maxillar barbels.

On a former occasion the genus *Leucosomus* was altogether misunderstood by me, and from an advice of mine it thus entered into the "History of the Fishes of Massachusetts, by Dr. D. H. Storer." On framing the genus *Leucosomus*, Heckel, by inadvertence, applies the name of *Cyprinus chrysoleucus*, Mitch., to *Leuciscus pulchellus*, Storer, as shown by the figures given of its teeth, and the wording of its generical diagnosis. *Leucosomus*, therefore, is identical with *Cheilonemus*, and accordingly is the name to be adopted. *Cheilonemus* was proposed for *Leuciscus pulchellus*, and allied species, when it was supposed that *Cyprinus chrysoleucus* would constitute the type of the genus *Leucosomus*. But it is now well ascertained that *Cyprinus chrysoleucus* of Mitchell belongs to Rafinesque's genus *Luxilus*; and *Luxilus* has the priority over *Leucosomus*.

1. LEUCOSOMUS DISSIMILIS, Grd.

SPEC. CHAR.—Head rather small, sub-conical, constituting the fifth of the total length. Eye large; its diameter entering four times in the length of the side of the head. Gape of mouth somewhat oblique; posterior extremity of maxillar bone reaching a vertical line drawn in front of the orbit. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Insertion of ventrals situated in advance of the anterior edge of the dorsal. Greyish brown above, yellowish beneath; flank silvery. Fins greyish olive.

SYN.—*Leucosomus dissimilis*, GRD. in *Proc. Acad. Nat. Sc. Philad.* VIII, 1856, 189.

This species may be easily recognized by the small size of the scales of the back compared to those of the flanks. In that respect it approximates certain species of the genus *Semotilus*. Its head is sub-conical, contained about five times in the total length. The eye is large; its diameter being contained four times in the length of the side of the head. The dorsal fin is higher, and the anal deeper, than long. The tips of the ventrals approximate the vent.

D 1, 8 + 1; A 2, 8 + 1; C 4, 1, 8, 8, 1, 5; V 1, 8; P 17.

The color is uniform greyish brown above, silvery along the middle of the flank, and dull yellowish beneath; the fins being of a greyish olive tint.

List of specimens.

| Catal. No. | Cor'g No. of teeth. | No of spcc. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|---------------------|-------------|-------|------------------------|-----------------|------------------------|---------------------|-----------------|
| 158 | 2733 | 2 | ----- | Milk river, Upp. Mo-- | 1853 | Gov. I. I. Stevens.... | Alcoholic.. | Dr. Geo. Suckle |
| 159 | 2734 | 12 | Young | Lit. Muddy riv. Up. Mo | 1853 | -----do----- | -----do----- | -----do----- |
| 160 | ----- | 18 | ----- | -----do----- | 1853 | -----do----- | -----do----- | -----do----- |

2. LEUCOSOMUS PALLIDUS, G r d.

PLATE LXI, FIGS. 6—10. (By error: *Leucosomus macrocephalus*.)

SPEC. CHAR.—Head moderate sized, rather elongated, entering four times and a-half in the total length. Snout sub-conical and tapering. Eye moderate; its diameter being contained five times in the length of the side of the head. Gape of mouth somewhat oblique; posterior extremity of the maxillary extending to a vertical line intersecting the anterior rim of the pupil. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Insertion of ventrals situated somewhat in advance of the anterior edge of the dorsal. Greyish brown above, yellowish white beneath; a black spot at the base of the caudal and anterior edge of the dorsal fin.

SYN.—*Leucosomus pallidus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 190.

This species has the same general physiognomy as *L. dissimilis*. The scales of the back are likewise a good deal smaller than on the flanks, but in *totum* they are larger than in the preceding species. The origin of the ventrals is likewise situated in advance of the anterior margin of the dorsal. The caudal fin is not so deeply furcated as in *L. dissimilis*. The dorsal and anal fins are deeper than long; they are of but moderate development, as well as the ventrals and the pectorals; the tips of the ventrals scarcely approximating the vent.

D 1, 8 + 1; A 2, 8 + 1; C 7, 1, 9, 8, 1, 8; V 1, 8; P 17.

The scales moderate sized, somewhat smaller on the back than on the sides; sub-circular in outline, with radiating furrows upon their posterior section only.

The dorsal region is greyish brown, the ventral region yellowish white. A black spot may be observed at the base of the caudal, and another upon the anterior margin of the dorsal.

References to the figures.—Plate LXI, fig. 6, represents *Leucosomus pallidus*, size of life. Fig. 7 is a section of the body across the line of greatest depth. Fig. 8, a scale of the dorsal region. Fig. 9, a scale from the lateral line. Fig. 10, a scale from the abdominal region.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|--------------|-------|----------------------|-----------------|------------------------|------------|---------------------|---------------------|
| 157 | 8 | A.&Y. | Antelope creek, Ark. | 1853 | Lt. A. W. Whipple ---- | VIII. | Alcoholic. | Dr. C. B. Kennerly. |

3. LEUCOSOMUS INCRASSATUS, G r d.

PLATE LXI, FIGS. 1—6.

SPEC. CHAR.—Head rather large, sub-conical, constituting about the fourth of the total length. Eye moderate sized; its diameter entering a little over five times in the length of the side of the head. Gape of the mouth slightly oblique; posterior extremity of maxillar bone reaching a vertical line drawn within the anterior rim of the orbit. Anterior margin of dorsal fin equidistant between the fork of the caudal and the extremity of the snout. Insertion of ventrals situated in advance of the anterior edge of the dorsal. Dark greyish above, light greyish beneath, with a black spot at the anterior edge of the dorsal. Other fins unicolor, light yellowish olive.

SYN.—*Leucosomus incrassatus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 190.

The species here referred to is remarkable for its stout and short body and well developed head, which constitutes a little less than the fourth of the total length. The fork of the caudal is according to the pattern of that of *L. pallidus*. The dorsal and anal fins are somewhat deeper than long. The pectorals and ventrals are small; the tips of the latter, when directed backwards, are far from attaining to the vent. Nothing is more uniform than the formulæ of the fins of the various species of this genus:

D 2, 8 + 1; A 2, 8 + 1; C 5, 1, 9, 8, 1, 6; V 1, 8; P 17.

As to the scales, they are moderate sized, sub-circular, nearly as large on the dorsal region as on the flanks, exhibiting radiating furrows upon their posterior section alone.

Dark greyish above, light greyish beneath, with a yellowish hue all over the head and body. A black spot upon the anterior margin of the dorsal; none upon the caudal.

References to the figures.—Plate LXI, fig. 1, represents *Leucosomus incrassatus*, size of life; fig. 2 being a section of the body across the line of greatest depth. Fig. 3, a dorsal scale. Fig. 4, a scale from the lateral line. Fig. 5, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor'g No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Where obtained. | Nature of specimen. | Collected by— |
|------------|---------------------|--------------|--------|----------------------------------|-----------------|----------------------|---------------------|-------------------|
| 156 | 2732 | 1 | Adult. | 20 miles west of Choctaw Agency. | 1853 | Lt. A. W. Whipple... | Alcoholic... | H. B. Möllhausen. |

4. LEUCOSOMUS MACROCEPHALUS, G r d.

SPEC. CHAR.—Head very large, rather elongated, forming more than the fourth of the total length. Snout sub-conical, thickish. Eye moderate; its diameter entering about six times in the length of the side of the head. Gape of the mouth slightly oblique; posterior extremity of the maxillary extending to a vertical line drawn across the anterior rim of the pupil. Anterior margin of dorsal fin equidistant between the extremity of the snout and the fork of the caudal. Insertion of ventrals situated in advance of the anterior edge of the dorsal. Brownish grey above, silvery white beneath; a black spot at the base of the caudal and anterior edge of the dorsal.

SYN.—*Semotilus macrocephalus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 204.

It is by a mere accident that this species formerly appeared under the head of *Semotilus*. It may easily be distinguished from its congeners by its very large head, which forms more than the fourth of the entire length. Its body is very much compressed and quite tapering posteriorly.

The caudal fin is moderately furcated; the dorsal is higher, and the anal deeper, than long. The pectorals and ventrals are small; the tips of the latter not extending to the vent. The number of the rays of the fins scarcely undergoes any variations. In the present species they stand as follows:

D 2, 8 + 1; A 2, 8 + 1; C 6, 1, 9, 8, 1, 5; V 1, 8; P 15.

Two rudimentary rays in front of both the dorsal and anal, one of which is very exiguous.

The scales are more uniformly imbricated than in *L. dissimilis* and *L. pallidus*, where a noted difference is observed in that respect between the anterior and posterior regions of the body.

The color of the back is brownish grey, the sides and belly being silvery white. The anterior margin of the dorsal and the base of the caudal exhibit, each, a black spot.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|----------------|---------------------|-----------------|------------------|---------------------|------------------|
| 177 | 2741 | 10 | Adult & young. | Fort Pierre, Nebr.. | 1854 | Dr. John Evans.. | Alcoholic. | Dr. John Evans.. |

CERATICHTHYS, Baird.

GEN. CHAR.—Body elongated, fusiform or sub-fusiform, somewhat compressed. Head flattened above, very declivous anteriorly, with the snout rounded and overlapping the lower jaw. Mouth moderate in size, sub-terminal and horizontal, provided with a barbel at its angle, and inserted upon the extremity of the maxillar bone. Eye approximating the upper surface of the head, and rather moderate in size. The isthmus is wide. The insertion of the ventrals is even with a vertical line drawn from the anterior margin of the dorsal fin. The latter is higher, and the anal deeper, than long. The scales are large, and the lateral line nearly straight along the middle of the flauks. The pharyngeal bones are pretty stout upon their convexity, which is very slightly expanded, whilst the upper and lower branches are nearly equally developed, the latter, however, more slender. The teeth are stoutish, compressed, of the prehensile kind of the hooked type, generally without grinding surface. Sometimes, however, a grinding surface may be observed upon some of the teeth which are subject to some variations, being compressed or else sub-conical, generally hooked, and occasionally conical. They are disposed upon a single row: 4—4.

SYN.—*Ceratichtys*, Bd. Mss.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 212.

The abbreviated and rounded head, which bears a great resemblance to that of several species of *Blennius*, is a trait which will at once enable to distinguish this genus so soon as it is known to be a cyprinoid. There are other genera in the cyprinoid family having a rather short and rounded head, but none in which the blennioid *fascies* is so well marked.

The species of this genus are, as yet, but very imperfectly known. Rafinesque has indicated some of them under various names; his *Rutilus amblops* is one. Dr. Jared P. Kirtland has described another under the name of *Semotilus biguttatus*. Another, still, has been briefly characterized by me as *C. leptcephalus*, in the "Proceedings of the Academy of Natural Sciences of Philadelphia, vol. VIII, 1856, 212."

A specimen, three inches long, collected near the mouth of Poteau creek, Arkansas, by Dr. George G. Shumard, being, according to all probabilities, immature, we must defer its description to a future occasion.

NOCOMIS, Girard

GEN. CHAR.—Body short, stoutish and compressed, covered with large scales. The ventrals are inserted opposite the anterior margin of the dorsal, perhaps somewhat anterior to it. The caudal is furcated. The head is large, rounded upon the snout, which is declivous. The mouth is large and terminal, the lower jaw being slightly overlapped by the upper. A barbel upon the posterior extremity of the maxillary. Eyes moderate sized. Isthmus rather wide. The pharyngeals are stoutish, somewhat expanded upon their convexity; expansion tapering off towards the tip of the upper limb, which is gently curved inwards. The inferior limb is scarcely longer than the upper, looks more slender, is flattened upon its extremity, which is turned outwards, causing a convexity inwardly. The teeth are of the voratorial kind of the hooked type, without grinding surface. They are sub-cylindrical, acerated and hooked, disposed upon a double series of one and four, in the following manner: 1 | 4—4 | 1.

SYN.—*Nocomis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 190.

This genus is allied to *Semotilus* by its pharyngeal teeth, differing chiefly from it by its mouth, which is not so deeply cleft, and by the presence of maxillar barbels, which are wanting in *Semotilus*.

A second species of this genus, *N. bellicus*, inhabits the Black Warrior river, Alabama, and is mentioned in the "Proceedings of the Academy of Natural Sciences of Philadelphia, vol. VIII, 1856, 213."

NOCOMIS NEBRASCENSIS, G r d .

SPEC. CHAR.—Head contained four times and a half in the total length. Posterior extremity of maxillary even with a vertical line drawn behind the nostrils. Eye sub-circular; its diameter entering five times in the length of the side of the head. Body stoutish and compressed, covered with large scales. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Dorsal and anal fins deeper than long. Caudal fin constituting the fifth of the length. Tip of ventrals overlapping the vent, although not reaching the anal fin. Reddish brown above, golden yellow beneath.

SYN.—*Nocomis nebrascensis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 190.

The anal fin is inserted posteriorly to the dorsal, both being narrower than high or deep. The ventrals are rather small; the pectorals being moderate sized.

D 1, 8 + 1; A 1, 7 + 1; C 9, 1, 9, 8, 1, 8; V 8; P 17.

The scales are nearly as deep as long, anteriorly sub-truncated, posteriorly rounded, with radiating grooves upon their posterior section only. The lateral line is nearly median, being but slightly deflexed upon the thoracic region.

It is a fish about four inches in total length, of a uniform reddish brown hue above, and golden yellow beneath; a blackish streak is observed along the middle of the flanks terminating into a black spot at the base of the caudal fin.

List of specimens.

| Catal. No. | Cer. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|----------|---|-----------------|------------------|---------------------|-----------------|
| 48 | 2661 | 3 | Adult... | Sweet Water, a tributary of Nebraska river. | 1853 | J. S. Bowman... | Alcoholic. | J. S. Bowman... |

HYBOPSIS, Agass.

GEN. CHAR.—Body elongated, compressed, sub-fusiform in profile, covered with rather large scales. The lateral line being straight along the middle of the flanks. The head is of moderate size, sub-conical and rounded upon the snout, which protrudes beyond the lower jaw. A barbel, inserted upon the anterior margin of the posterior extremity of the maxillary, may be seen at the angle of the mouth. The eyes are large, the isthmus narrow. The dorsal is a little higher, and the anal deeper, than long. The insertion of the ventrals takes place opposite the second ray of the dorsal, hence very nearly under its anterior margin. The tail is deeply furcated. The pharyngeal bones have the same form and appearance as in *Hudsonius*; the teeth are likewise of the same kind (bruising) and type (hooked with a grinding surface), but more irregular yet. Sometimes not hooked, the grinding surface contorted and nearly absent, or even resembling a truncated cone. They are disposed upon a double row of four and one: 1 | 4—4 | 1, or 0 | 4—4 | 1.

SYN.—*Hybopsis*, AGASS. in Amer. Journ. of Sc. Second series, XVII, 1854, 358.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 210.

This genus, it will appear, is intimately related to *Hudsonius*, from which it chiefly differs by the presence of barbels at the angle of the mouth, and by its straight lateral line also.

It was left rather vaguely defined by its author, for there are many genera in which “the mouth is protractile downwards, after the fashion of *Catostomus*,” with the lips neither swollen nor thickened. And many other genera, too, in which there is “only four or five compressed and hooked teeth in each main row, and one or two in a second row.” What is really of generic value is left for us to conjecture, since we are not in possession of its typical species.

The generic characters which we now offer are based upon *Leuciscus storerianus* and a new species from Alabama (*Hybopsis winchelli*, Proc. Acad. Nat. Sc. Philad. VIII, 1856, 211), and should they prove generally distinct from *Hybopsis gracilis*, Agass., a new name will have to be coined for our species.

TRIBE OF ALBURNI.

The genera brought together in this tribe are numerous, and quite as diversified in their dentition as in the former group. They differ from the latter by the absence of barbels. As in the preceding, the teeth are of the hooked types, with or without grinding surface (*Dentes uncinato-submolaes et uncinato-subconici*), mostly of the raptatorial kind (*Dentes raptatorii*). In the majority of cases, the teeth are disposed upon a double series also.

This group was first distinguished in the “Proceedings of the Academy of Natural Sciences of Philadelphia, vol. VIII, 1856, 190.”

EXOGLOSSUM, Rafin.

GEN. CHAR.—The body is elongated, sub-cylindrical, somewhat compressed. The head is sub-conical, flattened at the occiput, and terminated by a blunt snout. The mouth is sub-terminal, opening downwards and forwards, the lower jaw being shorter than the upper and not surrounded by the lips around its symphysis, the lips being largely developed at the angle of the mouth and along the upper jaw also. The eye is of moderate size. The isthmus is wide. The origin of the ventrals is situated opposite the anterior margin of the dorsal or posterior to it. The caudal is furcated. The scales are rather large. The pharyngeal bones are exiguous, very slender upon their inferior branch, hardly dilated above. The teeth are of the raptatorial kind of the hooked type, without grinding surface, instead of which a sharp, but not crenated, edge. They are disposed upon a double row of one and four, thus: 1 | 4—4 | 1.

SYN.—*Exoglossum*, RAFIN. in Journ. Acad. Nat. Sc. Philad. I, I, 1818, 419.—HECKEL, in Russeg. Reisen, I, II, 1842, 1023.—CUV. & VAL. Hist. nat. Poiss. XVII, 1844, 480.—STORER, Synops. 1846, 176.—AGASS. in Amer. Journ. of Sc. 2d series, XIX, 1855, 215.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 191.

The shortness of the lower jaw, which exposes the anterior extremity of the tongue, is a feature exclusively peculiar to this genus. That the structure just alluded to is really of a generical value, is evinced by the fact that two species are now known to possess it. The general aspect, as well as the structure of the scale, are similar to those of *Nocomis*.

EXOGLOSSUM MIRABILE, Grd.

PLATE LVI, FIGS. 5—8.

SPEC. CHAR.—Head sub-conical, blunt, and constituting the sixth of the total length. Mouth small; posterior extremity of maxillar bone even with a vertical line drawn across the nostrils. Eye sub-circular; its diameter entering four times in the length of the side of the head. Anterior margin of dorsal much nearer the extremity of the snout than the base of the caudal. Insertion of ventrals placed somewhat posteriorly to the anterior margin of the dorsal, their tip nearly reaching the vent. Reddish brown above; middle of flank with a silvery band; beneath light reddish.

SYN.—*Exoglossum mirabile*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 191.

A very characteristic species, very slender and fusiform, and distinguished from *E. maxillingua* by a smaller head, smaller mouth, the position a little more backwards of the ventrals, and larger scales. The latter are longer than deep, except in the lateral line, anteriorly sub-truncated, posteriorly rounded, with radiating furrows upon the posterior section only; the lateral line is straight and median. The dorsal is higher, and the anal deeper, than broad upon their base. The caudal fin enters nearly five times and a half in the total length.

D 2, 8 + 1; A 2, 7 + 1; C 12, 1, 9, 8, 1, 10; V 8; P 15.

The color is reddish brown above, light reddish beneath, with a silvery band along the middle of the flanks from head to tail. A black spot may be observed upon the insertion of the caudal fin.

References to the figures.—Plate LVI, fig. 5, represents *Exoglossum mirabile*, size of life. Fig. 6 is a scale from the dorsal region. Fig. 7, a scale from the lateral line. Fig. 8, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor'g No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|---------------------|--------------|--------|----------------------------------|-----------------|--------------------|---------------------|----------------------|
| 47 | 2660 | 3 | Adult. | Arkansas river, near Fort Smith. | 1853 | Lt. A. W. Whipple. | Alcoholic. | Dr. Geo. G. Shumard. |

CLIOLA, Girard.

GEN. CHAR.—Body slender and sub-fusiform in profile, compressed; snout rounded; mouth small and terminal, with both jaws equal. There is a rather wide isthmus. The eyes are well developed also. The dorsal fin is about as long as high, or longer than high. The caudal fin is fureated; the insertion of the ventrals, opposite the anterior margin of the dorsal. The scales being large, and the lateral line following the middle of the flanks. The pharyngeal bones are of moderate strength; the inferior branch is rather slender, and nearly straight when viewed in front; from the insertion of the teeth, they gradually expand to the entire convexity, which is gentle and gradual. The teeth themselves are of the raptorial kind, of the hooked type, without grinding surface, compressed, curved, and disposed upon one single row of four: 4—4.

SYN.—*Cliola*, GAD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 192.

The species of this genus have the external aspect of *Dionda*, but differ from the latter by the pharyngeal teeth, which are curved and without grinding surface.

1. CLIOLA VIGILAX, G r d .

SPEC. CHAR.—Head constituting the fifth of the total length. Eye moderate, its diameter entering about three times and a half in the length of the side of the head. Posterior extremity of maxillar bone not extending quite as far back as a vertical line drawn at the anterior rim of the orbit. Anterior margin of dorsal fin equidistant between the extremity of the snout and the insertion of the caudal. Yellowish brown, with a blackish streak along the lateral line, a black spot at the base of the caudal, and one at the anterior edge of the dorsal.

SYN.—*Ceratichthys vigilax*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 391.

Leuciscus vigilax, B. & G. in Marcy's Expl. of Red Riv. of La. 1853, 248, Zool. pl. xxiv, figs. 1—4.

Cliaola vigilax, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 192.

The body is sub-fusiform, compressed. The head forms one-fifth of the entire length; it is contained three times in the length of the body: the caudal fin being about one-fifth of the entire length. The head itself has the shape of a truncated cone. The eyes are sub-elliptical, their longitudinal diameter being contained three times and a half in the length of the sides of the head. The mouth is rather small, its angle not extending to a vertical line drawn at the anterior rim of the orbit. The opercle is considerably large and almost trapezoidal in shape. The subopercle and preopercle are comparatively small. The isthmus beneath is about three-tenths of an inch wide.

The dorsal fin is longer than high, and is composed of nine rays, bifurcated from about their middle, some of the middle rays showing another subdivision upon their extremity. The caudal fin is furcated, its angles being acute. It contains eighteen well developed rays, and several rudimentary ones above and below; the central ones bifurcate twice. The base of the caudal fin is considerably broader (higher) than the central portion of the peduncle of the tail. The anal fin is situated behind the dorsal, is higher than long, sub-trapezoidal, and composed of eight bifurcated rays; the central ones subdivided towards their extremity. The ventrals are inserted somewhat behind the anterior margin of the dorsal; they are rather slender, posteriorly rounded, composed of eight bifurcated rays, the middle ones subdivided towards their extremity; and when bent backwards the fin does not reach quite to the vent, which is situated immediately in advance of the anterior margin of the anal fin. The pectorals are slender; when bent backwards they do not reach the insertion of the ventrals. They are composed of fourteen bifurcated rays, the central ones subdividing upon their last third. Formula:

D 9; A 8; C 3, 1, 8, 8, 1, 3; V 8; P 14.

The scales are proportionally large, somewhat higher than long, rounded at both extremities, more abruptly anteriorly, with radiating furrows upon their posterior half. There are sixteen rows of them on the line of greatest depth, and eight on the peduncle of the tail. The lateral line, in which thirty-eight to forty scales may be counted, runs along the middle of the flank, slightly bent downwards on the abdomen.

The ground color is yellowish brown; a blackish stripe composed of crowded dots follows the lateral line on the sides. A black spot may be seen at the base of the caudal, and one also at the anterior margin of the dorsal.

List of specimens.

| Catal. No. | Cor'g. No of teeth. | No. of spec. | Locality. | When collected. | Whence obtained | Nature of specimen. | Collected by— |
|------------|---------------------|--------------|--|-----------------|-----------------------------------|---------------------|------------------------|
| 31 | 2645 | 1 | Otter creek, trib. of Red river, Arkansas. | 1852 | Capt. R. B. Marcy and McClelland. | Alcoholic. | Capt. G. B. McClelland |

2. CLIOLA VELOX, Grd.

SPEC. CHAR.—Head contained about four times and a half in the total length. Eye large; its diameter entering three times in the length of the side of the head. Posterior extremity of maxillary not extending quite so far as the anterior rim of the orbit. Anterior margin of dorsal fin somewhat nearer the extremity of the snout than the insertion of the caudal. Olivaceous, darker above than beneath; a black streak along the middle of the flank terminating into a jet black spot at the base of the caudal. A spot at the anterior edge of the dorsal.

SYN.—*Cliola velox*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 192.

This is a very slender and elegant species, differing from *C. vigilax* by a more conical head, much larger eyes, and larger scales. The dorsal fin is less elongated, being nearly as high as long. The number of the rays differ but little:

D 1, 9; A 1, 8; C 9, 1, 9, 8, 1, 8; V 8; P 14.

The ground color is olivaceous, with a silvery reflect over the middle of the flanks; a black streak follows the course of the lateral line. A jet black spot may be seen at the base of the caudal. A black spot also exists at the anterior margin of the dorsal.

List of specimens.

| Catal. No. | Cor'g No. of teeth. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|---------------------|--------------|-------------------------|-----------------|------------------|---------------------|-----------------------|
| 29 | 2643 | 2 | San Pedro creek, Texas. | 1854 | Major Emory..... | Alcoholic. | Dr. C. B. Kennerly... |

3. CLIOLA VIVAX, Grd.

SPEC. CHAR.—Head contained somewhat over five times in the total length. Eye moderate; its diameter entering three times and a half in the length of the side of the head. Posterior extremity of maxillar bone not reaching a vertical line drawn in front of the orbit. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Yellowish with an obsolete greyish streak along the middle of the flauks, and a black spot at the base of the caudal.

SYN.—*Cliola vivax*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 192.

This species might easily be mistaken for *C. velox*, were it not for the shortness of its head and its small eye. Besides, the body is not so much elongated, and is covered with scales a good deal smaller. On the other hand, the shape of the fins, as well as the number of their rays, afford but minor differences. The dorsal appears to be somewhat higher, and the pectorals more slender and more elongated.

D 1, 9; A 1, 8; C 6, 1, 9, 8, 1, 7; V 8; P 12.

The color is uniform light yellowish or saffron, with a black spot at the base of the caudal fin; the middle of the flanks exhibit traces of a greyish or blackish streak.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|----------------------|-----------------|--------------------|-----------|---------------------|------------------------|
| 30 | 2644 | 1 | Leen river, Texas .. | 1853 | Lt. A. W. Whipple. | 11 | Alcoholic.. | Dr. C. B. Kennerly.... |

ALBURNELLUS, Girard.

GEN. CHAR.—Body slender and compressed, covered with large, more or less deciduous, scales, which are deeper than long and posteriorly furrowed. Gape of the mouth oblique; jaws sub-equal, lower one slightly protracted beyond the upper, which is not emarginated. Isthmus narrow. Dorsal fin higher than long. Ventrals inserted in advance of the dorsal. Caudal fin deeply furcated. The pharyngeal bones are slender, expanded upon their convexity, the upper limb bent inwards and downwards, and the inferior limb rather exiguous and shorter than the upper. The teeth themselves are slender and compressed, more or less hooked, of the raptorial kind, and disposed upon a double row of two and four, thus: 2 | 4—4 | 2.

SYN.—*Alburnellus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 193.

This genus differs from *Alburnus*, to which it is closely allied, by the lower jaw being less protracted, requiring no emargination of the upper one to fit its apex. Moreover, the main row of pharyngeal teeth is composed of four teeth instead of five.

1. ALBURNELLUS DILECTUS, GRD.

PLATE LVII, FIGS. 9—12.

SPEC. CHAR.—Head forming a little more than the sixth of the total length. Posterior extremity of maxillar bone reaching a vertical line drawn at the anterior rim of the orbit. Diameter of eye entering three times in the length of the side of the head. Anterior margin of dorsal fin somewhat nearer the fork of the caudal than the extremity of the snout. Insertion of ventrals nearer the extremity of the snout than the base of the caudal fin. Pectorals slender, though far from reaching the insertion of the ventrals. Reddish yellow, with a lateral silvery streak.

SYN.—*Alburnus dilectus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 193.

The largest specimens observed are about three inches and a half in total length; the head forming a little more than the sixth part of it. The greatest depth is nearly equal to the length of the head. The diameter of the circular eye is contained about three times in the length of the side of the head, and less than once in advance of its anterior rim. There are ten longitudinal rows of scales between the insertion of the ventrals and the base of the dorsal; they are anteriorly subtruncated, rounded, and tapering posteriorly. The lateral line runs along the fourth row from the ventrals upwards.

D 2, 8 + 1; A 2, 11 + 1; C 8, 1, 9, 8, 1, 7; V 1, 8; P 14.

The anal fin is as long as deep, and a good deal longer than the dorsal; its origin is nearly opposite the posterior margin of the dorsal. The tips of the ventrals approximate the vent without overlapping it.

The ground color is uniformly reddish yellow, lighter beneath than above; a silvery streak may be observed along the middle of the flanks. The fins are light yellowish; the rays of the dorsal and caudal being tinged with greyish.

References to the figures.—Plate LVII, fig. 9, represents *Alburnellus dilectus*, size of life. Fig. 10 is a scale from the dorsal region. Fig. 11, a scale from the lateral line. Fig. 12, a scale from the abdominal region.

List of specimens.

| Catal. No. | No. of spec | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|-------------|-------------|----------------------------------|-----------------|----------------------|---------------------|------------------------|
| 71 | 24 | Adt. & Y'g. | Arkansas river, near Fort Smith. | 1853 | Lt. A. W. Whipple... | Alcoholic. | Dr. Geo. G. Shumard .. |

2. ALBURNELLUS UMBRATILIS, Grd.

SPEC. CHAR.—Head constituting about the fifth of the whole length. Posterior extremity of the maxillary extending to a vertical line drawn at the anterior rim of the orbit. Diameter of the eye entering three times and a half in the length of the side of the head. Anterior margin of dorsal fin nearer the extremity of the snout than the fork of the caudal. Insertion of ventrals nearer the extremity of the snout than the base of the caudal. Pectorals not reaching the insertion of the ventrals. Dorsal region greyish brown; flanks silvery grey; belly reddish yellow.

SYN.—*Alburnus umbratilis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 193.

This is a shorter and deeper species, and which might easily be mistaken for a *Luxilus*, so striking is its general resemblance with small specimens of the latter genus. The greatest length is about three inches; the greatest depth being equal to the length of the head, and contained five times in the total length. The lateral line, though running along the fourth row of scales from the insertion of the ventrals, is more deflexed upon the abdomen than in *A. dilectus*; the longitudinal rows of scales being fourteen in number.

D 1, 8 + 1; A 1, 11 + 1; C 5, 1, 9, 8, 1, 6; V 1, 8; P 13.

The anal fin is nearly as long as deep, and longer than the dorsal; its anterior margin is placed a little behind the posterior margin of the dorsal. The tips of the ventrals overlap the vent, nearly reaching the anterior margin of the anal.

The color of the dorsal region is of a greyish brown tint; the sides being of a silvery grey, and the belly dull reddish yellow. The fins are olivaceous tinged with greyish.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|-------------|-----------------------|-----------------|--------------------|---------------------|------------------|
| 73 | 2678 | 24 | Adt. & Y'g. | Sugarloaf creek, Ark. | 1853 | Lt. A. W. Whipple. | Alcoholic. | H. B. Mölhausen. |

ALBURNOPS, Girard.

GEN. CHAR.—Body slender and compressed, protected with large and deciduous scales, which are deeper than long, and posteriorly furrowed. Snout rather blunt and thick, overlapping the lower jaw, which is slightly shorter than the upper. Eye large. Gill apertures separated beneath by a narrow isthmus. Dorsal fin higher than long. Insertion of ventrals placed somewhat behind the anterior margin of the dorsal, else in advance of it. Caudal fin deeply furcated. The pharyngeal bones resemble, by their configuration, those of *Alburnellus*. The teeth themselves are of the prehensile kind of the hooked type, with a narrow and sometimes contorted grinding surface. They are disposed upon a double row of two and four: 2 | 4—4 | 2, or 1 | 4—4 | 2.

SYN.—*Alburnops*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 194.

Thus we see that a marked difference between *Alburnops* and *Alburnellus* consists in the presence of a grinding surface to the teeth in the former, and which is absent in those of the latter.

This genus may furthermore be distinguished from *Alburnus* and *Alburnellus* by a smaller mouth and by a thickening of the snout, which overlaps slightly the lower jaw, contrary to what is the case in *Alburnus* and *Alburnellus*. In that respect, *Alburnops* will remind us of some species of *Hyborhynchus*. The eye is large; a very narrow isthmus separates the gill apertures beneath. The insertion of the ventrals takes place under the anterior margin of the dorsal fin, which resembles that of *Alburnus* and *Alburnellus*.

In both of the latter genera the ventrals are situated in advance of the dorsal. The caudal is furcated. On the other hand, the anal has a narrower base than in *Alburnus* and *Alburnellus*; the lateral line is nearly median, instead of being deflexed upon the abdomen.

1. ALBURNOPS BLENNIUS, Grd.

PLATE LVII, FIGS. 13—16.

SPEC. CHAR.—Head constituting the fifth of the entire length. Snout blunt and abbreviated; lower jaw shorter than the upper; posterior extremity of maxillary bone extending to a vertical line drawn within the anterior rim of the orbit. Anterior margin of dorsal fin nearer the extremity of the snout than the insertion of the caudal. Insertion of ventrals situated slightly behind the anterior edge of the dorsal; their tips approximating the vent. Reddish brown, darker above than beneath, silvery on the sides; fins unicolor.

SYN.—*Alburnops blennius*, GRD in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 194.

This species has the snout most prominently rounded. The posterior extremity of the maxillary extends to a vertical line drawn somewhat within the anterior rim of the orbit. The eye is rather large; its diameter entering three times and a half in the length of the side of the head. The greatest length being about three inches and a half, the head forming the fifth part of it; the depth of the body is less than the length of the head.

D 2, 8 + 1; A 2, 7 + 1; C 7, 1, 9, 8, 1, 8; V 1, 8; P 14.

The anal fin is deeper than long; its anterior margin is nearly equidistant between the isthmus and the tip of the lower lobe of the caudal. The pectorals are slender and longer than the ventrals.

The scales, deeper than long, are sub-lozange-shaped and furrowed upon their posterior section. There are ten longitudinal rows upon the greatest depth, six above the lateral line and three below it.

The color is reddish brown; the middle of the flanks silvery; the fins unicolor.

References to the figures.—Plate LVII, fig. 13, represents *Alburnops blennius*, size of life. Fig. 14, a scale from the dorsal region. Fig. 15, a scale from the lateral line. Fig. 16, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|---------|----------------------------------|-----------------|--------------------|---------------------|----------------------|
| 67 | 2674 | 18 | A. & Y. | Arkansas river, near Fort Smith. | 1853 | Lt. A. W. Whipple. | Alcoholic. | Dr. Geo. G. Shumard. |

2. ALBURNOPS SHUMARDI, Grd.

PLATE LVII, FIGS. 1—4.

SPEC. CHAR.—Head constituting the fifth of the total length. Snout sub-conical, lower jaw shorter than the upper. Posterior extremity of the maxillary reaching a vertical line drawn across the anterior rim of the pupil. Anterior margin of dorsal fin equidistant between the extremity of the snout and the insertion of the caudal. Insertion of ventrals situated slightly behind the anterior margin of the dorsal; their tips approximating the vent. Reddish brown; flanks silvery.

SYN.—*Alburnops shumardi*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 194.



The general appearance is the same as that of the preceding species. The snout is more conical, the mouth larger and more deeply cleft. The head constitutes likewise the fifth of the total length, which measures three inches and a half. The eye is well developed, sub-circular; its diameter entering a little over three times in the length of the side of the head.

The anal fin is deeper than long, its anterior margin being nearer the tip of the lower lobe of the caudal than the extremity of the snout. The dorsal is higher than in the preceding species. The pectorals being slender. The formula of the fins reads thus:

$$D\ 2, 8 + 1; A\ 2, 8 + 1; C\ 6, 1, 9, 8, 1, 7; V\ 1, 8; P\ 15.$$

The scales are large, deeper than long, sub-elliptical on the back, elsewhere anteriorly sub-truncated and posteriorly rounded, with radiating grooves upon the posterior section only. There are but nine rows of scales, five above and three below the lateral line.

The color is reddish brown, lighter beneath than above; the middle of the flanks appearing as though streaked with silver; the fins being unicolor, of a light yellow or straw tint.

References to the figures.—Plate LVII, fig. 1, represents *Alburnops shumardi*, size of life. Fig. 2, a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------|----------------------------------|-----------------|--------------------|---------------------|----------------------|
| 68 | 2675 | 2 | Adult. | Arkansas river, near Fort Smith. | 1853 | Lt. A. W. Whipple. | Alcoholic. | Dr. Geo. G. Shumard. |

3. ALBURNOPS ILLECEBROSUS, Grd.

PLATE LVII, FIGS. 5—8.

SPEC. CHAR.—Head contained five times and a half in the total length. Snout sub-conical; lower jaw shorter than the upper. Posterior extremity of maxillar bone extending to a vertical line drawn in front of the orbit. Anterior margin of dorsal fin equidistant between the extremity of the snout and the insertion of the caudal. Insertion of ventrals situated somewhat in advance of the anterior edge of the dorsal; their tips reaching the vent. Reddish brown, lighter beneath than above, with the middle of the flanks silvery; fins unicolor.

SYN.—*Alburnops illecebrosus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 194.

This is perhaps the most graceful of the three species so far known of this genus. The snout is less prominent than in *A. shumardi*, and more so than in *A. blennius*. The eyes are larger than in either of the two species just alluded to; their diameter entering about three times in the length of the side of the head. The head is contained five times and a half in the total length, which averages about three inches.

The dorsal fin is much higher than long, and not well represented on the accompanying figure: it being much lower posteriorly, hence its upper edge a good deal more inclined backwards. The anal is, as usual, deeper than long; its anterior margin being equidistant between the isthmus and the tip of the inferior lobe of the caudal.

The scales are large, much deeper than long, and proportionally more so than in the foregoing two species. Their anterior margin is sub-truncated, the posterior edge being rounded, with radiating grooves upon the latter section only. There are ten rows of scales as in *A. blennius*.

The color is reddish brown or fulvous, lighter beneath than above; the middle of the flanks being silvery. The fins are light yellowish olive, unicolor.

References to the figures.—Plate LVII, fig. 5, represents *Alburnops illecebrosus*, size of life. Fig. 6 is a scale from the dorsal region. Fig. 7, a scale from the lateral line. Fig. 8, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|---------------|----------------------------------|-----------------|-------------------|---------------------|----------------------|
| 66 | 2673 | 24 | Adt. & young. | Arkansas river, near Fort Smith. | 1853 | Lt. A. W. Whipple | Alcoholic | Dr. Geo. G. Shumard. |

PLARGYRUS, Rafin.

GEN CHAR.—Head large and sub-conical; mouth rather large, terminal; gape more or less oblique upwards. Jaws equal. Eyes large. Isthmus quite narrow. Tail tapering. Caudal fin furcated. The insertion of the ventrals is situated opposite the anterior margin of the dorsal fin, or a little behind it. Dorsal and anal fins without strong and undivided rays anteriorly. Scales very large, imbricated, much higher than long. Lateral line forming a downwards curve beneath the middle of the flanks. Pharyngeal bones rather slender, with an angular expansion at the upper portion of the descending branch, the expansion itself tapering away towards the upper and inner extremity. The teeth are compressed, of the prehensile kind, of the hooked type, very slightly hooked, provided with a grinding surface, being disposed upon a double row as follows: 2 | 4—4 | 2.

SYN.—*Plargyrus*, RAFIN. Ichth. Ohiens. 1820, 50.—GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1856, 195.

Hypsolepis, BAIRD (MS.)—GRD. in Storer, Hist. Fish. Mass. in Mem. Amer. Acad. New S. V, 1855, 284.

The genus *Plargyrus* includes the prettiest species of American Cyprinoids. Their comparatively small size, compressed and graceful body, sub-fusiform in its profile, added to brilliant and vivid colors, have brought these fishes to the notice of the multitude. They are commonly known as "Red Dace," "Silver-side Fall-fish," "White and Yellow Winged Shiner," "Shiner," &c. They occur in the waters of the Mississippi basin, as well as in the eastern, northern, and southern States.

The teeth of this genus are figured by Heckel, under the name of *Argyreus rubripinnis*, the second species of his genus *Argyreus*, and which is nothing else but *Plargyrus cornutus* in a breeding dress.

PLARGYRUS BOWMANI, Grd.

LATE LIX, FIGS. 1—5.

SPEC. CHAR.—Head constituting about the fifth of the total length. Posterior extremity of maxillar bone corresponding to a vertical line drawn behind the nostrils. Diameter of eye entering three times and a half in the length of the side of the head. Anterior margin of dorsal fin equidistant between the extremity of the snout and the insertion of the caudal. Origin of ventrals situated opposite the anterior margin of the dorsal, therefore equidistant also between the snout and the base of the caudal; their tips reaching the vent. Dorsal fin higher and anal deeper than long. Reddish brown above, yellowish beneath, with the sides silvery. A black streak along the flanks, above the lateral line.

SYN.—*Plargyrus bowmani*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 196.

We inscribe this species to the memory of one who, under difficulties of various sorts, during a travel across the continent, thought it not of small importance to collect and preserve specimens of natural history, which he forwarded to the Smithsonian Institution.

The species is gracefully sub-fusiform in its profile, the depth, in advance of the dorsal, being equal to the fifth of the entire length, in which the head itself enters about five times. The eye is very large, its diameter entering three times and a half in the length of the side of the head.

D 2, 8 + 1; A 2, 9; C 8, 1, 9, 8, 1, 9; V 1, 8; P 1, 14.

The tips of the pectoral fins are nearly at the same distance from the insertion of the ventrals as the tips of the latter are from the origin of the anal fin.

The dorsal region is reddish brown, the sides being silvery and the abdomen yellowish. A black streak may be seen along the upper edge of the silvery zone of the flanks. Fins olivaceous; rays tinged with greyish.

References to the figures.—Plate LIX, fig. 1, represents *Plargyrus bowmani*, size of life. Fig. 2, a section of the body across the line of greatest depth. Fig. 3, a dorsal scale. Fig. 4, a scale from the lateral line. Fig. 5, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------|---|-----------------|-------------------|---------------------|--------------------|
| 65 | 2672 | 1 | Adult. | Sweetwater fork of Platte (Nebraska) river. | 1852 | J. S. Bowman..... | Alcoholic. | J. S. Bowman |

CYPRINELLA, Girard.

GEN CHAR.—Body very much compressed, either elongated and sub-fusiform, or else with the dorsal and abdominal outlines rather arched. The head is of moderate size, sub-conical, the snout generally protruding beyond the lower jaw. Mouth small, its gape slightly oblique, and sub-terminal. No barbels. Eyes moderate. Isthmus narrow. Tail tapering; caudal fin furcated. Insertion of ventrals opposite or slightly in advance of the anterior margin of dorsal fin. Scales large, else of moderate development, imbricated, much higher than long, with radiating furrows upon their posterior section only. Lateral line forming a downwards curve beneath the middle of the flanks. Pharyngeal bones resembling those of *Plargyrus*. The teeth are slender and compressed, of the raptorial kind of the hooked type, slightly hooked, without grinding surface, instead of which, a sharp ridge inconspicuously crenated, and disposed upon a double row of one and four in the following manner: 1 | 4—4 | 1.

SYN.—*Cyprinella*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 196.

Had the name of *Hypsolepis* not been preoccupied to designate another genus, it might have been applied with great propriety to the species of the present genus, since the fishes herein included possess that curious character of having the scales higher than long. They replace in the southwest the *Plargyri* of more northern climes. Though generally smaller than the species of *Plargyrus*, some do resemble the latter in a very striking manner, whilst others are much shorter and deeper in proportion. The chief differences between the present genus and *Plargyrus* is to be found in the pharyngeal teeth and the position of the ventrals.

To *Moniana* it bears more striking resemblances and real affinities. The position of the ventral fins is the same; the pharyngeal bones are alike also; the teeth are of the same general pattern, but disposed upon a double series in *Cyprinella*, and upon one only in *Moniana*. Moreover, in *Cyprinella* the snout generally protrudes beyond the lower jaw, though the mouth is sub-terminal and its gape slightly oblique.

1. CYPRINELLA BUBALINA, G r d .

SPEC. CHAR.—Body short ; back very much arched. Peduncle of tail slender. Head constituting the fifth of the entire length. Eye large and circular ; its diameter entering three times and a half in the length of the side of the head. Jaws equal ; posterior extremity of maxillar bone extending to a vertical line drawn a little in advance of the orbit. Dorsal fin higher than long, its anterior margin equidistant between the tip of the snout and the insertion of the caudal. Origin of ventrals situated slightly in advance of the anterior margin of the dorsal. Pectorals slender ; other fins well developed.

SYN.—*Leuciscus bubalinus*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 391 ; and, in *Marcy's* Expl. of Red Riv. of La. 1853, 249, Zool. pl. xiv, figs. 5—8.

Cyprinella bubalina, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 197.

The body is very much compressed and rather short in general appearance. The back is considerably arched in advance of the dorsal fin, behind which the body tapers quite rapidly posteriorly, rendering the peduncle of the tail comparatively slender. The head is about one-fifth of the entire length. The eyes are comparatively large and circular, their diameter being contained three times and a half in the length of the side of the head, one diameter intervening between the eye and the snout. The nostrils are nearer to the eyes than to the tip of the snout. The jaws are even. The opercular apparatus is conspicuously developed, especially the opercle, which has the shape of an elongated quadrangle, slightly concave posteriorly, and slightly rounded inferiorly. The isthmus is quite small.

The anterior margin of the dorsal fin is equidistant between the extremity of the snout and the base of the caudal fin. It is angular, higher than long, and composed of eight rays. The anal has the same length as the dorsal, but is not quite so deep as the latter is high ; it is composed of nine articulated rays and two minute rudiments at the anterior margin. The ventrals when bent backwards reach the anterior margin of the anal fin, consequently overlapping the anus which is situated close to the anal fin. They are composed each of eight rays, all soft or articulated. The pectorals are comparatively small and slender, their tips reaching the insertion of the ventrals when brought backwards. Their posterior margin is rounded ; their rays are eleven in number. In all the fins the rays are bifurcated, and the middle ones subdivided still. The formula is as follows :

D 8 ; A 2, 9 ; C 4, 1, 9, 9, 1, 3 ; V 8 ; P 11.

The scales are anteriorly sub-truncated, posteriorly rounded, with numerous radiating grooves. Ten longitudinal rows may be counted upon the line of greatest depth of the body, and five rows on the peduncle of the tail. The lateral line, which contains about thirty-six scales, forms a very open curve downwards, and nearer to the insertion of the ventrals than to the base of dorsal.

The ground color is altered to greyish; the real tint is not preserved on the specimen before us.

List of specimens.

| Catal. No. | Cor'g No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|---------------------|--------------|--------|---|-----------------|--|----------------------|---------------------|
| 125 | 2708 | 1 | Adult. | Otter creek, trib. of north fork of Red river, Ark. | 1852 | Capt. R. B. Marcy & Geo. B. McClellan. | Alcoholic. | Capt. McClellan.... |

2. CYPRINELLA UMBROSA, Grd.

PLATE LVIII, FIGS. 1—5.

SPEC. CHAR.—Body rather short; back very much arched. Peduncle of tail robust. Head constituting more than the fifth of the total length. Eye well developed and circular; its diameter entering four times in the length of the side of the head. Posterior extremity of maxillary reaching a vertical line drawn in front of the orbit. Anterior margin of dorsal fin equidistant between the tip of the snout and the insertion of the caudal. Origin of ventrals situated slightly in advance of the anterior margin of the dorsal. Pectorals moderate. Greyish red above; greyish yellow beneath. Fins unicolor.

SYN.—*Cyprinella umbrosa*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 197.

Also a deep bodied species, much larger than the preceding, indeed the largest of the species hitherto known of its genus. The ventral outline is as much arched as that of the back. The greatest depth, taken at the anterior margin of the dorsal, is equal to the third of the length, the caudal fin excluded. The entire length measures about three inches and a quarter, the caudal fin being a little shorter than the greatest depth. The nape is a little depressed; the head constitutes the fourth of the length, the caudal fin excluded. The eye is circular; its diameter entering about four times in the length of the side of the head. The dorsal fin is higher than long; its anterior margin is nearer the tip of the snout than the insertion of the caudal. The insertion of the ventrals is a little in advance of the anterior margin of the dorsal; their tips reaching the vent. The pectorals are of moderate development; their tips not extending as far as the origin of the ventrals. The anal is deeper than long; its anterior margin being nearer the isthmus than the tip of the inferior lobe of the caudal.

D 2, 8 + 1; A 2, 9 + 1; C 3, 1, 9, 8, 1, 4; V 1, 8; P 14.

The scales are large, considerably larger than long, obscurely lozange-shaped, somewhat tapering upwards and downwards. The radiating furrows appear to be much fewer in the scales of the lateral line and those above it than in the scales below. The lateral line itself describes a downwards curve upon the middle region of the abdomen, being much nearer the insertion of the ventrals than the base of the dorsal fin. The dorsal region is greyish red, or light reddish brown, whilst the ventral region is greyish yellow, or yellowish olive. The dorsal and caudal are greyish olive; the other fins being yellowish or light straw color.

References to the figures.—Plate LVIII, fig. 1, represents *Cyprinella umbrosa*, from Coal creek, and size of life. Fig. 2, is a section of the body across the line of greatest depth. Fig. 3, a dorsal scale. Fig. 4, a scale from the lateral line. Fig. 5, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimens. | Collected by— |
|------------|--------------------|--------------|--------------|---------------------------------------|-----------------|--------------------|------------|----------------------|-----------------------|
| 134 | 2713 | 8 | Adult | Coal creek, Arkansas, | 1853 | Lt. A. W. Whipple. | VI. | Alcoholic ... | H. B. Möllhausen, ... |
| 133 | 2712 | 2 |do. | 20 miles west of Choctaw agency | 1853 |do..... | ..... | ....do..... |do..... |

3. CYPRINELLA GUNNISONI, Grd.

SPEC. CHAR.—Body short, rather deep; back somewhat arched. Peduncle of tail of moderate development. Head constituting less than the fifth of the total length. Eye moderate sized; its diameter entering three times and a half in the length of the side of the head. Posterior extremity of maxillar bone reaching a vertical line drawn near the anterior rim of the orbit. Anterior margin of dorsal fin equidistant between the tip of the snout and the fork of the caudal. Origin of ventrals situated in advance of the dorsal. Pectorals and ventrals rather small. Reddish brown, lighter beneath than above. Fins unicolor.

SYN.—*Cyprinella gunnisoni*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 197.

This species is inscribed to the memory of an officer who had taken at heart the promotion of science in his country, and was brought to a most lamentable death while in the active field of his duty.

The body is short but not so deep as in the preceding species. The head is smaller than in *C. umbrosa*, but the eye preserves the same proportions. The dorsal fin is higher, and the anal deeper, than long. The anterior margin of the anal being somewhat nearer the fork of the caudal than the isthmus, whilst the anterior margin of the dorsal is nearer the insertion of the caudal than the tip of the snout. The tips of the ventrals scarcely reach the vent, and the pectorals do not extend as far as the origin of the ventrals.

D 2, 8 + 1; A 2, 9 + 1; C 7, 1, 9, 8, 1, 6; V 1, 8; P 13.

The scales are large, not so much imbricated as in *C. umbrosa*, although equally as deep, and anteriorly sub-truncated. The upper and lower margins are less tapering than in the species just referred to.

The color is reddish brown, darker along the dorsal region than on the abdomen; the middle of the flank exhibiting a whitish metallic reflect. The dorsal and caudal are greyish olive; the rest of the fins being yellowish.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|------------|----------------------------|-----------------|---------------------|------------|---------------------|--------------------|
| 139 | 2718 | 12 | A. & Y.... | Cottonwood creek, Utah.... | 1854 | Lt. E. G. Beckwith. | 1 | Alcoholic.... | Mr. Kreuzfeld..... |

4. CYPRINELLA BECKWITHI, Grd.

SPEC. CHAR.—Body short, rather deep; back somewhat arched. Peduncle of tail slender. Head contained four times and a half in the total length. Eye moderate sized; its diameter entering four times in the length of the side of the head. Gape of the mouth somewhat oblique. Posterior extremity of the maxillary extending to a vertical line drawn in front of the orbit. Anterior margin of dorsal fin somewhat nearer the insertion of the caudal than the tip of the snout. Origin of ventrals situated somewhat in advance of the dorsal. Pectorals slender, larger than the ventrals. Greyish brown above, orange red beneath. Fins unicolor.

SYN.—*Cyprinella beckwithi*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 197.

A species allied to the preceding one, by its external form and general appearance, but readily distinguished from it by a larger head and larger scales. The latter being likewise larger than in *C. umbrosa*. The dorsal fin is much higher than long; the anal longer than deep, with its anterior margin nearer the fork of the caudal than the isthmus. The tips of the ventrals just reaching the vent, whilst the pectorals are far from approximating the origin of the ventrals.

D 2, 8 + 1; A 2, 9 + 1; C 5, 1, 9, 8, 1, 6; V 1, 8; P 13.

The scales, as already stated, are larger than in either *C. gunnisoni* or *C. umbrosa*; their upper and lower edges tapering somewhat as in the latter mentioned species.

The color is greyish brown above, and orange red beneath, with an obsolete silvery streak along the middle of the flanks. The fins being unicolor.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|---------|--|-----------------|---------------------|---------------------|----------------------|
| 135 | 2714 | 9 | A. & Y. | Sluice of Arkansas river, near Fort Makee. | 1854 | Lt. E. G. Beckwith. | Alcoholic. | Mr. Kreuzfeld. . . . |

5. CYPRINELLA SUAVIS, Grd.

SPEC. CHAR.—Body rather short, sub-fusiform in profile; back slightly arched. Head constituting the fifth of the entire length. Diameter of eye entering nearly four times in the length of the side of the head. Gape of the mouth oblique. Posterior extremity of maxillar bone extending to a vertical line drawn behind the nostrils. Anterior margin of dorsal fin nearer the insertion of the caudal than the tip of the snout. Origin of ventrals situated somewhat in advance of the dorsal. Pectorals slender and elongated. Yellowish brown, lighter beneath than above; middle of flanks metallic white. Fins unicolor.

SYN.—*Cyprinella suavis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 197.

By its general form and appearance this species establishes the transition between the deep and slender species. The head forms about the fifth, and the depth the fourth, of the total length. The dorsal fin is higher, and the anal deeper than long; the anterior margin of the anal is nearer the tip of the lower lobe of the caudal than the extremity of the snout. The tips of the ventrals approximate the vent; but the extremities of the pectorals do not reach the origin of the ventrals.

D 2, 8 + 1; A 2, 9 + 1; C 7, 1, 9, 8, 1, 6; V 1, 8; P 14.

The scales are moderate sized, sub-elliptical in their outline, though rather truncated anteriorly. The lateral line describes a gentle curve below the middle of the flanks.

The color is yellowish brown above, the middle of the flanks reflecting a metallic white tint, whilst the belly is light yellow. The fins being unicolor, of a light yellowish tint.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|---------------|--------------------------------|-----------------|-------------------|------------|---------------------|---------------------|
| 138 | 2717 | 24 | A. & Y. . . . | Near San Antonio, Texas. . . . | 1853 | Lt. A. W. Whipple | 9 | Alcoholic. . . . | Dr. C. B. Kennerly. |

6. CYPRINELLA LEPIDA, Grd.

PLATE LVIII, FIGS. 21—25.

SPEC. CHAR.—Body elongated, sub-fusiform. Peduncle of the tail robust. Head contained four times and a half in the total length. Eye well developed; its diameter entering four times in the length of the side of the head. Snout rather blunt; gape of mouth somewhat arched; posterior extremity of the maxillary extending to a vertical line drawn before the orbit. Anterior margin of dorsal fin nearer the insertion of the caudal than the tip of the snout. Origin of ventrals placed slightly in advance of the dorsal. Pectorals moderate. Reddish ash above; pale sulphur yellow beneath. Fins unicolor. ♂

SYN.—*Cyprinella lepida*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 197.

The body is elongated and fusiform, the greatest depth taken at the anterior third of the body being contained four times and a half in the total length, of which the head forms somewhat less than the fourth. The head, therefore, is well developed; the eye is circular, its diameter being contained four times in the length of the side of the head.

The dorsal fin is much higher, and the anal somewhat deeper, than long; the origin of the anal being equidistant between the isthmus and the fork of the caudal. The ventrals are posteriorly rounded, their extremities overlapping the vent without reaching the origin of the anal.

D 2, 8 + 1; A 2, 9 + 1; C 8, 1, 9, 8, 1, 7; V 1, 8; P 14.

The scales are larger than in any of its hitherto known congeners; they are less attenuated superiorly and inferiorly than in *C. umbrosa*.

The color is reddish ash above and pale sulphur yellow beneath, the sides exhibiting a metallic tint, sometimes whitish, at others yellowish. The dorsal and caudal are greyish yellow; the rest of the fins pale yellow.

References to the figures.—Plate LVIII, fig. 21, represents *Cyprinella lepida*, size of life. Fig. 22 is a section of the body taken across the line of greatest depth. Fig. 23, a dorsal scale. Fig. 24, a scale from the lateral line. Fig. 25, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of tecth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|------------------|----------------------|-----------------|-------------------------|------------|---------------------|-----------------------|
| 136 | 2709 | 7 | Adult and young. | Rio Erio, Texas..... | 1853 | Lieut. A. W. Whipple .. | 21 | Alcoholic.. | Dr. C. B. Kennerly... |

7. CYPRINELLA NOTATA, Grd.

PLATE LVIII, FIGS. 16—20.

SPEC. CHAR.—Body elongated, sub-fusiform. Peduncle of the tail rather slender. Head constituting the fifth of the total length. Eye moderate sized; its diameter entering about three times and a half in the length of the side of the head. Snout anteriorly blunt; gape of mouth slightly arched; posterior extremity of maxillar bone reaching to a vertical line drawn behind the nostrils. Anterior margin of dorsal fin somewhat nearer the insertion of the caudal than the tip of the snout. Origin of ventrals placed in advance of the anterior margin of the dorsal. Pectorals small. Reddish brown above; yellowish beneath; a jet black spot at the base of the caudal; fins otherwise unicolor.

SYN.—*Cyprinella notata*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 198.

Here is another elongated and fusiform species, but which may easily be distinguished from *C. lepida* by a shorter head, a less furcated caudal, and especially by the presence of smaller scales. The dorsal is much higher and the anal somewhat deeper than long; the anterior margin of the anal being equidistant between the fork of the caudal and the extremity of the snout. The ventrals are of moderate development, posteriorly sub-truncated, their tips reaching the vent. The pectorals are small and far from extending to the origin of the ventrals.

D 2, 8 + 1; A 2, 8 + 1; C 5, 1, 9, 8, 1, 6; V 1, 8; P 14.

The scales, besides being smaller than in *C. lepida*, are less tapering still at their superior and inferior edges; the radiating furrows being also more numerous.

The dorsal region is reddish brown, and the abdominal yellowish with a metallic reflect, assuming rather an argentine tint along the middle of the flanks. A jet black patch may be observed at the base of the caudal, which is greyish olive, like the dorsal; the rest of the fins being yellowish.

References to the figures.—Plate LVIII, fig. 16, represents *C. notata*, size of life. Fig. 17 is a section of the body across the line of the greatest depth. Fig. 18, a dorsal scale. Fig. 19, a scale from the lateral line. Fig. 20, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|------------------|----------------------|-----------------|------------------------|------------|---------------------|-----------------------|
| 136 | 2715 | 2 | Adult and young. | Rio Seco, Texas..... | 1853 | Lieut. A. W. Whipple.. | 19 | Alcoholic.. | Dr. C. B. Kennerly... |

8. CYPRINELLA WHIPPLII, G^rd.

PLATE LVIII, FIGS. 6—10.

SPEC. CHAR.—Body elongated and sub-fusiform. Peduncle of the tail stoutish. Head constituting the fifth of the entire length. Eye rather large; its diameter entering nearly four times in the length of the side of the head. Snout sub-conical and tapering; gape of the mouth nearly horizontal; posterior extremity of maxillary bone corresponding to a vertical line drawn at the anterior rim of the orbit. Anterior margin of dorsal fin nearer the insertion of the caudal than the tip of the snout. Origin of ventrals situated under the anterior edge of the dorsal. Pectorals and ventrals slender. Reddish brown above; golden yellow beneath; a black patch at the posterior margin of the dorsal fin.

SYN.—*Cyprinella whipplii*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 198.

Gracefully elongated and sub-fusiform. Dorsal region slightly arched upon the insertion of the fin. Greatest depth forming a little more than the fifth of the total length, whilst the head, which is sub-conical, constitutes a little less than the fifth of the same dimension. The eye is rather large, its diameter entering about four times in the length of the side of the head. A very characteristic feature consists in a very high dorsal fin, rounded upon its upper margin. The origin of the ventral fin is situated opposite the anterior margin of the dorsal or very slightly in advance of it. The anal fin is very much developed also, somewhat deeper than long, its anterior margin being nearer the fork of the caudal than the isthmus. The ventrals and pectorals are slender and lanceolated, the tips of the former overlapping the vent and reaching the origin of the anal, whilst the latter are far from approximating the insertion of the ventrals.

D 2, 8 + 1; A 2, 9 + 1; C 8, 1, 9, 8, 1, 6; V 1, 8; P 14.

The scales are of moderate development, and the lateral line, as usual, deflexed upon the abdomen, approximates more the ventrals than the dorsal fin.

The color is reddish brown above; yellowish beneath with a golden reflect. A black patch may be observed at the posterior margin of the dorsal fin; the upper fins assuming a greyish olive tint, the lower fins a light yellowish one.

References to the figures.—Plate LVIII, fig. 6, represents *Cyprinella whipplii*, size of life. Fig. 7 is a section of the body across the line of greatest depth. Fig. 8, a dorsal scale. Fig. 9, a scale from the lateral line. Fig. 10, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------------|--------------|--------|--------------------------|-----------------|---------------------|----------------------|----------------------|
| 137 | 2716 | 1 | Adult. | Sugarloaf creek, Ark.... | 1853 | Lt. A. W. Whipple.. | Alcoholic. | H. B. Möllhausen.... |

9. CYPRINELLA LUGUBRIS, Grd.

SPEC. CHAR.—Body elongated, sub-fusiform. Peduncle of the tail rather slender. Head contained four times and a half in the total length. Eye large; its diameter entering three times and a half in the length of the side of the head. Snout sub-conical; gape of the mouth oblique; posterior extremity of the maxillary corresponding to a vertical line drawn at the anterior rim of the orbit. Anterior margin of dorsal fin nearer the tip of the snout than the insertion of the caudal. Origin of the ventrals situated opposite the anterior edge of the dorsal. Pectorals and ventrals rather small. Dark brown above; sides and abdomen silvery white. Fins unicolor.

SYN.—*Cyprinella lugubris*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 199.

This species is one of those collected by the party of which the gallant Gunnison was the commander.

It is elongated, sub-fusiform; the head being large and so is the mouth, although the latter is smaller than in *C. macrostoma*, referred to in the United States and Mexican Boundary report. The ventrals are small, posteriorly truncated, inserted under the anterior margin of the dorsal; their tips not reaching the vent. The pectorals are lanceolated, and their extremities not extending as far as the origin of the ventrals. The dorsal is much higher, and the anal somewhat deeper, than long; the anterior margin of the latter being nearly equidistant between the isthmus and the tip of the lower lobe of the caudal.

D 2, 8 + 1; A 2, 9 + 1; C 7, 1, 9, 8, 1, 8; V 1, 8; P 14.

The scales are of but moderate development. The color is dark brown above, the sides and the abdomen pervaded with a silvery tint. The fins are unicolor, greyish and yellowish.

List of specimens.

| Catal. No. | Cor. No. of teeth | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|-------------------|--------------|------------|--------------------------|-----------------|-------------------------|------------|---------------------|--------------------|
| 141 | 2720 | 1 | Adult..... | Cottonwood creek, Utah.. | 1853 | Lieut. E. G. Beckwith.. | 1 | Alcoholic.. | Mr. Kreuzfeld..... |

10. CYPRINELLA LUDIBUNDA, Grd.

SPEC. CHAR.—Body elongated, sub-fusiform. Peduncle of the tail rather slender. Head constituting the fifth of the total length. Eye large; its diameter entering about three times in the length of the side of the head. Snout sub-conical; gape of the mouth nearly horizontal; posterior extremity of maxillar bone corresponding to a vertical line drawn behind the nostrils. Anterior margin of dorsal fin equidistant between the insertion of the caudal and the tip of the snout. Origin of ventrals situated somewhat in advance of the anterior edge of the dorsal. Pectorals and ventrals of moderate development. Reddish brown; middle of the flanks silvery; lateral line marked with black dots.

SYN.—*Cyprinella ludibunda*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 199.

This species is an associate of the preceding one, and was collected under the same unfortunate circumstances.

Although all the specimens which we have examined are immature, still there is no doubt in our mind as to its specific difference from all the species hereto alluded to. The head is small and conical, with the snout round and tapering. The mouth being small. The ventrals are inserted in advance of the anterior margin of the dorsal.

D 1, 8; A 1, 6; C 4, 1, 9, 8, 1, 5; V 1, 8; P 12.

Owing to the somewhat damaged condition of the fins, the foregoing formula of the rays must be considered as an approximation, and not held for absolutely correct.

The scales are large, and the lateral line gently deflexed upon the abdominal region. The color is reddish brown above, rather more yellowish beneath, with the middle of the flanks silvery, and black dots along the track of the lateral line. The fins are unicolor.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimen. | Collected by— |
|------------|--------------|-------|-------------------------|-----------------|-----------------------|-----------|---------------------|---------------------|
| 132 | 7 | Young | Cottonwood creek, Utah. | 1853 | Lt. E. G. Beckwith... | 1 | Alcoholic. | Mr. Kreuzfeld |

MONIANA, Girard.

GEN. CHAR.—Body compressed, sub-fusiform. Head rather small, sub-conical or rounded. Snout occasionally protruding slightly. Mouth sub-oblique, terminal; both jaws generally equal. No barbels. Isthmus narrow. Eyes moderate. Caudal fin furcated. Scales deeper than long, with radiating furrows upon their posterior section alone. These characters, so far, are found in *Platygyrus*. But now for the differences. The insertion of the ventrals is situated in advance of the anterior margin of the dorsal, which is higher than long. The pharyngeal teeth are compressed, of the raptatorial kind, of the hooked type, without grinding surface, instead of which a sharp ridge is observed, very minutely crenated. They are disposed upon a single row of four, thus: 4—4.

SYN.—*Moniana*, Girard, in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 199.

This genus is composed of small species, all of which being provided with scales similar in their general outline to those of *Platygyrus* and *Cyprinella*.

1. MONIANA LUTRENSIS, Girard.

SPEC. CHAR.—Body sub-fusiform, elongated; back slightly convex. Head contained three times and a half in the total length. Eye moderate, sub-circular; its diameter entering four times in the length of the side of the head. Jaws equal; posterior extremity of maxillary bone not reaching a vertical line drawn at the anterior rim of the orbit. Anterior margin of dorsal fin equidistant between the tip of the snout and the base of the caudal. Insertion of ventrals situated in advance of the anterior edge of the dorsal. Pectorals slender; their tips not reaching quite the origin of the ventrals. Bluish black or brown; dorsal fin yellowish brown; other fins reddish.

SYN.—*Luciscus lutrensis*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 391; & in *Marcy's* Expl. of Red Riv. of La. 1853, 251, Zool. pl. xiv. figs. 9—12.

Moniana lutrensis, Girard, in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 199.

The body is very much compressed and sub-fusiform in general appearance, somewhat tapering from the posterior margin of the dorsal and anal fins to the caudal, the base of which is broader than the peduncle of the tail. The greatest depth is equal to the length of the head, which is contained three times and a half in the total length, the caudal fin included. The greatest thickness is nearly equal to half of the depth. In general aspect it resembles *Luxilus kentuckiensis* of Dr. Kirtland. The eyes are of medium size, sub-circular; their diameter being contained four times in the length of the sides of the head. The nostrils, situated towards the upper surface of the head, are nearer the eyes than the tip of the snout. The posterior extremity of the maxillary does not reach a vertical line drawn at the anterior rim of the orbit.

The upper and posterior margins of the opercle constitute a uniform curve, whilst the anterior and inferior margins are straight, forming together a rather acute angle. The sub-opercle and inter-opercle are comparatively small.

The dorsal and anal fins are well developed; the anterior margin of the dorsal fin is equidistant between the extremity of the snout and the base of the caudal fin; the fin itself is quadrangular, higher than long, and composed of eight rays, the last one being double, and the anterior one rudimentary and in close contact with the next. The anal is shaped somewhat like the dorsal; it has nine developed rays, and an anterior rudimentary one. The caudal is deeply furcated, with acute angles, and shorter than the head. It is composed of nineteen well developed rays, and several rudimentary ones, above and below. The ventrals are posteriorly rounded, composed of eight rays, and when bent backwards their tips reach the anus, which is situated immediately in advance of the anal fin. The pectorals are elongated, rather slender, rounded; their tips not quite reaching the insertion of the ventrals. They are composed of eleven slender, bifurcated, but not sub-divided, rays. The median rays of the dorsal, caudal, anal, and ventrals, are sub-divided for at least one-fourth of their length, the bifurcation of the first degree beginning about their middle. Formula of the rays:

D 1, 7 + 1; A 1, 9; C 2, 1, 9, 8, 1, 3; V 8; P 11.

The scales are proportionally large, their posterior, superior, and inferior margins uniformly rounded; anteriorly sub-truncated; twelve longitudinal rows of them may be counted upon the line of the greatest depth of the body, and six rows on the peduncle of the tail. The lateral line, which contains thirty-six scales, is considerably bent down on the abdomen, and slightly interrupted in advance of the anal fin.

The ground color, as preserved in alcohol, is dull bluish brown; the back is bluish; the dorsal fin yellowish brown; the caudal, pectorals, and ventrals being reddish.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|--------------|---------|--|-----------------|--|------------|---------------------|-------------------|
| 104 | 5 | Adult. | Otter creek, tributary to North Fork of Red river, Arkansas. | 1852 | Capt. R. B. Marey and Geo. B. McClellan. | .... | Alcoholic. | Capt. McClellan. |
| 107 | 10 | A. & Y. | Trib. of Gypsum creek, Canadian river. | 1853 | Lt. A. W. Whipple..... | 15 |do.... | H. B. Möllhansen. |

2. MONIANA LEONINA, Grd.

PLATE LIX, FIGS. 6—10.

SPEC. CHAR.—Body rather short and deep. Head constituting about the fifth of the total length. Snout sub-conical; jaws equal; posterior extremity of maxillar bone extending to a vertical line drawn behind the nostrils. The eye is moderate sized; its diameter entering four times in the length of the side of the head. Anterior margin of dorsal equidistant between the tip of the snout and the insertion of the caudal. Insertion of ventrals situated slightly in advance of the dorsal. Pectorals and ventrals moderately developed. Greyish brown above; white or dull yellowish beneath.

SYN.—*Moniana leonina*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 199.

This is the largest of the hitherto known species of the genus. The entire length measures three inches and a quarter, the head forming the fourth of it, the caudal fin excluded. The body is very deep upon its middle, where the greatest depth is a little less than the fourth of the entire length. The mouth is proportionally small. The eye being circular, its diameter entering four times in the length of the side of the head. The dorsal and anal fins are sub-

trapezoid in their outline, the anal being somewhat longer than the dorsal, and, likewise, deeper than long. Both of these fins are sub-concave upon their external edge; the anterior margin of the anal is equidistant between the isthmus and the fork of the caudal. The ventrals are obtusely rounded upon their posterior margin; their tips overlapping the vent and reaching the origin of the anal. The pectorals are sub-lanceolated; their extremities not extending as far back as the insertion of the ventrals. The rays are:

D 2, 9 + 1; A 2, 9 + 1; C 5, 1, 9, 8, 1, 7; V 1, 8 or 9; P 16.

The scales are remarkably deep, rather sub-truncated anteriorly, rounded posteriorly, and rather tapering superiorly and inferiorly.

The upper region is greyish brown, whilst the flanks and the abdomen are dull yellowish or whitish, with a somewhat metallic reflect. The dorsal and caudal are greyish yellow; the rest of the fins light sulphur yellow.

References to the figures.—Plate LIX, fig. 6, represents *Moniana leonina*, size of life. Fig. 7 is a section of the body taken across the line of greatest depth. Fig. 8, a dorsal scale. Fig. 9, a scale from the lateral line. Fig. 10, a scale from the abdominal region.

List of specimens.

| Catal. No. | Corr. No. of teeth. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|---------------------|--------------|------------------|------------------------|-----------------|-------------------------|------------|---------------------|-----------------------|
| 115 | 2701 | 18 | Adult and young. | Leon river, Texas..... | 1853 | Lieut. A. W. Whipple .. | 11 | Alcoholic.. | Dr. C. B. Kennerly .. |

3. MONIANA DELICIOSA, G r d .

SPEC. CHAR.—Body slender and elongated. Head constituting the fifth of the total length. Snout sub-conical; upper jaw overlapping the lower. Posterior extremity of the maxillary extending to a vertical line drawn between the nostrils and the orbit. Eye large and circular; its diameter entering three times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the tip of the snout and the insertion of the caudal. Pectorals and ventrals slender and of moderate development. Reddish brown above; yellowish beneath; middle of flanks silvery.

SYN.—*Moniana deliciosa*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 199.

This is one of the most slender of all the species hitherto known of the genus. Its length is a little over two inches and a half, the head forming the fifth part of it. The latter is proportionally small, sub-conical anteriorly. The eye is quite large and circular, its diameter entering about three times in the length of the side of the head. The dorsal is much higher, and the anal much deeper, than long; the anterior margin of the anal is nearer the tip of the lower lobe of the caudal than the isthmus. The origin of the ventrals is equidistant between the tip of the snout and the insertion of the caudal; they are posteriorly sub-truncated, their extremities extending as far as the vent. The pectorals are slender, sub-ovate in their outline, and, in being brought alongside the body, they do reach the insertion of the ventrals. The caudal is deeply furcated, longer than the head, and contained four times and a half in the total length.

D 2, 8 + 1; A 2, 7 + 1; C 6, 1, 9, 8, 1, 7; V 1, 8; P 13.

There are ten longitudinal rows of scales upon the greatest depth of the body; the scales themselves are large. The lateral line being slightly deflexed upon the abdominal region.

The color of the dorsal region is reddish brown, whilst the abdominal region is yellowish. A silvery streak may be observed along the middle of the flanks above the lateral line, which

is maculated with blackish along the peduncle of the tail. The dorsal and caudal are greyish yellow; the rest of the fins yellowish.

List of specimens.

| Catal. No. | Corr. No. of teeth. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|---------------------|--------------|------------------|--|-----------------|------------------------|------------|---------------------|---------------------|
| 119 | 2704 | 12 | Adult and young. | Leon river, tributary of Rio San Antonio, Texas. | 1853 | Lieut. A. W. Whipple.. | 11 | Alcoholic | Dr. C. B. Kennerly. |

4. MONIANA LAETABILIS, Grd.

SPEC. CHAR.—Body elongated, sub-fusiform. Head contained four times and a half in the total length. Snout sub-conical; jaws equal. Posterior extremity of maxillar bone extending to a vertical line drawn in front of the orbit. Eye large and circular; its diameter entering a little over three times in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the tip of the snout. Pectorals and ventrals well developed. Reddish brown above; sides silvery; beneath yellowish.

SYN.—*Moniana laetabilis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 200.

The body is elongated, sub-fusiform in profile, the peduncle of the tail slender. The head is well developed, and contained four times and a half in the total length, which measures about two inches. The greatest depth is equal to the length of the head. The fins are quite conspicuously developed; the dorsal is much higher, and the anal much deeper, than long; the anterior margin of the anal is nearer the isthmus than the fork of the caudal. The caudal itself being but moderately furcated, and its posterior margin crescent-shaped. The origin of the ventrals is nearer the extremity of the snout than the insertion of the caudal; their tips overlapping the vent and reaching the anterior margin of the anal. The pectorals are slender and lanceolated; their tips extending to the insertion of the ventrals. The following is the formula of the fins:

D 2, 8 + 1; A 2, 9 + 1; C 8, 1, 9, 8, 1, 9; V 1, 8; P 13.

The scales are of moderate development and rather deciduous; the lateral line being, as usual, deflexed upon the middle of the abdomen, and nearer the insertion of the ventrals than the base of the dorsal.

The color of the upper region is reddish brown, the abdomen being yellowish white, whilst the middle of the sides reflect a silvery tint. The fins are yellowish.

List of specimens.

| Catal. No. | Corr. No. of teeth. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|---------------------|--------------|------------------|---------------------------------------|-----------------|------------------------|------------|---------------------|--------------------|
| 120 | 2705 | 12 | Adult and young. | Hurrah creek, tributary of Rio Pecos. | 1853 | Lieut. A. W. Whipple.. | XII. | Alcoholic. | H. B. Möllhausen.. |

5. MONIANA PULCHELLA, Grd.

PLATE LVIII, FIGS. 11—15.

SPEC. CHAR.—Body rather short and deep. Head constituting the fifth of the whole length. Snout sub-conical; upper jaw overlapping slightly the lower one. Posterior extremity of the maxillary extending to a vertical line drawn behind the nostrils. Eye moderate sized and circular; its diameter entering three times and a half, or a little more, in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Ventrals and pectorals of moderate development. Reddish brown above, silvery upon the sides, and brownish yellow beneath. Fins unicolor.

SYN.—*Moniana pulchella*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 200.

This species is somewhat allied to *M. lutrensis*, from which it differs by a shorter snout and a more compact tail. The eye is large also. A distinctive feature between the two species is to be found in the squamation, since the scales are more deeply imbricated in *M. lutrensis* than in *M. pulchella*. The vertical fins are well developed, whilst the horizontal ones are of but moderate development. The caudal is deeply furcated, and somewhat longer than the head, since it enters four times and a half in the total length. The dorsal and the anal are sub-trapezoid, the upper edge of the dorsal being sub-concave, whilst the inferior edge of the anal is nearly linear. The base of the latter fin is somewhat longer than that of the former, and the anterior margin of the anal is nearer the isthmus than the fork of the caudal. The origin of the ventrals is nearer the extremity of the snout than the insertion of the caudal. These fins are posteriorly rounded off, and their tips reach the vent when bent in that direction. The pectorals are sub-ovate; their tips not extending as far as the insertion of the ventrals.

D 2, 8 + 1; A 2, 9 + 1; C 8, 1, 9, 8, 1, 9; V 1, 8; P 13.

The scales are large, sub-truncated anteriorly where deepest, and rounded upon the remaining edges, with numerous radiating furrows upon their posterior section.

The dorsal region is reddish brown and the abdominal region brownish yellow, whilst the middle of the sides exhibits an argentine tint. The dorsal and caudal are greyish yellow; the other fins being yellowish.

References to the figures.—Plate LVIII, fig. 11, represents *Moniana pulchella*, size of life. Fig. 12 is a section of the body taken across the line of greatest depth. Fig. 13, a dorsal scale. Fig. 14, a scale from the lateral line. Fig. 15, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of specs. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|---------------|----------------|--|-----------------|-------------------|---------------------|-----------------------|
| 121 | 2706 | 18 | Adult & young. | Arkansas river, near Fort Smith. | 1853 | Lt. A.W. Whipple. | Alcoholic. | Dr. Geo. G. Shumard. |
| 122 | ..... | 1 | Young. | Sugar Loaf creek, tributary of Poteau river. | 1853 | do. | do | H. B. Möllhausen |

6. MONIANA FRIGIDA, Grd.

PLATE LIX, FIGS. 16—20.

SPEC. CHAR.—Body somewhat elongated, sub-fusiform. Peduncle of tail stoutish. Head constituting a little less than the fifth of the entire length. Snout sub-conical; upper jaw overlapping the lower. Posterior extremity of the maxillary extending to a vertical line drawn behind the nostrils. Eye moderate sized and circular; its diameter entering nearly four times in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the tip of the snout. Horizontal fins of moderate development. Reddish brown above; yellowish or whitish beneath.

SYN.—*Moniana frigida*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 200.

This species is a little more than three inches in total length, and stands next to the largest of the hitherto known species. The head forms about the fifth of the length. The body is rather deep and very much compressed; the caudal fin deeply furcated. The eye is circular, and its diameter contained four times in the length of the side of the head. The upper edge of the dorsal fin is linear; the lower edge of the anal, sub-concave. The anterior margin of the

latter fin is nearer the fork of the caudal than the isthmus. The caudal fin is nearly equal to the head in length. The origin of the ventrals is slightly nearer the extremity of the snout than the insertion of the caudal; they are rounded posteriorly, their tips overlapping the vent, and reaching at the same time the anterior edge of the anal. The pectorals are slender, their extremities not extending as far as the insertion of the ventrals. The rays are as follows:

D 2, 8 + 1; A 2, 8 + 1; C 7, 1, 9, 8, 1, 8; V 1, 8; P 14.

The scales are rather large, and the furrows of their posterior section quite numerous. The lateral line is deflexed upon the middle of the abdomen, and somewhat nearer the insertion of the ventrals than the base of the dorsal.

The dorsal region is reddish brown; the sides and abdomen being of a metallic yellow or white tint. The middle of the flanks exhibit sometimes an indistinct, or rather diffused greyish silvery, occasionally blackish, band or streak.

References to the figures.—Plate LIX, fig. 16, represents very imperfectly and incorrectly *Moniana frigida*, size of life. Fig. 17 is a section of the body taken upon the line of greatest depth. Fig. 18, a dorsal scale. Fig. 19, a scale from the lateral line. Fig. 20, a scale from the abdominal region.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimen. | Collected by— |
|------------|--------------|--------|-------------------------------------|-----------------|--------------------|-----------|---------------------|---------------------|
| 99 | 1 | Adult. | Rio Frio, trib. of Rio Nucces, Tex. | 1853 | Lt. A. W. Whipple. | 21 | Alcoholic. | Dr. C. B. Kennerly. |

7. MONIANA TRISTIS, Gr d.

SPEC. CHAR.—Body elongated, sub-fusiform. Peduncle of tail long and slender. Head constituting the fifth of the length. Snout rounded and rather abbreviated; jaws equal. Posterior extremity of maxillar bone extending to a vertical line drawn behind the nostrils. Eye large and circular; its diameter entering about three times and a half in the length of the side of the head. Anterior margin of dorsal fin somewhat nearer the extremity of the snout than the insertion of the caudal. Vertical fins well developed. Reddish brown, lighter beneath than above, with a lateral dark streak.

SYN.—*Moniana tristis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 201.

A slender and graceful species, sub-fusiform in profile, though the back, properly so called, is rather arched. The peduncle of the tail is long and of nearly uniform depth. The head constitutes about the fifth of the length. The vertical fins are well developed. The caudal is longer than the head, deeply crescent-shaped upon its posterior margin. The dorsal and anal are much higher else deeper than long; the former slightly linear, the latter slightly concave, upon their external edge, the anterior margin of the anal being equidistant between the isthmus and the concavity of the caudal. The horizontal fins are of moderate development; the origin of the ventrals is nearer the tip of the snout than the insertion of the caudal; these fins are posteriorly sub-truncated, slightly rounded off, and when stretched backwards they reach the vent. The pectorals are sub-ovate in their outline, their tips not extending quite to the insertion of the ventrals. The formula of the rays is:

D 2, 8 + 1; A 2, 7 + 1; C 6, 1, 9, 8, 1, 7; V 1, 8; P 15.

The scales are of moderate development; eleven rows of them may be counted upon the line

of greatest depth of the body, five above and five below the lateral line, which is nearly median, and at equal distance between the base of the dorsal fin and the insertion of the ventrals.

The color is dark reddish brown, somewhat lighter beneath than above. A slender blackish streak may be observed along the middle of the flanks. The fins are of a uniform greyish olive tint.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|-------------|-----------|-----------------|---------------------|---------------------|---------------------|
| 93 | 2693 | 5 | Adt. & y'g. | ..... | 1854 | Lt. E. G. Beckwith. | Aleoholic. | Mr. Kreuzfeld |

RICHARDSONIUS, Girard.

GEN. CHAR.—The body is very much compressed, sub-fusiform in its outline and deep upon its middle. The head is proportionally small; the mouth terminal, slightly oblique, constructed upon the same pattern as in *Luxilus*, though somewhat larger, and unprovided with cirri or barbels. The eye is large. Isthmus very narrow. Caudal fin furcated. Insertion of ventrals situated in advance of the anterior margin of the dorsal. Anal fin longer than the dorsal; its anterior margin situated in advance to the posterior margin of the dorsal, in which respect it differs from *Luxilus*. Scales deeper than long, posteriorly furrowed. The pharyngeal bones are narrow, with a slight expansion upon their convexity; the teeth being of the raptorial kind of the hooked type, strongly hooked, without grinding surface, instead of which a sharp but not crenated ridge. They are disposed upon a double row of four or five and two or three, as follows: 2 | 4—4 | 3, or 2 | 5—5 | 2.

SYN.—*Richardsonius*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 201.

The present genus bears some resemblance to *Squalius*, from which it may be distinguished by the smooth edge of the dental ridge and the long anal, together with the peculiar position of the latter in reference to the dorsal. The scales are also smaller and much deeper than long, which is not the case in *Squalius*.

1. RICHARDSONIUS BALTEATUS, GRD.

PLATE LX, FIGS. 1—4.

SPEC. CHAR.—Head forming less than the fifth of the total length. Snout sub-conical; jaws even; posterior extremity of maxillary bone extending to a vertical line drawn in front of the orbit. Eye large and circular; its diameter entering three times and a half in the length of the side of the head. Anterior margin of dorsal fin equidistant between the extremity of the snout and the fork of the caudal. Anal fin longer than deep and about as long as the head. Caudal fin constituting about the fourth of the total length. Greyish black above; silvery white beneath. Fins unicolor.

SYN.—*Cyprinus (Abramis) balteatus*, RICHARDS. FAUN. BOR. AMER. III, 1836, 301.—STOKER, SYNOPS. 1846, 160.

Richardsonius balteatus, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 202.

The greatest depth enters about four times and a half in the total length, the thickness being less than the half of the depth. The head is contained five times and one-third in the total length, of which the caudal fin constitutes about the fourth part. The dorsal fin is higher than long, sub-trapezoid in its outline, the upper margin being nearly linear. The caudal is deeply furcated. The anal is longer than deep and longer than the head itself, and diminishing rapidly in depth posteriorly, its inferior edge being slightly concave, and its anterior margin nearer the isthmus than the tip of the inferior lobe of the caudal. The ventrals are well developed, posteriorly sub-truncated, their tips reaching the vent, which is situated close to the anterior margin of the anal fin. Their origin is nearer the extremity of the snout than the insertion of the caudal. The pectorals are large, elongated, posteriorly rounded, and, when

brought alongside the body, their extremities reach nearly the origin of the ventrals. The formula of the rays may be thus expressed :

(Length, 5 inches.) D 2, 11 ; A 2, 18 + 1 ; C 9, 1, 9, 8, 1, 8 ; V 1, 9 ; P 15.

(Length, 6 inches.) ————— 2, 21 ; ————— 16.

The scales are of moderate development, somewhat irregular in their outline, with radiating furrows upon their posterior half, all being directed backwards. The lateral line is deflexed along the abdomen, bringing it much nearer the insertion of the ventrals than the base of the dorsal.

The color of the dorsal region and upper aspect of the head is dark greyish brown or blackish; the sides of the head, the flanks, and the belly, being silvery white. The dorsal, anal, and caudal fins are greyish yellow ; the ventrals and pectorals of a light straw or yellowish tint.

References to the figures.—Plate LX, fig 1, represents *Richardsonius balteatus*, size of life, from Fort Vancouver. Fig. 2 is a dorsal scale. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor'g No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|---------------------|--------------|--------|--------------------------|-----------------|-----------------------|---------------------|---------------------|
| 62 | 2669 | 1 | Adult. | Fort Dalles, Oregon..... | 1853 | Gov. J. I. Stevens... | Alcoholic. | Dr. Geo. Suckley... |
| 63 | 2670 | 1 | ..do.. | Fort Vancouver, Oregon. | 1853 | do..... |do..... |do..... |

2. RICHARDSONIUS LATERALIS, Gr d.

PLATE LX, FIGS. 5—8.

SPEC. CHAR.—Head constituting the fifth of the total length. Snout sub-conical ; jaws even ; posterior extremity of the maxillary extending to a vertical line drawn behind the nostrils. Eye large and circular ; its diameter entering nearly four times in the length of the side of the head. Anterior margin of dorsal fin a little nearer the extremity of the snout than the fork of the caudal. Anal fin deeper than long and much shorter than the head. Caudal fin entering four times and a half in the total length. Blackish brown above ; metallic yellowish white beneath, with a black streak above the lateral line. Fins unicolor.

SYN.—*Richardsonius lateralis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 202.

This species is more of an elongated and fusiform aspect than *R. balteatus*. The head is contained about five times in the total length. The pharyngeal teeth are five upon the outer row, instead of four.

The dorsal fin is sub-trapezoid also, higher than long, and somewhat nearer the extremity of the snout than the fork of the caudal. The caudal itself is but moderately furcated. The anal is deeper than long, nearly linear upon its external edge ; its anterior margin is equidistant between the isthmus and the tip of the inferior lobe of the caudal. The ventrals are moderate sized, posteriorly sub-truncated, their extremities reaching the vent, whilst their origin is nearly equidistant between the extremity of the snout and the insertion of the caudal. The pectorals are slender, but do not extend as far as the origin of the ventrals. The formula of the rays is as follows :

D 2, 9 + 1 ; A 2, 14 + 1 ; C 8, 1, 9, 8, 1, 7 ; V 1, 9 ; P 14.

The scales are of moderate development, irregular in their outlines, anteriorly sub-truncated and posteriorly rounded, exhibiting radiating furrows upon their posterior section only. The

lateral line is likewise deflexed upon the abdominal region, and nearer the insertion of the ventrals than the base of the dorsal.

The color of the dorsal region and upper surface of the head is blackish brown, whilst the sides of the head and the flanks exhibit a metallic yellowish white tint speckled with black. A black streak may be observed along the upper region of the flanks, just above the lateral line, and partly covering it. The fins are greyish olive; the ventrals and pectorals being somewhat more yellowish or else lighter than the rest.

References to the figures.—Plate LX, fig. 5, represents *Richardsonius lateralis*, size of life. Fig. 6 is a dorsal scale. Fig. 7, a scale from the lateral line. Fig. 8, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor'g No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|---------------------|--------------|-------|---------------------------------------|-----------------|----------------------|---------------------|---------------------|
| 64 | 2671 | 5 | A.&Y. | Fort Steilacoom, Puget's Sound, W. T. | 1853 | Gov. I. I. Stevens.. | Alcoholic. | Dr. Geo. Suckley... |

LUXILUS, Rafin.

GEN. CHAR.—Body very much compressed, and deepest upon the middle of its length. Head proportionally small and compressed like the body. Mouth small, terminal; when it is shut, the lower jaw fits into the upper one without protrusion of the snout; but when the mouth is partly open, the lower jaw *appears* longer than the upper. Eyes quite large. Isthmus small. Caudal fin furcated; insertion of ventrals situated in advance of the anterior margin of the dorsal. Scales large; lateral line forming a very open curve, convex downwards. Pharyngeal bones much stouter superiorly than inferiorly; a slight expansion may be observed upon the convexity of these bones, extending upwards. The teeth are of the bruising kind of the hooked type, with a slight hook and a well developed grinding surface, both edges of which being strongly crenated. They are disposed upon a single row of five, thus: 5—5. The three uppermost (sometimes the upper two only) stand out in bold relief from the line of the bone.

SYN.—*Luxilus*, RAFIN. Ichth. Ohiens, 1820, 48.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 202.

This is one of the most characteristic genus of North American cyprinoid, and altogether misunderstood by Heckel; for, *Cyprinus chrysoleucus*, Mitch., which he places in his genus *Leucosomus*, is generically distinct from *Leuciscus pulchellus* of Storer, as I have had the opportunity to ascertain. The diagnosis given of *Leucosomus* by its author, and the figures representing the pharyngeal dentition, leave no room for doubt. *Leucosomus*, therefore, is not synonymous with *Luxilus*, but was really established upon a species most intimately related to the one yet unpublished, and which is the type of the genus *Cheilonemus*. The latter, therefore, must give way to *Leucosomus*, a circumstance unavoidable and very much to be regretted, for it complicates the synonymy of both *Luxilus* and *Leucosomus*. It will include such species as are congenerical with *Luxilus chrysocephalus* of Rafinesque, and *Cyprinus chrysoleucas* of Mitchill.

1. LUXILUS OCCIDENTALIS, Grd.

SPEC. CHAR.—Body rather elongated, sub-fusiform in its outline. Head constituting about the fifth of the total length. Snout sub-conical, rather tapering. Gape of the mouth oblique. Posterior extremity of maxillar bone extending to a vertical line which would intersect the hind nostril. Eye large and circular; its diameter entering four times in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Origin of ventrals nearer the insertion of the caudal than the extremity of the snout. Anterior edge of anal fin equidistant between the isthmus and the tip of the lower lobe of the caudal. Dark greyish brown above; yellowish beneath, speckled with grey.

SYN.—*Leucosomus occidentalis*, B & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 137.

Luxilus occidentalis, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 203.

Numerous immature specimens of this species were collected, together with one about five inches in length. The body is very much compressed, deepest upon the middle of its length, and tapering towards both extremities; the greatest depth being contained four times in the total length. The snout is sub-conical, the head rather small, and forming about the fifth of the total length, it being slightly depressed above the eyes. The anterior margin of the dorsal fin is nearer the base of the caudal than the extremity of the snout. The caudal is furcated. Both the anal and dorsal are anteriorly elevated. The insertion of the ventrals is situated in advance of the anterior margin of the dorsal. The pectorals and the ventrals are of medium development.

D 2, 10 + 1; A 2, 11 + 1; C 8, 1, 9, 8, 1, 9; V 10; P 15.

The scales are of medium size, anteriorly sub-truncated, elsewhere rounded, and provided with radiating furrows upon their posterior section only. The lateral line is bent downwards upon the abdomen, constituting a curve, the convexity of which is nearer the ventral than to the dorsal outline.

The color of the upper region is dark greyish brown, the middle of the flanks being silvery, and the belly yellowish, speckled with grey. The fins are unicolor, of a greyish olive tint.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of specs. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|---------------|----------|----------------------------------|-----------------|-----------------------|---------------------|---------------------|
| 57 | ..... | 10 | Young. | Pose, or O-co-ya creek, Cal. | 1853 | Lt. R. S. Williamson. | Alcoholic. | Dr. A. L. Heermann. |
| 58 | ..... | 10 | ...do... | Four creeks, Tulare valley, Cal. | 1853 |do.....do..... |do..... |do..... |
| 59 | 2667 | 2 | Adult. |do..... | 1853 |do.....do..... |do..... |do..... |

2. LUXILUS SECO, Grd.

SPEC. CHAR.—Body rather elongated, sub-fusiform in its outlines. Head small, contained five times and a half in the total length. Snout sub-conical, rather abbreviated. Gape of the mouth slightly oblique; posterior extremity of maxillary extending to a vertical line intersecting the anterior nostril. Eye very large, sub-circular; its diameter entering about three times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the extremity of the snout and the fork of the caudal. Vertical fins moderately developed; pectorals and ventrals rather small. Light reddish brown above; yellowish white beneath. Fins light olive.

SYN.—*Luxilus seco*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 203.

The body is deeper than in *L. leptosomus*, figured and described in the Report of the United States and Mexican Boundary Commission. Its depth is equal to the fourth of the total length. The head is contained five times and a half in the same dimension. The eye is very large; its diameter entering three times only in the length of the side of the head. The mouth is small. The dorsal is much higher than long, superiorly sub-convex, whilst the anal is nearly as long as deep and inferiorly sub-concave. The anterior margin of the latter is somewhat nearer the tip of the lower lobe of the caudal fin than the isthmus. The caudal is longer than the head. The origin of the ventrals is nearer the extremity of the snout than the insertion of the caudal; their external edge is sub-convex, and, when extended backwards, their tips scarcely reach the vent. The pectorals are sub-ovate and far from reaching the insertion of the ventrals.

D 2, 8 + 1; A 2, 14 + 1; C 5, 1, 9, 8, 1, 6; V 9; P 14.

The scales are of moderate development, and the lateral line very much deflexed upon the abdomen.

The dorsal region is light reddish brown and yellowish white beneath; the middle of the flanks is silvery. The fins being unicolor, of a light olive.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|------------------|---|-----------------|--------------------|------------|---------------------|---------------------|
| 60 | 2668 | 10 | Adult and young. | Rio Seco, tributary to Rio Nueces, Texas. | 1853 | Lt. A. W. Whipple. | 19 | Alcoholic. | Dr. C. B. Kennerly. |

3. LUXILUS LUCIDUS, Grd.

PLATE LX, FIGS. 9—12.

SPEC. CHAR—Body rather elongated, sub-fusiform in its outlines. Head moderate sized, contained five times in the total length. Snout sub-conical, tapering; gape of the mouth somewhat oblique; posterior extremity of maxillar bone extending to a vertical line drawn in front of the orbit. Eye well developed; its diameter entering three times and a half in the length of the side of the head. Anterior margin of dorsal fin somewhat nearer the tip of the snout than the insertion of the caudal. Greyish brown above; yellowish beneath. Fins unicolor, assuming the tint of the region to which they belong.

SYN.—*Luxilus lucidus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 203.

The general form resembles that of *L. seco*. The head, however, is contained but five times in the length of the side of the head. The mouth is a good deal larger, whilst the eye is smaller. The dorsal fin is much higher than long; its upper edge being sub-convex. The anal is but a little deeper anteriorly than long; its lower edge is sub-concave, and its anterior margin nearer the fork of the caudal than the isthmus. The caudal itself is somewhat longer than the head, hence it is contained short of five times in the total length. The origin of the ventrals is nearer the extremity of the snout than the insertion of the caudal; their posterior edge is rounded off, or sub-convex, and their tips overlap the vent without reaching quite the origin of the anal. The pectorals are sub-lanceolated; their extremities not extending as far as the insertion of the ventrals. The following formula gives the number of the rays of the various fins.

D 2, 8 + 1; A 2, 10 + 1; C 9, 1, 8, 8, 1, 10; V 8; P 12.

The scales are rather large, very much deeper than long, anteriorly sub-truncated, posteriorly rounded, and tapering superiorly and inferiorly. The radiating furrows are but few and occasionally obsolete. The lateral line being very much deflexed upon the abdominal region.

The upper region is greyish brown, whilst the inferior region is yellowish, else of a dull whitish tint. The middle of the flank somewhat metallic white. The vertical fins are greyish; the ventrals and pectorals being yellowish.

References to the figures.—Plate LX, fig. 9, represents *Luxilus lucidus*, size of life; fig. 10 is a dorsal scale; fig. 11, a scale from the lateral line; and, fig. 12, a scale from the abdominal region.

List of specimens.

| Catal. No. | No. of specs. | Age. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimen. | Collected by— |
|------------|---------------|--------|--|-----------------|--------------------|-----------|---------------------|-------------------|
| 55 | 12 | A.&Y | Coal creek, tributary to south fork of Canadian river. | 1853 | Lt. A. W. Whipple. | VI | Alcoholic. | H. B. Möllhausen. |
| 56 | 12 | ..do.. | Twenty miles west of Choctaw Agency. | 1853 |do..... | XVI |do.... |do..... |

SEMOTILUS, Rafin.

GEN. CHAR.—Head sub-conical; jaws equal or else even anteriorly; gape of mouth slightly oblique upwards. The mouth itself being large, surrounded with soft lips. The isthmus is rather narrow. The insertion of the ventrals is situated in advance of the anterior margin of the dorsal fin, which is higher than long. The caudal is furcated. The scales are of moderate size. The pharyngeal bones are narrow, very slightly expanded upon the upper half of their curve. The teeth are of the voratorial kind, of the hooked type without grinding surface, stoutish, moderately hooked and disposed upon a double row in the following manner: 2 | 5—5 | 2; sometimes 2 | 4—5 | 2. Generally speaking, a black or brown spot may be observed at the base of the anterior margin of the dorsal fin.

SYN.—*Semotilus*, RAFIN. Ichth. Ohiens. 1820, 86.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 203.

The genus *Semotilus*, although imperfectly characterized by its author, gives no room for doubt as to the species he intended to include in it. *Semotilus dorsalis* and *Semotilus cephalus* are both well known species. *S. diplemia*, on the other hand, does not come under this head. On the other hand, *Cyprinus atromaculatus* of Mitchill, of the northern and eastern States, belongs to it.—(See Proc. Acad. Nat. Sc. Philad. VIII, 1856, 204.)

SEMOTILUS SPECIOSUS, Grd.

PLATE LXI, FIGS. 11—15.

SPEC. CHAR.—Body elongated, sub-fusiform in its outlines. Head constituting the fourth of the total length, the furcated portion of the caudal excluded. Snout sub-conical; gape of the mouth oblique; posterior extremity of maxillar bone extending to a vertical line drawn at the anterior rim of the pupil. Eye moderate size, sub-circular; its diameter entering five times in the length of the side of the head. Anterior margin of dorsal fin nearer the extremity of the snout than the tip of the caudal. Insertion of ventrals nearer the isthmus than the base of the caudal. Anal fin much deeper than long. Reddish brown above; yellowish or whitish beneath. Dorsal and caudal fin provided with a black spot at their base.

SYN.—*Semotilus speciosus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 204.

A graceful and slender fish, subfusiform in its outline, the head, which is conical and tapering forwards, constitutes exactly the fourth of the entire length, if we exclude the furcated portion of the caudal fin. The ventrals are situated somewhat more anteriorly than in *S. atromaculatus*. The upper edge of the dorsal as well as the inferior edge of the anal are sub-convex or rounded off. The anterior margin of the anal is nearer the extremity of the caudal than the isthmus. The ventrals are small, posteriorly rounded off when expanded; their tips, when brought backwards, not extending as far as the vent. The pectorals are moderate sized, sub-lanceolated, and far from reaching the origin of the ventrals with their extremities.

D 1, 8 + 1; A 2, 8 + 1; C 4, 1, 9, 8, 1, 5; V 1, 8; P 15.

The scales of the dorsal region in advance of the dorsal fin are quite small; those on the thoracic region are likewise smaller than posteriorly along the sides of the tail. They are longer than deep, except in the lateral line, sub-elliptical in their outline, sub-truncated anteriorly, with radiating grooves upon their posterior section only.

The dorsal region is reddish brown, whilst the abdominal region exhibits a yellowish or whitish tint. A dark blackish, somewhat metallic, streak may be observed along the middle of the flanks, terminating at the base of the caudal into a jet black spot. A similar spot exists at the anterior edge of the dorsal fin near its base. The other fins are unicolor, all being of a greyish olive or of a light yellow.

References to the figures.—Plate LXI, fig. 11, represents *Semotilus speciosus*, size of life. Fig. 12, a section of the body taken across the line of greatest depth. Fig. 13, a dorsal scale. Fig. 14, a scale from the lateral line. Fig. 15, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|-------------|-----------------------------|-----------------|------------------|---------------------|-------------------|
| 176 | 2740 | 15 | Adt. & y'g. | Trib. of Platte river, Neb. | 1852 | J. S. Bowman.... | Alcoholic. | J. S. Bowman..... |

HUDSONIUS, Girard.

GEN. CHAR.—Body elongated, compressed, fusiform in profile, and covered with quite large scales. The lateral line being nearly median. The head is of but moderate size; the snout being sub-conical and rounded anteriorly. The mouth is sub-terminal, somewhat protractile, in which situation it is directed obliquely forwards and downwards; when shut, the lower jaw fits within the upper, the snout being slightly protruding. There are no barbels about the mouth. The eyes are large; the isthmus is small. The dorsal is higher than long; its anterior margin is even with the insertion of the ventrals. The anal has a proportionally longer base than the dorsal. The caudal is deeply furcated. The pharyngeal bones are well developed; the inferior limb is rather short, its extremity being flattened and slightly turned outwardly. From the middle of the convexity a sudden expansion occurs, tapering into the upper limb, slightly curved downwards. The teeth are of the bruising kind, of the hooked type, provided with a grinding surface. But there occur many irregularities, being more or less hooked and the grinding surface more or less developed. It is not uncommon to observe all these variations upon the pharyngeal of a single specimen. The teeth are disposed upon a double row with the following variations: 2 | 4—4 | 2; 2 | 4—4 | 1; 0 | 4—4 | 2, or 0 | 4—4 | 1.

SYN.—*Hudsonius*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 210.

The type of the present genus is *Clupea hudsonia*, De Witt Clinton, *Leuciscus hudsonius* of more modern writers. This species occurs as far northwest as Lake Michigan and in the fresh waters of Illinois and Wisconsin.

A second species was detected in the brackish waters of Chesapeake bay and described under the name of *Hudsonius amarus*.—(See Proc. of the Acad. of Nat. Sc. of Philad. VIII, 1856, 210.)

GILA, B. & G.

GEN. CHAR.—Body sub-fusiform, compressed, with the back more or less arched, especially in large and old specimens, and sometimes tapering very much posteriorly, with the peduncle of the tail very slender. The head being depressed and proportionally small, with its upper outline often concave; the snout is elongated; the eyes are of moderate size; the isthmus small. The mouth is of medium size, the upper jaw overlapping the lower, so as to conceal its cleft from above. No barbels, or rudiments of barbels. The branchiostegals are three on either side. The ventral fins are inserted in advance of the anterior margin of the dorsal, and the anal posteriorly to the base of the dorsal. The caudal is furcated. The scales are small on the dorsal region and of medium size on the sides, and longer than deep. The lateral line forms an open curve along the middle of the abdomen. The pharyngeal bones are well developed, the inferior limb elongated, the upper one forming an open curve; the convexity being somewhat expanded, the expansion tapering along the upper and inwards limb. The teeth are well developed, of the raptorial kind of the hooked type, without grinding surface, sub-cylindrical, slightly compressed, and disposed upon a double row of one or two and four or five as follows: 1 | 4—5 | 2, or else 2 | 4—5 | 2.

SYN.—*Gila*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 368; & in *Sitgr. Expl. of Zuñi & Color. Rivers*, 1853, 148—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 205.

Prior to our "researches upon the Cyprinoid fishes inhabiting the fresh waters of the United States west of the Mississippi valley,"* the genus *Gila* was still composed of heterogeneous elements. Two of our own species originally placed in it have gone, with some other new species, to form the genus *Tigoma*. A third and a fourth species, described by Dr. Ayres, have likewise been removed elsewhere; the former going into the genus *Ptychocheilus* associated with

*See Proceedings of the Academy of Natural Sciences of Philadelphia, vol. VIII, 1856.

four others; the latter was erected into a distinct genus under the name of *Orthodon*; and, what is still more curious, *Orthodon* belongs to the tribe of *Chondostomi*, hence its affinities with *Gila* are most remote.

The three species of *Gila* described hereon are admirably figured in Captain Sitgreaves' "Report of an Expedition down the Zuñi and Colorado Rivers, 1853." The other species known up to the present time, two in number, are figured in the "Report on the United States and Mexican Boundary Survey, vol. II."

1. GILA ROBUSTA, B. & G.

SPEC. CHAR.—Body sub-fusiform, anteriorly stout, posteriorly tapering. Head constituting the fourth of the total length. Eye small, sub-elliptical; its diameter entering about eight times in the length of the side of the head. Posterior extremity of maxillar bone extending to a vertical line drawn somewhat within the anterior rim of the orbit. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Base of anal fin entering nine times and a half in the total length. Origin of ventrals nearly equidistant between the extremity of the snout and the insertion of the caudal. Greyish brown above; yellowish beneath.

SYN.—*Gila robusta*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 368; and, in *Sitgr. Rep. Zuñi and Color. Riv.* 1853, 148; *Fishes*, pl. I.—**GRD.** in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 205.

The general shape of the body is sub-fusiform, very much swollen anteriorly, and tapering very suddenly from the dorsal fin towards the base of the caudal. The body itself is compressed; its greatest depth is midway between the occiput and the anterior margin of the dorsal.

The head is very much depressed above, rapidly sloping from the nape to the snout. The side of the head enters four times in the total length, whilst its crenial region enters in it six times. The eyes are rather small, longitudinally elliptical; their diameter entering about eight times in the length of the side of the head, and thrice from the tip of the snout to the pupil. The nostrils are large, situated towards the upper aspect of the head, and placed nearer the orbit than the extremity of the snout. The mouth is rather large; the upper jaw overlapping the lower; both being surrounded with quite conspicuous lips. The posterior extremity of the maxillar bone does not reach a vertical line drawn in advance of the pupil, although it extends beyond the anterior rim of the orbit. There are three branchiostegal rays on either side, broad, flattened, closely approximated. The gill openings are quite large, being separated beneath by a very narrow isthmus. The mucous pores on the head are not conspicuous; a series, however, more apparent than the rest, may be traced from occiput to snout, in passing under the orbit.

The dorsal fin, which is inserted exactly upon the middle of the total length, is somewhat higher than long and slightly concave upon its upper margin; its posterior margin is half the height of the anterior margin. All but the anterior ray dichotomize thrice, although the branches of the third bifurcation remain in close contiguity. The posterior margin of the caudal is crescent-shaped, the upper and lower lobe being symmetrical; the sixteen median rays are dichotomized in the same manner as those of the dorsal fin. The insertion of the anal takes place immediately behind the base of the dorsal, and of which it has the same general shape, being deeper than long and slightly concave exteriorly; its posterior margin, however, has but one-third of the depth of the anterior margin. The rays are bifurcated like those of the dorsal. The ventrals are exteriorly rounded, nearly equidistant between the extremity of the snout and the insertion of the caudal fin, and when bent backwards they scarcely reach the vent. Their rays affect the same structure as in the other fins. The pectorals are very broad when expanded, and their rays thrice dichotomized. When bent backwards their posterior

extremity does not reach the insertion of the ventrals in the female, whilst in the male they extend beyond.

D 1, 9; A 1, 9; C 8, 1, 8, 8, 1, 7; V 1, 9; P 15.

The scales are quite diversified, being of different sizes, according to the regions of the body. They are very small on the dorsal region between the occiput and the dorsal fin, increasing somewhat in size between the dorsal and the caudal, and becoming almost uniform along the peduncle of the tail. They are largest along the flanks, whilst they are again reduced in size on the belly from the throat to the anal fin. In shape they are sub-elliptical, anteriorly truncated, or undulated, longer than deep, exhibiting radiating furrows, not only upon the posterior section, but likewise laterally. The lateral line is very conspicuous, slightly deflexed along the flanks, where it is equidistant between the dorsal and abdominal outlines, to the very base of the caudal fin.

The color is uniformly greyish brown above and yellowish beneath. The fins assuming the tints of the region of the body to which they belong.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------|-----------------|-----------------|------------------------|---------------------|---------------------|
| 246 | 2798 | 3 | Adult. | Zuñi river..... | 1852 | Capt. L. Sitgreaves... | Alcoholic.. | Dr. S.W. Woodhouse. |

2. GILA ELEGANS, B. & G.

SPEC. CHAR.—Body very slender; tail very much attenuated. Head constituting the fifth of the total length. Eye small, sub-elliptical; its diameter entering seven times in the length. Posterior extremity of maxillar bone extending to a vertical line drawn in advance of the orbit. Anterior margin of dorsal fin nearer the extremity of the snout than the base of the caudal. Base of anal fin entering about nine times in the total length. Origin of ventrals much nearer the extremity of the snout than the base of the caudal. Reddish brown above; metallic yellow beneath.

SYN.—*Gila elegans*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 369; and, in *Sitgr. Rep. Zuñi and Color. Rivers*, 1853, 150, pl. ii.—**GRD.** in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 205.

The most striking peculiarity of this species consists in its elongated and slender body, and especially its slender tail, terminated by a rather well developed and deeply furcated caudal fin. Indeed, all the fins are proportionally well developed. The greatest depth in advance of the dorsal enters seven times in the total length. The greatest thickness being about the half of the depth.

The head is very much depressed, flattened upon the snout, forming the fifth of the total length. The eyes are sub-elliptical, their diameter entering seven times in the length of the side of the head, and twice between the tip of the snout and the anterior rim of the orbit. They are more apparent upon a view of the head from beneath than from above. The nostrils are situated entirely upon the upper surface of the snout, further apart from the extremity of the latter than the eye. The mouth is inferior; the upper jaw overlapping the lower. The posterior extremity of the maxillar bone extending to a vertical line drawn in advance of the orbit. The isthmus is very small.

The rays in all the fins have the same general structure as in the preceding species; the dorsal and anal are provided anteriorly with three rudimentary rays instead of one, and the posterior margins of either of these fins is much lower than the anterior margin as compared to the

preceding species. The insertion of the anal takes place immediately behind the base of the dorsal. The origin of the ventrals being much nearer the extremity of the snout than the insertion of the caudal fin. Their formula is as follows:

D 3, 9; A 3, 10; C 9, 1, 9, 9, 1, 10; V 9; P 16.

The scales are much longer than deep, anteriorly sub-truncated or undulated, and deepest, whilst they taper somewhat towards a posterior rounded margin, which alone exhibits radiating furrows. The lateral line is deflexed upon the middle of the abdomen, so as to approximate more the base of the ventrals than that of the dorsal fin; further back it is median to the insertion of the caudal.

The color is uniform reddish brown above, and metallic yellow or white beneath; the fins being of a dull olive tint.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------|------------------------|-----------------|---------------------------|---------------------|----------------------|
| 248 | ..... | 3 | Adult. | Gila river..... | 1853 | Lieut. J. G. Parke.... | Alcoholic. | Dr. A. L. Heermann.. |
| 249 | 2799 | 1 | ..do.. | ?..... | 1854 | Lieut. E. G. Beckwith.... | ..do.... | Mr. Kreuzfeld..... |
| 250 | ..... | ..... | ..do.. | Colorado river..... | 1854 | Major Emory | ..do.... | Arthur Schott..... |
| 251 | 2800 | 1 | ..do.. | Zuñi river | 1852 | Capt. L. Sitgreaves... | ..do.... | Dr. S. W. Woodhouse. |
| 935 | ..... | 3 | ..... | Fort Yuma, California. | 1855 | Major S. H. Thomas.... | ..do.... | Major Thomas |

3. GILA GRACILIS, B. & G.

SPEC. CHAR.—Body sub-fusiform, compressed. Head constituting the fourth of the total length. Eye large, sub-circular; its diameter entering nearly six times in the length of the side of the head. Posterior extremity of the maxillar bone extending to a vertical line drawn somewhat in advance of the orbit. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Base of anal fin entering twelve times in the total length. Origin of ventrals somewhat nearer the insertion of the caudal than the extremity of the snout. Yellowish brown above; beneath silvery white.

SYN.—*Gila gracilis*, B. & G. in Proc. Acad. Nat. Sc. Philad, VI, 1853, 369; and, in *Sitgr. Rep. Zuñi and Color. Rivers*, 1853, 151. Fishes, Pl. III.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 205.

The body is sub-fusiform in profile, quite compressed, tapering more gradually backwards than in the preceding two species. The greatest depth corresponds to the anterior margin of the dorsal fin, and enters about five times and a half in the total length; the greatest thickness, at the origin of the body, is comprised eight times and a half in the length.

The head, which is sub-pyramidal and slightly depressed above, constitutes the fourth of the total length. The eyes being large and sub-circular; their longitudinal diameter entering nearly six times in the length of the side of the head. The nostrils, which are situated towards the upper surface of the head, are much nearer the orbit than the extremity of the snout. The upper jaw overlaps the tip of the lower one; the posterior extremity of the maxillar bone extending somewhat beyond a perpendicular line drawn through the anterior rim of the orbit. Series of mucous pores may be traced from the origin of the lateral line across the nape, hence to the nostrils along the parietal region; also downwards along the preopercle to the angle of the mouth, and under the orbit towards the snout.

The dorsal fin is situated slightly in advance of the middle of the total length; its anterior margin being somewhat nearer the insertion of the caudal than the extremity of the snout. It

is a little higher than long, with its upper margin slightly concave. The anal fin resembles the dorsal in form and proportions, being slightly convex exteriorly and deeper than long. Its anterior margin is situated a little backwards to the posterior margin of the dorsal. The caudal is deeply furcated; its lobes being symmetrical. The developed rays of these three fins are bifurcated twice upon their length. The ventrals are sub-oval; their insertion is placed somewhat in advance of the dorsal, and when bent backwards their tip reaches the vent and occasionally also the anterior margin of the anal fin. The pectorals are sub-triangular, tapering; their insertion is close to the head, rather more towards the inferior aspect than on the sides; their extremity does not reach the insertion of the ventrals, and consequently not the anterior margin of the dorsal.

D 3, 8; A 3, 8; C 8, 1, 10, 11, 1, 7; V 1, 8; P 16.

The vent is situated close to the anal fin, and nearer the tip of the lower lobe of the caudal than the extremity of the snout. The scales, as a general rule, are rather small, thin, and sub-circular. The smallest ones occur between the dorsal fin and the occiput, and especially upon the latter region. From the middle of the flanks downwards they increase in size, being slightly imbricated till near the abdomen, whence they diminish on to the belly, where they lose again their imbrication. Radiating grooves affect the posterior section or half of the scale only. The lateral line undergoes a gentle downwards curve upon the middle of the abdomen, where it is nearer the abdominal than dorsal outline, passing through the area of the largest scales, being very conspicuous from head to tail.

The color is of a uniform yellowish brown tint on the head, and along the dorsal region covered with the smallest scales. The sides and belly are shining silvery white. The fins being yellowish, the inferior ones lighter than the upper.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|------------------|-----------------|--------------------------|---------------------|------------------------|
| 245 | 2797 | 8 | Zuñi river | 1852 | Capt. L. Sitgreaves..... | Alcoholic. | Dr. S. W. Woodhouse... |

TIGOMA, Girard.

GEN. CHAR.—Bears a general resemblance to *Gila*, from which it differs by a much smaller mouth, and larger scales, and the scales of the dorsal region, though smaller than on the sides, are not so disproportionate as in the genus just alluded to. The ventrals are inserted in advance of the anterior margin of the dorsal, and the caudal fin is furcated. It is not deemed superfluous to state that there are no barbels at the angle of the mouth; and a characteristic of this genus, as distinct from *Gila*, consists in its terminal mouth and even jaws. The pharyngeal bones resemble very much those of *Gila*, but the inferior limb is not quite so long, the convexity not quite so expanded, and the upper limb more curved inwards. As to the teeth, it requires a minute observation to detect a generical difference; they are more compressed and more strongly hooked; otherwise, of the raptorial kind, of the hooked type, either without a grinding surface or else provided with a grinding surface more or less developed. They are disposed in the following wise: 2 | 5—5 | 2; 2 | 4—5 | 2, or 1 | 4—5 | 2, besides some intermediate formulæ.

SYN.—*Tigoma*, Gir. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 205.

Some of the species of this genus we had formerly included in other genera, and now we add a few more hitherto undescribed.

1. TIGOMA CONFORMIS, Grd.

SPEC. CHAR.—Body rather short, sub-fusiform in its outlines. Head of moderate development, constituting the fourth of the total length. Mouth rather small, with its gape somewhat oblique; posterior extremity of maxillar bone extending to a vertical line drawn behind the nostrils. Eye moderate sized; its diameter entering nearly five times in the length of the side of the head. Isthmus small. Anterior margin of dorsal fin nearer the fork of the caudal than the extremity of the snout. Origin of ventrals nearer the isthmus than the insertion of the caudal. Scales well developed. Purplish brown above; dark yellowish beneath.

SYN.—*Lavinia conformis*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 137.

Tigoma conformis, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 206.

Only one specimen of this species was obtained; its total length being about four inches. It has a quite compact tail. The general appearance of the fish is suggestive of *Lavinia crassicauda*; the body is deeper and proportionally less elongated; the eye much smaller, and the scales larger. Another distinctive mark between these two fishes consists in the position of the ventrals, the insertion of which, in *T. conformis*, is situated in advance of the anterior margin of dorsal, whilst it is placed slightly behind it in *Lavinia crassicauda*.

The dorsal fin is higher than long; its upper edge being sub-convex. The anal, which is likewise deeper than long, is sub-truncated or slightly convex upon its external edge; its anterior margin is somewhat nearer the isthmus than the tip of the inferior lobe of the caudal. The ventrals are small, sub-ovate, posteriorly rounded off, and reaching the anal orifice. The pectorals are likewise small and sub-ovate in their outlines, their extremities not extending as far as the origin of the ventrals.

D 1, 8 + 1; A 2, 9; C 7, 1, 9, 9, 1, 8; V 1, 8; P 16.

The scales are well developed, smaller on the dorsal region than along the sides, and smaller still on the belly than on the back. They are somewhat deeper than long, anteriorly sub-truncated and rounded upon the remaining edges, with radiating furrows upon their posterior section only. The lateral line is deflexed upon the middle of the flanks and nearer the insertion of the ventrals than the base of the dorsal.

The upper region of the head and body is dark purplish brown, lighter on the sides, and dark yellowish beneath, with metallic reflects. The fins are somewhat greyish yellow, the vertical being darker than the horizontal ones.

List of specimens.

| Catal. No. | Cor'g No. of teeth. | No. of spec. | Locality. | When collected. | Whence obtained | Nature of specimens. | Collected by— |
|------------|---------------------|--------------|--|-----------------|-----------------------|----------------------|---------------------|
| 231 | 2785 | 1 | Pose or O-co-ya creek, Tulare valley, Cal. | 1853 | Lt. R. S. Williamsen. | Alcoholic. | Dr. A. L. Heermann. |

2. TIGOMA BICOLOR, Grd.

SPEC. CHAR.—Body elongated, anteriorly compact, diminishing posteriorly. Head well developed, constituting somewhat less than the fourth of the total length. Mouth large; posterior extremity of maxillary extending to a vertical line drawn at the anterior rim of the orbit. Eye moderate; its diameter entering six times in the length of the side of the head. Origin of ventral fins placed slightly in advance of the anterior margin of the dorsal, which is nearer the insertion of the caudal than the extremity of the snout. Scales large. Dorsal region bluish grey; sides and belly silvery white, sometimes golden.

SYN.—*Tigoma bicolor*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 206.

A large species: the largest hitherto known of this genus. It is twelve inches in total length, the head forming somewhat less than the fourth of it. The greatest depth is nearly equal to the length of the head. The eye is sub-circular, and its diameter contained about six times, or a little more, in the length of the side of the head. The dorsal and anal fins are sub-trapezoid, the anal being smaller than the dorsal. The origin of the ventrals is situated but slightly in advance of the dorsal fin. The latter is higher than long: a character of the genus. The pectorals and ventrals are of moderate development.

D 1, 8, or 1, 9 + 1; A 2, 8 + 1; C 8, 1, 9, 8, 1, 7; V 1, 10; P 18.

The scales are quite large, deeper than long upon the anterior portion of the body, and longer than deep upon the posterior portion, with numerous radiating grooves upon their posterior section only. The lateral line is somewhat deflexed on the middle of the flanks and nearer the insertion of the ventrals than the base of the dorsal.

The dorsal region is bluish grey; the sides and belly are silvery white, sometimes golden, but always in contrast with the tint of the back.

List of specimens.

| Catal. No. | Cor'g No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|---------------------|--------------|-------|-------------------------|-----------------|-----------------------|----------------------|---------------------|
| 234 | 2788 | 3 | A.&Y. | Klamath lake, Oregon... | 1855 | Lt. R. S. Williamson. | Alcoholic. | Dr. J. S. Newberry. |

3. TIGOMA OBESA, Grd.

SPEC. CHAR.—Body short and compact; peduncle of the tail rather attenuated. Head small, constituting the fifth of the total length. Snout abbreviated and rounded; posterior extremity of maxillary bone extending to a vertical line drawn in front of the orbit. Eye moderate sized, sub-circular; its diameter entering a little over four times in the length of the side of the head. Anterior margin of dorsal fin nearly equidistant between the extremity of the snout and the fork of the caudal fin. Origin of ventrals somewhat nearer the insertion of the caudal than the extremity of the snout. Bluish grey above; yellowish white beneath, with a lateral reddish streak.

SYN.—*Tigoma obesa*, Grn. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 206.

A very characteristic species, owing to its short and deep body, its short and conical head, and its small fins. It bears a general resemblance to *T. purpurea*, but its head is much smaller. The anal fin is somewhat larger than the dorsal, both of them are sub-trapezoid in shape. The extremities of the ventrals are far from reaching the vent; the same is true of the pectorals with reference to the origin of the ventrals. The following formula gives the number of the rays:

D 1, 8 + 1; A 2, 9 + 1; C 6, 1, 9, 8, 1, 5; V 1, 8; P 15.

The scales are moderately developed, presenting the same variations in length and depth, according to the regions of the body where they occur, as in *T. bicolor*. The lateral line is nearly median, being but slightly deflexed and but slightly nearer the insertion of the ventrals than the base of the dorsal.

The upper region is bluish grey, whilst the inferior region is yellowish white. A reddish streak may be observed above the lateral line from the opercular apparatus to the tail. The vertical fins are greyish yellow; the pectorals and ventrals exhibiting a rather more yellowish tint.

List of specimens.

| Catal. No. | Cor'g No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|---------------------|--------------|-------|--------------------------|-----------------|--------------------|----------------------|-------------------|
| 215 | 2773 | 3 | A.&Y. | Salt Lake valley, Utah.. | 1852 | J. Soulé Bowman... | Alcoholic. | J. S. Bowman..... |

4. TIGOMA HUMBOLDTI, Grd.

SPEC. CHAR.—Body rather short and deep, tapering gradually towards the peduncle of the tail. Head contained a little over four times and a half in the total length. Snout thickish and rounded; gape of mouth slightly oblique; posterior extremity of maxillar bone extending to a vertical line drawn within the anterior rim of the orbit. Eye well developed, sub-circular; its diameter entering four times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the extremity of the snout and the fork of the caudal. Origin of ventrals equidistant between the extremity of the snout and the insertion of the caudal. Bluish or greyish black above; yellowish beneath.

SYN.—*Tigoma humboldti*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 206.

This species resembles *T. obesa* by a deep and rather short body; the greatest depth being equal to the third of the length, the caudal fin excluded. The head and eyes are also much larger. The anal fin is somewhat more developed than the dorsal, which is sub-trapezoid, with its upper edge nearly straight, whilst the inferior edge of the anal is sub-concave, and its anterior margin nearer the fork of the caudal than the isthmus, whilst its base enters about eight times in the total length. The ventrals are posteriorly rounded off, extending as far as the vent. The pectorals are likewise broad and rounded posteriorly, but they do not reach the insertion of the ventrals.

D 1, 9; A 1, 12; C 5, 1, 9, 8, 1, 4; V 1, 9; P 14.

The scales are much larger than in *T. obesa*, and somewhat smaller on the dorsal region in advance of the fin than along the flanks. The lateral line is but slightly deflexed opposite the pectorals, whence it is straight to the tail, somewhat below the mesial line of the flanks.

The dorsal region above the lateral line is bluish or greyish black, with a yellow or reddish streak from the supra-tympanic region to the peduncle of the tail. The flanks below the lateral line, and the belly, are yellowish. The fins are more or less greyish, upon a yellowish ground.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|------------|---------------------|-----------------|---------------------|---------------------|------------------|
| 225 | 2779 | 2 | Ad't.&Y'g. | Humboldt river..... | 1852 | J. Soulé Bowman ... | Alcoholic .. | J. Soulé Bowman. |

5. TIGOMA EGREGIA, Grd.

SPEC. CHAR.—Body rather elongated, sub-fusiform in profile. Head contained four times in the length, the caudal fin excluded. Snout sub-conical and thickish; gape of the mouth slightly oblique; jaws equal; posterior extremity of the maxillary extending to a vertical line drawn within the anterior rim of the orbit. Eye moderate sized, sub-circular; its diameter entering four times and a half in the length of the side of the head. Anterior margin of dorsal fin nearer the extremity of the snout than the fork of the caudal. Origin of ventrals equidistant between the insertion of the caudal fin and the extremity of the snout. Bluish black above; yellowish orange beneath.

By its general aspect this species resembles *T. lineata*, whilst its structural characters are suggestive of *T. humboldti*. The dorsal and anal fin are nearly equal in size and shape; the upper edge of the former and the inferior edge of the latter are slightly sub-concave. The anterior margin of the anal is nearer the tip of the inferior lobe of the caudal than the isthmus; its base enters nine times in the total length, the caudal fin excluded. The ventrals are posteriorly sub-truncated; their tips not extending to the vent. The pectorals are rather slender, sub-ovate in their outline, their extremities not reaching the origin of the ventrals.

D 1, 8 + 1; A 2, 9 + 1; C 6, 1, 9, 8, 1, 7; V 1, 8; P 13.

The scales are about as large as in *T. humboldti*, and the lateral line is almost identical in its direction. Its system of coloration is likewise very similar to that of the species just alluded to. Dorsal region bluish black with a metallic reflect; middle of the flanks yellow, with numerous black dots constituting two dark zones, one above, the other below the lateral line, between which zones may be observed two streaks of red or golden orange. The belly exhibiting a uniform metallic yellow tint. The dorsal and caudal fins being greyish, whilst the remaining fins are more of a yellowish tint.

List of specimens.

| Catal. No. | Cer. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------|-----------|-----------------|---------------------|---------------------|--------------------|
| 226 | 2780 | 1 | Adult. | ? | 1854 | Lt. E. G. Beckwith. | Alcoholic .. | Mr. Kreuzfeld..... |

6. TIGOMA LINEATA, Grd.

SPEC. CHAR.—Body elongated, sub-fusiform. Head forming a little less than the fourth of the total length. Snout sub-conical; gape of the mouth somewhat oblique; lower jaw slightly overlapped by the snout. Posterior extremity of maxillar bone extending to a vertical line drawn at the anterior rim of the orbit. Eye moderate, sub-circular; its diameter entering nearly five times in the length of the side of the head. Anterior margin of dorsal fin somewhat nearer the extremity of the snout than the tip of the upper lobe of the caudal. Origin of ventrals nearer the extremity of the snout than the fork of the caudal. Scales small. Bluish brown streaks above; uniform yellowish beneath.

SYN.—*Tigoma lineata*, GRD. in Proc. Acad. Nat. Se. Philad. VIII, 1856, 206.

The general aspect is elongated, the body being sub-fusiform, anteriorly thickish, and quite tapering posteriorly. The head is small and conical, constituting somewhat less than the fourth of the total length. The dorsal and anal fins are rather narrow; their external margin being slightly sub-concave. The anal itself is smaller than the dorsal, and its anterior margin is nearer the tip of the inferior lobe of the caudal than the isthmus; its own base entering more than thirteen times in the whole length. The ventrals are small, posteriorly rounded, sub-ovate, not quite reaching the vent. The pectorals are moderate sized and posteriorly rounded; their extremities being far from extending to the origin of the ventrals.

D 1, 8; A 1, 8 + 1; C 6, 1, 9, 8, 1, 5; V 1, 9; P 15.

The scales are proportionally small; the lateral line describing an open downwards curve, remaining below the mesial line even along the peduncle of the tail.

The ground color is yellowish; the centre of the scales of the upper regions being black, the back and upper half of the flanks appear as if marked with alternate lines of black and yellow. The belly is unicolor. The dorsal and caudal are greyish olive; the other fins, yellowish.

List of specimens.

| Catal. No. | Cor. No. of teeth | No. of spec. | Age. | Locality. | When collected | Whence obtained. | Nature of specimen. | Collected by— |
|------------|-------------------|--------------|-------------|-----------|----------------|---------------------|---------------------|--------------------|
| 229 | 2783 | 6 | Ad't. & y'g | ?..... | 1854 | Lt. E. G. Beckwith. | Alcoholic. | Mr. Kreuzfeld..... |

7. TIGOMA GRACILIS, Grd.

SPEC. CHAR.—Body elongated, sub-fusiform in profile. Head contained about four times and a half in the total length. Snout sub-conical, rather abbreviated; gape of mouth somewhat oblique; posterior extremity of the maxillary extending to a vertical line drawn immediately in front of the orbit. Eye moderate, sub-circular; its diameter entering five times in the length of the side of the head. Anterior margin of dorsal fin nearer the extremity of the snout than the tip of the upper lobe of the caudal. Origin of ventrals nearer the fork of the caudal than the extremity of the snout. Scales small. Bluish grey above; yellowish beneath.

SYN.—*Tigoma gracilis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 206.

The body is elongated and compressed, sub-fusiform, resembling *T. lineata*, but the body and head both are proportionally more elongated. The ventrals are inserted but slightly in advance of the anterior margin of the dorsal; they are posteriorly rounded, their tips not reaching quite the vent. The pectorals are narrow and elongated. Their extremities being very far from reaching the vent. The dorsal and anal are sub-trapezoid, the former higher, and the second deeper, than long. The dorsal being somewhat larger than the anal, the anterior margin of which is much nearer the tip of the inferior lobe of the caudal than the isthmus, whilst its own base enters about eleven times in the total length, the caudal fin excluded. The formula of the fins is:

D 1, 8; A 2, 7 + 1; C 6, 1, 9, 8, 1, 7; V 1, 9; P 16.

The scales are proportionally small, smaller than in *T. lineata*, especially on the dorsal region. The lateral line is slightly deflexed, running a little below the middle of the flanks.

The upper regions and sides of the body and head are bluish grey, the sides being somewhat lighter than the back. The inferior regions are yellowish-white, unicolor. The dorsal and caudal are greyish yellow, the remaining fins being yellowish or straw color.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|------------|-----------|-----------------|----------------------|---------------------|--------------------|
| 230 | 2784 | 2 | Adt. & yg. | ?..... | 1854 | Lt. E. G. Beckwith.. | Alcoholic. | Mr. Kreuzfeld..... |

8. TIGOMA CRASSA, Grd.

PLATE LXII.

SPEC. CHAR.—Body plump and contracted. Head rather small, constituting about the fifth of the total length. Snout short and depressed, rounded off anteriorly. Mouth moderate; posterior extremity of maxillary extending to a vertical line drawn behind the nostrils. Eye small; its diameter entering six times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the extremity of the snout and the fork of the caudal. Origin of ventrals nearer the isthmus than the insertion of the caudal. Pectorals and ventrals small. Scales large. Upper region deep bluish or purplish black, lighter on the sides; beneath yellow.

SYN.—*Tigoma crassa*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 207.

This species has a short and deep body; the greatest depth being more than the fourth of the entire length. The peduncle of the tail is very stoutly built. The head is small and sub-conical, constituting nearly the fifth of the entire length of the fish. The dorsal and anal are both narrow fins compared to their height and depth; their outer edge is nearly linear. The anterior margin of the anal is somewhat nearer the tip of the inferior lobe of the caudal than the isthmus. The caudal fin is almost equal to the head in length. The ventrals and pectorals are of but moderate development, the tips of the former reaching the anal aperture, whilst the extremities of the latter are far from extending to the origin of the ventrals.

D 1, 8; A 1, 8 + 1; C 7, 1, 9, 8, 1, 8; V 1, 9; P 1, 19.

The scales are well developed, longer than deep, anteriorly sub-truncated, tapering and rounded off posteriorly with radiating furrows upon their posterior section only. The upper region of the head and body is deep bluish or purplish black, of a somewhat lighter shade on the middle of the flanks, whilst the inferior region is yellow with a metallic reflect, affecting also the scale of the flanks and those of the dorsal region.

References to the figures.—Plate LXII, fig. 1, represents *Tigoma crassa*, size of life. Fig. 2 is an outline of the fish seen from above. Fig. 3, a section of the body taken across the line of greatest depth. Fig. 4, a dorsal scale. Fig. 5, a scale from the lateral line. Fig. 6, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------|--------------------------------------|-----------------|-----------------------|---------------------|-----------------------|
| 216 | 2777 | 1 | Adult. | Sacramento river, near Fort Reading. | 1855 | Lt. R. S. Williamson. | Alcoholic. | Dr. J. S. Newberry... |

CHEONDA, Girard.

GEN. CHAR.—The body is elongated, fusiform in profile, and very much compressed. The caudal fin is furcated. The head is rather small and sub-conical, and the snout, though rounded, is yet elongated. The eye is large and the isthmus small or narrow. The ventral fins are inserted in advance of the dorsal. The scales being of medium size, sub-circular in shape, with radiating furrows upon their posterior section alone. The lateral line is deflexed upon the abdomen. The teeth are of the prehensile kind, of the hooked type, with a grinding surface; they are compressed and disposed upon a double row of two and four and five, thus: 2 | 4—5 | 2.

SYN.—*Cheonda*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 207.

This genus has the general aspect of both *Gila* and *Tigoma*, by the position of the ventrals in advance of the anterior margin of the dorsal, by the absence of barbels at the angle of the mouth, which is of moderate size, and its gape nearly horizontal. The jaws are either sub-equal, as in *Tigoma*; else the snout overlaps somewhat the lower jaw, in which case the resemblance to *Gila* becomes more manifest.

1. CHEONDA COOPERI, Grd.

PLATE LXIII, FIGS. 1—5.

SPEC. CHAR.—Body elongated, sub-fusiform in profile. Head contained a little short of five times in the total length. Snout thickish, sub-conical, overlapping somewhat the lower jaw; posterior extremity of the maxillar bone extending to a vertical line drawn behind the nostrils. Eye well developed; its diameter entering four times and a half in the length of the side of the head. Fins well developed. Upper regions reddish-grey; sides and belly yellowish-white with a metallic reflect.

SYN.—*Cheonda cooperi*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 207

The anterior margin of the dorsal fin is nearer the extremity of the snout than the fork of the caudal fin; its upper edge is nearly linear. The anal fin is somewhat larger than the dorsal, sub-truncated upon its external edge; its anterior margin being nearer the tip of the inferior lobe of the caudal than the isthmus; its base entering about eight times in the total length. The caudal fin is nearly as long as the head. The ventrals are broad when expanded, posteriorly sub-truncated or sub-convex, and, when directed backwards, their extremities do not quite reach the anal aperture. The origin of these fins is a little nearer the extremity of the snout than the insertion of the caudal. The pectorals are elongated, sub-lanceolated or sub-ovate, although their extremities do not extend as far as the origin of the ventrals.

D 2, 9 + 1; A 2, 11 + 1; C 7, 1, 9, 8, 1, 8; V 1, 9; P 16.

The scales are sub-circular, rather deeper than long, with radiating furrows upon their posterior section only. The lateral line is nearer the ventral than the dorsal outline.

The upper region of the head and body is reddish grey, whilst the sides and belly are yellowish white, with a metallic reflect over the entire body. The fins are unicolor, the inferior ones being more of a yellow tint than the dorsal and the caudal, which are greyish olive.

References to the figures.—Plate LXIII, fig. 1, represents *Cheonda cooperi*, size of life. Fig. 2 is the head from beneath, exhibiting the outline of the mouth. Fig. 3, a dorsal scale. Fig. 4, a scale from the lateral line. Fig. 5, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimen. | Collected by— |
|------------|-------------------|--------------|--------|---------------------------------------|-----------------|---------------------|-----------|---------------------|---------------------|
| 235 | 2791 | 1 | Adult. | Fort Vancouver, Columbia river, W. T. | 1854 | Gov. I. I. Stevens. | 11 | Alcoholic. | Dr. Jas. G. Cooper. |

2. CHEONDA COERULEA, Grd.

SPEC. CHAR.—Body elongated, sub-fusiform in profile. Head contained four times and a half in the total length. Snout slender and conical. Jaws sub-equal; posterior extremity of the maxillary extending to a vertical line drawn across the anterior rim of the orbit. Eye rather large; its diameter entering five times in the length of the side of the head. Fins small. Upper regions of a greyish azure; inferior regions dull silvery white; black dots being scattered all over the back, sides, and belly.

SYN.—*Cheonda coerulea*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 207.

This may readily be distinguished from its congener, the preceding species, by the presence of much smaller fins; the anal is a good deal smaller than the dorsal, and the ventrals are situated somewhat less anteriorly with reference to the dorsal. The anterior margin of the dorsal is nearer the extremity of the snout than the fork of the caudal, precisely as in *C. cooperi*; its upper edge is likewise nearly linear. The position of the anal fin is the same as in the species just alluded to; its base, however, enters fourteen times in the total length, instead of eight, and its inferior edge is sub-concave. The caudal fin is shorter than the head. The insertion of the ventrals is equidistant between the extremity of the snout and the last scales on the base of the caudal; their posterior edge is sub-truncated or convex, and their tips do not extend as far as the vent. The pectorals are sub-lanceolated and rather slender in appearance.

D 2, 9 + 1; A 2, 8 + 1; C 5, 1, 9, 8, 1, 6; V 1, 10; P 17.

The scales have the same general shape and structure as in the preceding species; the lateral line being also nearer the ventral than the dorsal outline.

The upper regions are of a greyish azure; the inferior regions being of a dull silvery white tint, with numerous black dots scattered all over the back, sides, and belly. The fins are unicolor, the inferior ones much lighter than the others.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------------|--------------|--------|----------------------|-----------------|-----------------------|----------------------|-------------------------|
| 237 | 2790 | 1 | Adult. | Lost river, Oregon.. | 1855 | Lt. R. S. Williamson. | Alcoholic. | Dr. John S. Newberry... |

SIBOMA, Girard.

GEN. CHAR.—Body stout and somewhat compressed, covered with large scales. The caudal is crescent-shaped posteriorly; the origin of the ventrals is situated a little posteriorly to the anterior margin of the dorsal, or immediately under it. The head is rather small, sloping towards a wedge-shaped snout, superiorly convex. The mouth is of moderate or small size, horizontal, terminal, with even jaws. No barbels. Eye below the medium size. Isthmus rather narrow. Pharyngeal bones stout, expanded upon their convexity, with the inferior branch short and bent inwardly so that its extremity is directed outwardly, whilst the upper branch is slightly bent inwards. The teeth are large and very compressed, and terminated by a slender hook. They are of the raptatorial kind, of the hooked type, without grinding surface, properly so called, but instead of a sharp edge along the inner margin of the teeth, a blunt and narrow ridge may be observed. They are disposed upon a double row of one and two and four and five, as follows: 1 | 4—5 | 2.

SYN.—*Siboma*, GAD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 208.

The general aspect of this genus resembles more that of *Tigoma* than any other of the same family. The chief difference between the two genera consisting in the position of the ventrals in reference to the dorsal.

1. SIBOMA CRASSICAUDA, Grd.

PLATE LXIV, FIGS. 1—4.

SPEC. CHAR.—Body somewhat elongated, rather thick. Peduncle of the tail very stout. Head contained four times and a half in the total length, its profile is very much inclined, and the snout sub-pyramidal. Posterior extremity of maxillar bone extending to a vertical line drawn midway between the nostrils and the orbit. Eye rather small, sub-circular; its diameter entering nearly six times in the length of the side of the head. Anterior margin of dorsal fin a little nearer the extremity of the snout than the fork of the caudal. Light purplish brown above; yellowish beneath.

SYN.—*Lavinia crassicauda*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 137.

Siboma crassicauda, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 208.

The body in this species is very stoutly built, maintaining its depth posteriorly. The peduncle of the tail is very much developed. The greatest depth is nearly equal to the length of the head, which is contained four times and a half in the total length. The head itself is proportionally large, of moderate size; its upper surface is very much inclined forwards from the occiput to a nearly wedge-shaped or sub-pyramidal snout. The gape of the mouth is moderate. The eye is sub-circular, and its diameter is contained about six times in the length of the side of the head. The caudal fin is but moderately emarginated posteriorly, and resembles more a crescent on that margin than a fork. The dorsal and anal are well developed, sub-trapezoid in shape; the latter being somewhat smaller than the former, and its anterior margin equi-

distant between the insertion of the pectorals and the tip of the middle rays of the caudal. The origin of the ventrals is situated nearly opposite the anterior margin of the dorsal, else somewhat posterior to it; they are posteriorly rounded or sub-convex, quite broad when expanded, their tips overlapping the vent and reaching the anterior margin of the anal fin when extended in that direction. The pectorals are of moderate development, posteriorly rounded, sub-ovate in their outlines, and far from extending to the origin of the ventrals.

D 2, 8 + 1; A 2, 8 + 1; C 7, 1, 9, 8, 1, 8; V 1, 9; P 17 or 18.

The scales are large, deeper than long, anteriorly sub-truncated, posteriorly rounded, with radiating furrows upon the posterior section alone. The lateral line is slightly deflexed upon the thoracic region, whence it becomes nearly straight to the base of the caudal, being nearly equidistant between the base of the dorsal fin and the insertion of the ventrals.

The dorsal region is light purplish brown, the middle of the scales exhibiting more of the brown than of the purple tint. The flanks appear sometimes as though obsoletely clouded, whilst the abdominal region is of a uniform dull yellowish tint. The fins are unicolor; the dorsal and caudal greyish, the others yellowish.

References to the figures.—Plate LXIV, fig. 1, represents *Siboma crassicauda*, size of life; fig. 2 is a dorsal scale; fig. 3, a scale from the lateral line; fig. 4, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor'g No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|---------------------|--------------|--------|-----------------------|-----------------|-----------------------|---------------------|---------------------|
| 235 | 2772 | 2 | Adult. | Rio San Joaquin, Cal. | 1853 | Lt. R. S. Williamson. | Alcoholic. | Dr. A. L. Heermann. |

2. SIBOMA ATRARIA, Grd.

SPEC. CHAR.—Body somewhat elongated, sub-fusiform in profile. Peduncle of the tail rather stout; head constituting a little less than the fourth of the total length; its profile gently sloping forwards, the snout being sub-conical. Mouth small; posterior extremity of the maxillary extending to a vertical line drawn immediately behind the nostrils. Eye small and sub-circular; its diameter entering five times and a half in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Blackish or brownish black above; greyish white beneath.

SYN.—*Siboma atraria*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 208.

The largest specimen of this species which we have examined is about seven inches in length, and although small, compared to the specimens of *S. crassicauda*, to which we had to compare it, yet the distinctive features between the two species appear very striking. And first of all, the imbrication of the scales in *S. atraria* is such as to expose more of their surface than in *S. crassicauda*, and, moreover, the lateral line in *S. atraria* runs along the seventh row of scales from the insertion of the ventrals upwards, leaving eleven rows above it, to the base of the dorsal fin, whilst in *S. crassicauda* there are as many rows of scales below as above the lateral line. The absolute number of longitudinal rows of scales is the same in both species. The head is proportionally larger than in *S. crassicauda*, but the fins are much less developed. The dorsal is a good deal larger than the anal, although both fins are similar in shape; their upper edge being sub-concave. The anterior margin of the anal is nearer the tip of the inferior lobe

of the caudal than the isthmus; its own base entering from thirteen to fourteen times in the entire length. The origin of the ventrals takes place opposite the anterior margin of the dorsal, hence nearer the insertion of the caudal fin than the extremity of the snout. These fins are sub-ovate in their outline, posteriorly rounded off, and when leaning on the abdomen their extremities do not extend as far as the vent. The pectorals are sub-ovate also, although less regularly so than the ventrals. The distance which separates their posterior extremities from the insertion of the ventrals is less than their own length.

D 2, 9 + 1; A 2, 8 + 1; C 7, 1, 9, 8, 1, 6; V 1, 8; P 16.

The ground color is olivaceous, the sides and the back being nearly black or brownish black, from the number of confluent maculae and dots. The inferior region is greyish white. The fins themselves are blackish upon an olivaceous ground. The sides and upper part of the head are likewise brownish black.

List of specimens.

| Catal. No. | Cor'g No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|---------------------|--------------|--------|--|-----------------|--------------------|---------------------|---------------------|
| 236 | 2789 | 1 | Adult. | In a spring in Utah district, near the desert. | 1853 | Lt. E. G. Beckwith | Alcoholic | Mr. Kreuzfeld. |

PTYCHOCHEILUS, Agass.

GEN. CHAR.—Body elongated, sub-cylindrical, and compressed. Head elongated also; mouth deeply cleft, but no barbels upon its angle. The snout overlaps the lower jaw, although the mouth remains horizontal and sub-terminal. The eye is of moderate size, and so with the isthmus. The ventral fins are inserted somewhat in advance of the anterior margin of the dorsal. The caudal is furcated and shorter than the head. The scales are of medium size; the lateral line being nearly median. The pharyngeal bones are long and slender, slightly expanded upon their convexity, with the inferior limb much more slender than the upper. The teeth are of the raptatorial kind, of the hooked type without grinding surface, sub-conical, slightly hooked, and disposed upon a double series of two and four or five, thus: 2 | 4—4 | 2, or 2 | 5—5 | 2.

SYN.—*Ptychocheilus*, AGASS. in Amer. Jour. of Sc. 2d Ser. XIX, 1855, 227.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 208.

By their general appearance, the species of this genus remind us of both *Mylopharodon* and *Mylocheilus*. Besides the cleft of the mouth, which is proportionally greater, they differ from the latter two genera by their system of dentition, which belongs to a quite different type.

I. PTYCHOCHEILUS OREGONENSIS, Grd.

PLATE LXIV, FIGS. 5—9.*

SPEC. CHAR.—Body sub-fusiform in profile. Head rather small, elongated; contained four times and a half in the total length; snout slender. Mouth deeply cleft; posterior extremity of maxillary extending to a vertical line intersecting almost the anterior rim of the pupil. Eye of moderate development; its diameter entering about five times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the extremity of the snout and the fork of the caudal. Pectoral and ventral fins rather small. Back and upper surface of head dark reddish brown; flanks and belly white, with a silvery tint.

SYN.—*Cyprinus (Leuciscus) oregonensis*, RICHARDS. Faun. Bor. Amer. III, 1836, 305.

Ptychocheilus gracilis, AGASS. & PICK. in Amer. Journ. of Sc. 2d Ser. XIX, 1855, 229.

Ptychocheilus oregonensis, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 209.

*By error on the plate, *Ptychocheilus gracilis*, Grd.

The upper edge of the dorsal fin is sub-concave, otherwise trapezoid in shape. The anal fin is somewhat smaller than the dorsal, similar to it in shape, even sub-concave upon its postero-inferior edge; its anterior margin is nearly equidistant between the isthmus and the tip of the inferior lobe of the caudal; its base entering about twelve times and a half in the total length. The ventrals are posteriorly sub-truncated, somewhat rounded off; their extremities just reach the vent. The pectorals are elongated, posteriorly rounded, and, when expanded, sub-ovate in their outline.

D 2, 9 + 1; A 2, 8 + 1; C 8, 1, 9, 8, 1, 8; V 1, 9; P 16.

The scales are deeper than long, somewhat irregular in their outline, with distant radiating furrows upon the posterior half, all directed backwards.

The upper surface of the head and the dorsal region are dark reddish brown, whilst the sides and the abdomen are whitish, with a silvery reflect. The fins are unicolor, either greyish olive or yellowish, according to the region of the body where they are inserted.

References to the figures.—Plate LXIV, fig. 5, represents, size of life, a young individual of *Ptychocheilus oregonensis*, from Fort Vancouver. Fig. 6 is the inferior surface of the head, in order to exhibit the outline of the mouth. Fig. 7, a dorsal scale. Fig. 8, a scale from the lateral line. Fig. 9, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cer. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------|---------------------------------|-----------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 189 | 2763 | 3 | Adult. | Wahlahmath river..... | 1855 | Lt. R. S. Williamsen. | Alcoholic. | Dr. John S. Newberry. |
| 199 | 2763 | 2 | ..do.. | Astoria, Oregon..... | 1854 | Lt. W. P. Trowbridge.....do.... |do.... | Lt. Trowbridge..... |
| 200 | ..... | 1 | ..... | Fort Steilacoom, Puget's Sound. | 1853 | Gov. I. I. Stevens.....do.... |do.... | Dr. Geo. Suckley..... |
| 201 | ..... | 1 | Young | Fort Vancouver..... |do.... |do.....do.....do.....do..... |do.....do.....do.....do..... |do.....do.....do.....do..... |

2. *PTYCHOCHEILUS GRANDIS*, Grd.

SPEC. CHAR.—Body very much elongated, sub-fusiform in profile. Head well developed, elongated, contained about four times and a half in the total length. Mouth deeply cleft; posterior extremity of the maxillary extending to a vertical line intersecting the middle of the pupil. Eye small; its diameter entering about ten times in the length of the side of the head. Isthmus very narrow. Anterior margin of dorsal fin a little nearer the extremity of the snout than the tip of the upper lobe of the caudal. Fins well developed. Scales moderate. Upper regions olivaceous; flank and belly whitish or yellowish.

SYN.—*Gila grandis*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1854, 18.

Ptychocheilus major, AGASS. in Amer. Journ. of Sc. 2d Ser. XIX, 1855, 229.

Ptychocheilus grandis, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 209.

The largest specimen which we have examined measures over twenty-one inches in total length. The head is somewhat sub-quadrangular or sub-pyramidal, more or less depressed upon the frontal region. The upper edge of the dorsal and the inferior edge of the anal fins are nearly linear, somewhat sub-concave; the anterior margin of the anal is nearer the tip of the lower lobe of the caudal than the isthmus. The insertion of the ventrals is much nearer the extremity of the snout than the tip of the caudal fin. These fins are broad and posteriorly rounded off, not reaching the vent with their extremities. The pectorals are likewise very

broad when expanded, and, when directed backwards, their extremities remain very far from the insertion of the ventrals.

D 2, 8 + 1; A 2, 8 + 1; C 6, 1, 9, 8, 1, 5; V 1, 9; P 16.

The scales, which are of moderate development, are very thin, much deeper than long, sub-circular, sub-quadrangular, or undulated upon their periphery. Numerous radiating furrows may be observed upon their posterior half, and sometimes also upon the lateral sections, and either directed posteriorly from the sides, or else sideways.

The color of the upper regions is olivaceous, whilst the lower part of the flanks and the belly are whitish or yellowish, with a metallic reflect. The fins are unicolor; the caudal and dorsal, greyish; the others yellowish.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------|---------------------|-----------------|---------------------------|-----------|---------------------|----------------------|
| 204 | | 1 | Adult. | San Francisco, Cal. | 1855 | Lt. R. S. Williamson..... | ..... | Alcoholic. | Dr John S. Newberry. |
| 937 | | 1 | ..do.. |do..... | 1856 | Dr. W. O. Ayres... | 21 |do.... | Dr. W. O. Ayres..... |

3. PTYCHOCHEILUS RAPAX, Grd.

PLATE LXV.

SPEC. CHAR.—Body elongated, sub-fusiform in profile. Head rather small and tapering forwards, contained four times and a half in the total length. Posterior extremity of the maxillar bone extending to a vertical line intersecting the anterior rim of the pupil. Eye sub-elliptical; its diameter entering about eight times in the length of the side of the head. Anterior margin of dorsal fin somewhat nearer the fork of the caudal than the extremity of the snout. Fins well developed. Dark brownish black above; whitish beneath.

SYN.—*Ptychocheilus rapax*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 209.

This is also a large species, differing from *P. grandis* by a proportionally shorter body, a more advanced position of the ventral fins and by much smaller scales on the dorsal region in advance of the dorsal. The dorsal fin, compared to its length, is less elevated, although higher than long. The inferior limb of the pharyngeal bones is not so long and slender, and there are but four teeth upon the main row, instead of five. The teeth and bones are stouter. The upper margin of the dorsal fin is nearly linear, somewhat sub-convex. The same is true with reference to the anal fin, the anterior margin of which being nearly equidistant between the tip of the inferior lobe of the caudal and the base of the pectorals. The ventrals are posteriorly rounded, not reaching the vent. The pectorals are likewise broad and rounded off, and their extremities, although far from reaching the origin of the ventrals, do, nevertheless, come a great deal nearer to it than in *P. grandis*.

D 2, 9 + 1; A 2, 8 + 1; C 5, 1, 9, 8, 1, 6; V 1, 9; P 18.

The scales on the middle of the flanks are of moderate development, and rather small elsewhere. They are very thin, deeper than long, sub-circular, irregular in their outline, with radiating furrows upon their posterior half, sometimes upon their entire surface. The lateral line is nearly median. All the upper surface and sides of the head, as far as a horizontal line drawn from the edge of the upper jaw direct to the caudal fin, which line passes below the

lateral line, is dark brownish black, darker along the dorsal region, properly so called, than along the flanks, which assume a somewhat clouded aspect. The inferior surface of the head, up to the mouth, and the abdominal region, properly so called, are whitish. The vertical fins exhibit a rather dark tint, whilst the horizontal fins are dull yellow.

References to the figures.—Plate LXV, lower figure, represents *Ptychocheilus rapax*, somewhat reduced in size. The upper left figure is a dorsal scale. The middle figure, a scale from the lateral line. The upper right figure, a scale from the abdominal region.

List of specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|--------|--------------------|-----------------|-------------------------|---------------------|---------------------|
| 205 | 2758 | 1 | Adult. | Monterey, Cal..... | 1853 | Lt. W. P. Trowbridge... | Alcoholic. | Lt. Trowbridge..... |

4. PTYCHOCHEILUS VORAX, Grd.

SPEC. CHAR.—Body of moderate length, rather deep upon its middle, and very much tapering posteriorly. Peduncle of the tail very slender. Head small, contained nearly five times in the total length. Posterior extremity of maxillar bone extending to a vertical line drawn across the anterior rim of the orbit. Eye moderate; its diameter entering about six times and a half in the length of the side of the head. Anterior margin of dorsal fin somewhat nearer the insertion of the caudal than the extremity of the snout. Bluish grey above; whitish beneath.

SYN.—*Ptychocheilus vorax*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 209.

The head is also depressed in this species, but it is much smaller, since it constitutes nearly the fifth of the entire length. The body is much deeper than in *P. lucius*. The greatest depth measured immediately in advance of the dorsal fin is nearly equal to the length of the head. The dorsal fin is not situated so far back, whilst the ventrals are inserted more in advance of the dorsal. The dorsal itself is much higher, and the anal much deeper, than long; both of these fins are well developed; the anterior margin of the anal being nearer the isthmus than the tip of the inferior lobe of the caudal. The posterior extremities of the ventrals do not quite extend to the vent; their origin is nearer the extremity of the snout than the insertion of the caudal. The pectorals are elongated, sub-lanceolated, their extremities being nearer the insertion of the ventrals than in any other species so far alluded to.

D 2, 9; A 2, 8 + 1; C 9, 1, 9, 8, 1, 10; V 1, 10; P 18.

The scales are rather small, and very much so upon the dorsal region between the dorsal fin and the occiput; they are almost minute over the abdomen, between the isthmus and the ventrals. They are but imperfectly imbricated, even along the middle of the flanks where they are the largest, and much longer than deep. Indeed, they appear to be longer than deep upon all the regions of the body. The lateral line undergoes quite a deflection along the abdominal region, so as to approximate the insertion of the ventrals a great deal more than the base of the dorsal fin.

The upper regions are bluish grey, whilst the predominating tint beneath is whitish or yellowish, with a metallic reflect. The fins themselves are yellowish.

List of Specimens.

| Catal. No. | Cor. No. of teeth. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------------|--------------|-----------|-----------|-----------------|----------------------------|---------------------|--------------------|
| 202 | 2756 | 2 | A. & Y. ? | ..... | 1854 | Lieut. E. G. Beckwith..... | Alcoholic.. | Mr. Kreuzfeld..... |

CLINOSTOMUS,¹ Girard.

GEN. CHAR.—Body elongated, compressed, sub-fusiform in profile. The head is compressed like the body, the frontal surface being very declivous and sloping towards a pointed rostrum, so that in profile the head is sub-triangular, and, if broader, would be wedge-shaped when seen from above. The mouth is very large, the lower jaw longer than the upper, beyond which it protrudes, giving to the gape an oblique direction upwards. The eye is very large; the isthmus quite narrow. The dorsal fin is higher than long, and placed between the ventrals and the anal, a little nearer the former than the latter. The caudal is deeply furcated. The scales are of but moderate development, varying considerably in size between the different species. The lateral line forms a downward curve upon the abdomen, so as to bring its convexity nearer to the ventral than the dorsal outline. The pharyngeal bones are rather slender, the lower limbs especially; a slight expansion may be observed upon their convexity; the upper limbs being flattened, bent inwardly, and either shorter or of equal length with the lower limbs. The teeth are of the raptorial kind, of the hooked type, without grinding surface, and disposed thus: 2 | 4—4 | 2, or 2 | 5—4 | 2, and sometimes 1 | 4—4 | 2.

SYN.—*Clinostomus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 211.

This genus is more closely related to *Ptychocheilus* than to any other of the family. The pharyngeal teeth are constructed upon the same pattern; the chief difference being found in the inclined gape of the mouth, and the protrusion of the lower jaw beyond the upper.

Its typical species is *Luxilus elongatus* of Dr. Kirtland, *Leuciscus elongatus* of other writers, *Leuciscus productus* of Dr. Storer.

Three other species have been characterised, one of which inhabiting the Potomac river (*C. funduloides*), another James river, Virginia (*C. affinis*); the third one (*C. carolinus*) was collected at Salem, North Carolina. (See Proc. Acad. Nat. Sc. Philad. VIII, 1856, 211.)

Family CYPRINODONTIDAE, Owen.

The upper arcade of the mouth (upper jaw) is formed exclusively by the premaxillary bones, as in the Cyprinoids. Both jaws are provided with teeth, which the latter have not. The pharyngeal teeth, the upper as well as the lower, are card-like, thus differing widely from those of Cyprinoids. The gill apertures are continuous under the throat, whilst in Cyprinoids they are separated by an isthmus, varying in width, according to the genera. The bony process at the base of the cranium, so characteristic in Cyprinoids, does not exist in the present family. The swimming or air bladder is simple, and not connected with the organ of hearing by a chain of small bones. The pseudo branchia are wanting. Their stomach is without cul-de-sac, and the pylorus without appendages. The majority are ovo-viviparous, in which case the eggs are retained in the abdominal cavity until hatched.

In most fishes of this family, if not in all, the upper surface of the head is protected by scales or plate-like scales, irregular in their outlines, and variable in size.

¹ A genus *Clinostomum* was instituted in the class of worms, with a few weeks priority, hence did not come to our knowledge till after the publication of the present one. As matters stand, there is no impropriety in preserving both in their respective classes.

SYN.—*Cyprinodontes*, AGASS. in Mém. Soc. Sc. nat. Neuch. I, 1834, 3; & Poiss. foss. V, II, 1839, 47.—MÜLL. in Wieg. Archiv. für Naturg. 1843, I, 320; & 1845, I, 131.

Cyprinodontidae, OWEN, Lect. comp. Anat. Vertebr. 1846, 48.—ED. Iconogr. Encycl. II, 1850, 203.—STORER, Hist. Fish. Mass. in Mem. Amer. Acad. New Ser. V, 1855, 293.

The fishes of this family are, generally speaking, of a diminutive size, inhabiting both the brackish and the fresh waters, being occasionally also met with in the salt waters at the margins of the bays and inlets of the seas. They are known under the common names of Minnows and Killifishes, of which they are numerous species, occurring sometimes in great numbers of the same kind; they are generally used for baits.

FUNDULUS, Lacép.

GEN. CHAR.—Body more or less elongated, sub-fusiform in profile. Upper surface of head flattened, covered with large scales. Mouth protractile, semi-circular. Premaxillar bones arched. Slender card-like teeth upon the jaws, the upper as well as the lower. Branchiostigal rays, five on either side. Scales large; no lateral line.

SYN.—*Fundulus*, LACÉP. Hist. nat. des. Poiss. V. 1803, & ed. in EVO, IV, 1819, 478.—Cuv. Règn. Anim. 2d ed., II, 1829; & ed. illustr. Poiss. 228.—VALENC. in Humb. & Bonpl. Rec. d'Observ. de Zool. & d'Anat. comp. II, 1832.—DEKAY N. Y. Faun. IV, 1842, 216.—STORER, Synops. 1846, 179; & Hist. Fish. Mass. in Mem. Amer. Acad. New Ser. V. 1855, 293.—VALENC. in Cuv. & Val. Hist. nat. Poiss. XVIII, 1846, 178.

The history of the genus *Fundulus* is interwoven with that of *Hydrargyra*, they having been misunderstood by the various writers on that subject until Valenciennes, in the "Histoire naturelle des Poissons," restored both of them within their true limits.

FUNDULUS PARVIPINNIS, Grd.

SPEC. CHAR.—Head constituting about the fourth of the total length. Eye sub-elliptical; its diameter entering four times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the extremity of the snout and the posterior edge of the caudal. Ventrals very small; their origin being nearer the extremity of the lower jaw than the insertion of the caudal fin. Pectorals broad and short. Olivaceous brown above; yellowish beneath. A black streak along the middle of the peduncle of the tail. Fins unicolor.

SYN.—*Fundulus parvipinnis*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 154.

The greatest length of the specimen observed is three inches and one-third; the head being contained in it somewhat over four times. The body is compressed, the back slightly arched anteriorly to the dorsal fin. The greatest depth is a little less than the fifth of the length. The eyes are sub-elliptical; their horizontal diameter being contained four times in the length of the side of the head: once in advance of the anterior rim of the orbit. The anterior margin of the dorsal fin is equidistant between the tip of the snout and the posterior margin of the caudal, which is sub-convex. The origin of the anal is situated opposite the middle of the base of the dorsal. All the fins are small, especially the ventrals, which are proportionally broad when expanded, posteriorly rounded off or sub-convex, whilst their extremities are far from reaching the vent. The pectorals are very broad, fan-shaped, posteriorly rounded, and when directed backwards their extremities are nearer the origin of the ventrals than the tips are to the vent. The caudal fin itself is rather short. The anal is narrow, and as deep as the dorsal is high.

D 2, 11; A 11; C 5, 1, 9, 8, 1, 4; V 5; P 16.

The scales are rather large; twelve longitudinal rows may be counted upon the line of the greatest depth of the body. They are longer than deep, posteriorly rounded off, and broader than anteriorly, which latter margin is sub-concave or crescent-shaped, the upper and inferior

edges being linear, and would be parallel were the scales not tapering towards their anterior concave margin just alluded to. Radiating furrows are observed upon the anterior section only.

The ground color is olivaceous brown; the upper aspect of the head, the back, and the sides are rather darker, resulting from crowded minute dots upon the scales, which dots are more scattered over the flanks. The belly and the inferior surface of the head are unicolor, yellowish. A black streak exists upon the middle of the flanks, from the anterior third of body to the base of caudal fin, intersected by irregular transverse and elongated spots.

List of specimens.

| Catal. No. | No. of spec. | Ago. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------|---------------------------|-----------------|-------------------------|---------------------|-----------------|
| 933 | 4 | Adult. | San Diego, California.... | 1853 | Lt. W. P. Trowbridge .. | Alcoholic . | A. Cassidy..... |

Family **ESOCIDÆ**, Bonap.

The upper arcade of the mouth is formed by the premaxillar in front, and the maxilar bones laterally. The body is covered with scales. The dorsal fin is situated opposite the anal; no adipose fin being present. The pseudo branchia are glandulous, not visible, being covered by the mucous membrane of the respiratory apertures. The swimming or air-bladder is simple; its inner surface exhibiting a *rete mirabile*. There are no pyloric appendages and no cul-de-sac to the stomach.

SYN.—*Esoces*, Cuv. Rēgn. Anim. II, 1817, 182; 2d ed. II, 1829; &, ed. illustr. Poiss. 229.—MULL. in *Wieg.* Archiv für Naturg. 1843, I, 323; &, 1845, I, 132.—Cuv. & VAL. Hist. nat. Poiss. XVIII, 1846, 269.

Esocidae, BONAP. Sagg. Distr. metod. Anim. Vertebr. 1831, 113.—RICHARDS. Faun. Bor. Amer. III, 1836, 123.—DEKAY, N. Y. Faun. IV, 1842, 222.—STORER, Synops. 1846, 184.

The pikes and pickerels which represent this family are all inhabitants of the fresh waters of the temperate zone. The genus *Esox* is the only one of the family as recently limited by the late Prof. Joh. Müller.

A few specimens of the latter genus were collected, under Lieut. A. W. Whipple, by Dr. George G. Shumard, near Fort Smith, Arkansas; and by H. B. Möllhausen in Coal creek, Arkansas, and twenty miles west of Choctaw Agency. A more minute investigation of these specimens is temporarily deferred until a larger collection shall enable us to monograph the genus, a task which could not be attempted under the present circumstances.

Family **SALMONIDÆ**, Bonap.

In this family the upper arcade of the mouth (upper jaw) is formed anteriorly by the premaxillar (intermaxillar bones), and laterally by the maxillaries, the dentition varying according to the genera. The body is always covered with scales. There is also an adipose fin. Pseudo branchia or accessory gills are present in all. Numerous pyloric appendages may be observed. The swimming or air bladder is simple, there being no oviduct; the eggs, upon leaving the ovaries, are dropped into the abdominal cavity, whence they find an exit through a post-anal aperture provided to that effect.

SYN.—*Salmones*, Cuv. Règn. Anim. II, 1817, 159; 2d ed. II, 1829; &, ed. illustr. Poiss. 253.—MÜLL. in *Wiegmann's Archiv für Naturg.* 1843, I, 323; &, 1845, I, 131 & 136.

Salmonidae, BONAP. Sagg. Distr. Anim. Vertebr. 1831, 115.—DEKAY, New Y. Faun. IV, 1842, 235.—STORER, Synops. 1846, 192.

Salmonoideae, RICHARDS. Faun. Bor. Amer. III, 1836, 137.

The Salmonid family, as characterised above, corresponds to the limits assigned to it by Professor Joh. Müller, in whose recent death science has sustained one of the most severe losses. His profound anatomical researches have often guided us through these pages wherever the characters of higher groups were at stakes.

SALMO, (Arledi), Valenc.

GEN. CHAR.—Body fusiform in profile; head large; mouth generally deeply cleft, and armed with conspicuous teeth. Pre-maxillary bones short, and rather situated upon the sides of the snout than immediately upon its extremity. The maxillaries are attached behind them, and composed each of a single piece. The lower jaw is strong, and terminates mostentimes into a small knob or tubercle, which, in some species, acquires a very great development. Strong and conical teeth, disposed upon a single row, are inserted upon the dentary. A few teeth on the front of the vomer, none on the shaft of that bone; a single row of them is also observed along the palatines, and two rows upon the pterygoids and upon the tongue. There is one anterior dorsal fin, followed posteriorly by a small adipose more or less thick. The caudal fin is well developed, and either truncated posteriorly or slightly emarginated.

SYN.—*Salmo*, ARTED. Gen. Pisc. ed *Walbanmi*, 1792, 58; &, Synon. Pisc. 1793, 22.—Cuv. Règn. Anim. II, 1817, 160; 2d ed. II, 1829; &, ed. illustr. Poiss., 254.—RICHARDS. Faun. Bor. Amer. III, 1836, 137.—DEKAY, New Y. Faun. IV, 1842, 235.—STORER, Rep. Fish. Mass. 1839, 104; and, Synops. 1846, 192.—VALENC. in *Cuv. and Val. Hist. nat. Poiss.* XXI, 1848, 166.—GRD. in *Proc. Acad. Nat. Sc. Philad.* VIII, 1856, 217.

The scales in all the species have that common character of being deprived of those radiating grooves or furrows which are seen elsewhere to extend from the organic centre of the scale to its periphery. The concentric, or lines of growth, are the only ones extant, and in many instances they are interrupted, or else have become obsolete upon the posterior section of the scale. In many instances, also, they have disappeared from the organic centre itself, which, under the microscope, appear perfectly homogeneous. Generally speaking, their outline is sub-elliptical, elongated in the direction of the longitudinal or horizontal axis of the body. Differences of minor value may be observed in each species. As to the size of the scales in this and the next two genera, they are either minute, small, or of moderate development.

The genus *Salmo* is here admitted within the limits assigned to it by Professor Valenciennes in the "Histoire naturelle des Poissons," including the anadromous salmons, together with the so-called "brook trouts," and others still, inhabiting the depths of ponds and lakes, showing themselves but once a year along shore for the purpose of depositing their spawn.

1. SALMO SCOULERI, Richards.

SPEC. CHAR.—A specific diagnosis, from want of perfect specimens, could not be drawn with sufficient accuracy to be introduced here.

SYN.—*Salmo scouleri*, RICHARDS. Faun. Bor. Amer. III, 1836, 158, and 223, pl. XIII.—DEKAY, New Y. Faun. IV, 1842, 242.—STORER, Synops. 1846, 194.—*Salar scouleri*, VALENC. in *Cuv. & Val. Hist. nat. Poiss.* XXI, 1848, 345.—GRD. in *Proc. Acad. Nat. Sc. Philad.* VIII, 1856, 217.

The "Ekewan," as this species is called by the natives of the Columbia river, we can simply allude to, since the only materials which we have had to work upon is a head about eleven inches in length. Its physiognomy corresponds altogether with the figure of that species given

in the *Fauna Borealis Americana*, and we are inclined to regard it as identical with the "Observatory Inlet Salmon," described in the same work.

The specimen alluded to was collected by Dr. John S. Newberry, under Lieutenant R. S. Williamson, in the Des Chûtes river, a tributary of the Columbia, Oregon.

2. SALMO QUINNAT, Richards.

PLATE LXVII.

SPEC. CHAR.—Body fusiform in profile, compressed; head forming about the fifth of the total length; maxillary bone curved, extending beyond the orbit; anterior margin of the dorsal equidistant between the extremity of the snout and the insertion of the caudal. Dorsal region olivaceous, studded with irregular black spots; dorsal and caudal fins similarly spotted. Region beneath the lateral line unicolor, silvery along the middle of the flanks, and yellowish on the belly. Inferior fins unicolor. Head above blackish grey; sides bluish grey.

SYN.—*Salmo quinnat*, RICHARDS, FAUN. BOR. AMER. III, 1836, 219.—DEKAY, NEW Y. FAUN. IV, 1842, 242.—STORER Synops. 1846, 196.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 217.

Common Salmon, LEWIS AND CLARK.

Of this species we have but a prepared skin, and, to a certain extent, deformed. Still the figure which we give is thought sufficiently accurate, and represents well its specific features.

The head is elongated and sub-conical, constituting about the fifth of the total length. The maxillary is gently curved, and its posterior extremity extends to a vertical line drawn posteriorly to the orbit; the teeth being rather slender and acerated. The eye is of moderate development, circular in shape, its diameter entering a little over seven times in the length of the side of the head, and twice in advance of its anterior rim. The opercle is large, broad, and irregularly rounded off upon its posterior margin. The limb of the preopercle is expanded and irregularly rounded off, also, upon its external margin. I find as many as twenty branchiostegals on the left side; those on the right being not all present, their number cannot be given. They are rather short, as usual flattened, and diminish very gradually from the sub-opercle to the hyoid apparatus.

The body is compressed, elongated, sub-fusiform, rather thickish upon its middle. The anterior margin of the dorsal fin is equidistant between the extremity of the snout and the insertion of caudal fin. It is a little higher anteriorly than long, and its posterior margin is less than the half of the anterior; its upper margin is sub-concave. The adipose is slender and arched, its tip extending beyond the tip of the last rays of the anal. The caudal fin is deeply furcated, and constitutes about the seventh of the total length. The anal is low but long; its base being greater than the base of the dorsal; its external margin is sub-concave. The insertion of the ventrals takes place opposite the posterior third of the dorsal. The pectorals are elongated, lanceolate, and about one-fourth longer than the ventrals. We have endeavored to count the rays, but, perhaps, not with an entire success.

Br. 20: 00; D 13; 0; A 16; C 5, 1, 9, 8, 1, 4; V 10; P 14.

The anterior two rays in both the dorsal and anal fins are mere rudiments or undeveloped rays. The accessories in the caudal may prove more numerous than we have actually put on record.

The scales are of moderate development, and conspicuously larger on an area along the middle of the flanks, and which is traversed by the lateral line. They are sub-ovoid in shape, a little narrower anteriorly than posteriorly, upon which margin the concentric stria are obliterated. Those of the lateral line are more irregular in their outline, and proportionally much larger than on the abdominal region, where they are slightly larger than on the dorsal region.

The ground color of the dorsal region is greyish olive, scattered all over with dark and irregular, sometimes confluent, spots, which do not extend quite to the lateral line. The dorsal, adipose, and caudal fins are spotted also. The rest of the body is unicolor, yellowish grey or straw color; the anal and ventrals being of the same hue, whilst the pectorals are blackish grey. The upper surface of the head is bluish black; the sides blue and silver, with a golden reflect.

The specimen here figured and described was caught, June 1st, 1855, in the Columbia river, and prepared by Dr. Geo. Suckley, under Gov. I. I. Stevens. "They reach," says the Dr., "a weight of 40 to 50 pounds; those of 30 pounds being quite common."

References to the figures.—Plate LXVII, fig. 1, represents *Salmo quinnat*, reduced from a specimen about seventeen inches in total length.

Fig. 2 is a scale from the dorsal region, midway between the dorsal fin and the lateral line.

Fig. 3, a scale of the lateral line.

Fig. 4, a scale from the abdominal region, midway between the lateral line and the insertion of the ventrals.

Figs. 2—4 are magnified views.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------|----------------------------|-----------------|-------------------------|---------------------|------------------------|
| 939 | 1 | Adult. | Columbia river, Oregon ... | 1853 | Gov. I. I. Stevens..... | Dried skin .. | Dr. Geo. Suckley |

3. SALMO SPECTABILIS, Grd.

SPEC. CHAR.—Body sub-fusiform in profile, very much compressed, the head forming about the fourth of the total length. Maxillar bone curved, extending to a vertical line passing somewhat posteriorly to the entire orbit. Anterior margin of dorsal fin a little nearer the extremity of the snout than the base of the caudal. Bluish grey above; silvery beneath. Dorsal region and upper portion of the flanks spread over with light spots.

SYN.—*Salmo spectabilis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 218.

The only specimen which we have before us being in a rather precarious state of keeping, our description of the species must, of course, remain incomplete. All the fins being broken off from their very base, the length and shape of the caudal could not be ascertained. The abdomen itself is ruptured, and all the viscera are lost. In its general appearance it resembles *Salmo hoodii* most; is, however, distinguished from it by a more elongated and conical head, hence a mouth more deeply cleft and the maxillary extending further back.

The body is gracefully elongated, very much depressed, and fusiform in its outline, seen in profile. The head, which is elongated and sub-conical, enters three times and a half in the length, the caudal fin excluded, whilst in *S. hoodii* it enters six times and a half in the total length. The mouth is deeply cleft, and both jaws are even anteriorly. The teeth are conspicuous and acerated; the largest may be observed upon the dentary (lower jaw); the next in size are those of the premaxillar (intermaxillar), on which bones there are but few; the maxillar teeth are very much alike to those on the pterygoidian bones, but are somewhat less acerated and a little stouter; they occupy most of the limb of the maxillary, leaving a free space posteriorly equal to that situated behind the premaxillary, likewise toothless. The pterygoidian

teeth occupy nearly the whole length of the bone. On the vomer the teeth are but few and less conspicuous than any of those above mentioned. The lingual teeth, three in each series, are nearly as large as on the lower jaw. The eye is well developed, sub-circular in shape, its horizontal diameter being contained about five times in the length of the sides of the head. The vertical diameter of the opercle is nearly one-third more than the transversal; that bone is broader inferiorly than superiorly. The sub-opercle is half the size of the former.

The scales are small, sub-elliptical in their horizontal diameter, and imbricated so as to conceal half of their surface. The lateral line is formed of very conspicuous tubes, and runs along the middle of the flanks, from the thoracic arch to the base of the caudal, in a nearly straight line.

The color, we venture to say, is very much altered on the specimen before us. The upper regions seems to indicate a ground of a bluish grey, becoming lighter along the sides, and still more so under the abdomen. Over the sides are distributed spots of a yellowish hue in the shape of large drops scattered all over from head to tail. Whether these spots extended over the head and fins we are at a loss to know under the present circumstances.

Ste. Mary's Mission, where the specimen here described was collected, is situated in the Flathead valley, upon the upper tributaries of the northern branch of the Columbia river.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------|---------------------------|-----------------|-------------------------|---------------------|-----------------------|
| 377 | 1 | Adult. | Ste. Mary's Mission ----- | 1853 | Gov. I. I. Stevens ---- | Alcoholic. | Dr. Geo. Suckley ---- |

FARIO, Valenc.

GEN. CHAR.—Possesses all the characters of the salmons, differing from the latter by the presence of but one row of teeth upon the shaft of the vomer. The rest of the bones forming the upper roof of the mouth being toothless.

SYN.—*Fario*, VALENC. in *Cuv. & Val. Hist. nat. des Poiss.* XXI, 1848, 277.—GRO. in *Proc. Acad. Nat. Sc. Philad.* VIII, 1856, 218.

The species of this genus are apparently more numerous in North America than in the Old World. The "salmon trout" and the "common trout" of the settlers of Oregon are examples of this group. The European "lake trout" belongs to this same type.

1. FARIO AURORA, Grd.

PLATE LXVIII.

SPEC. CHAR.—Body fusiform, compressed; head forming the fourth of the total length, caudal fin excluded. Upper jaw longest. Maxillary gently undulating; its posterior extremity extending to a vertical line passing considerably behind the entire orbit. Anterior margin of dorsal fin equidistant between the tip of the snout and the base of the caudal. Ground color greyish silvery above; sides and belly yellowish orange; dorsal fin spotted.

SYN.—*Fario aurora*, GRO. in *Proc. Acad. nat. Sc. Philad.* VIII, 1856, 218.

Salmo aurora, GRAY. MS.

Red char, LEWIS & CLARK.

The specimens upon which our description is based measures something over eleven inches in total length. The body is compressed and the back rounded; the greatest depth, taken in

advance of the dorsal fin, enters four times and a half in the total length. Its profile is fusiform. The head is rather small and conical, forming the fourth of the entire length, excluding the caudal fin; the snout is rounded, sub-conical, protruding beyond the lower jaw. It is probable that in larger specimens it protrudes a great deal more, and especially more so in the male than in the female. The mouth is deeply cleft; the maxillary is rather narrow, and its free extremity extends to a vertical line passing considerably behind the orbit. The teeth are but moderately developed and very acute. An irregular row may be observed upon the shaft of the vomer, and a few smaller ones on the front of the same bone. The lingual series are parallel. The eye is of moderate development, sub-circular in shape; its horizontal diameter being contained about four times and a half in the length of the side of the head. The opercle is much higher than broad, and narrower above than below; its situation being very oblique. The sub-opercle is gracefully rounded exteriorly and but moderately developed. The branchiostegals are eleven on either side. The anterior margin of the dorsal is equidistant between the snout and the insertion of the caudal fin; its height is equal to its base, but its posterior margin is not quite the half of the anterior; it is composed of twelve rays, the anterior two of which being rudimentary. The adipose fin is very slender, and situated opposite the posterior portion of the anal. The latter is deeper than long, but resembles the dorsal in its general outline; it contains thirteen rays, the anterior two of which being likewise rudimentary. The posterior margin of the caudal is furcated; the length of that fin enters about seven times and a half in the entire length of the fish. The origin of the ventrals is situated opposite the fourth developed ray of the dorsal or sixth in the series; these fins are composed of nine rays, the tips of which do not quite extend as far posteriorly as the tips of the posterior rays of the dorsal. The pectorals are rather small, broad upon their exterior and expanded margin, and composed of fourteen rays.

Br. 11: 11; D 12; 0; A 13; C 8, 1, 9, 8, 1, 7; V 9; P 14.

The rays in all the fins are bifurcated or branched, with the exception of the external caudal rays, and the rudimentary ones, as a matter of course.

The scales are of but moderate development; they are sub-elliptically elongated, somewhat irregular in their outline, and imbricated for nearly the half of their longitudinal diameter. Those constituting the lateral line are more elongated than the rest, with the concentric stria obliterated upon their posterior margin (fig. 30.)

The coloration as observed on specimens preserved in alcohol is very much altered indeed. A uniform greyish tint seem to prevail all over the dorsal region. The sides are silvery, whilst the abdomen appears to have been of a deep orange, which is traceable over the lower fins. The upper surface of the head is uniform greyish black, whilst the cheeks and opercular apparatus are of a pure silver hue. The dorsal fin alone exhibits black spots; the latter may have existed on the caudal fin.

Specimens of this species were collected at Astoria, Oregon Territory, by Lieut. W. P. Trowbridge.

References to the figures.—Plate LXVIII, fig. 1, represents *Fario aurora*, somewhat reduced in size.

Fig. 2 is a scale from the dorsal region taken midway between the lateral line and the dorsal fin.

Fig. 3, a scale of the lateral line.

Fig. 4, a scale from the abdominal region midway between the lateral line and the insertion of the ventral fins.

Figs. 2—4 are magnified views.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------|----------------------|-----------------|-----------------------|---------------------|-----------------------|
| 583 | 2 | Adult. | Astoria, Oregon..... | 1854 | Lt. W. P. Trowbridge. | Alcoholic. | Lieut. Trowbridge.... |

2. FARIO TSUPPITCH, GRD.

PLATE LXIX, FIGS. 1—4.

SPEC. CHAR.—Body very much elongated, compressed, fusiform in profile; head forming about the sixth of the total length. Snout rounded, with the jaws sub-equal. Maxillary gently curved, dilated posteriorly, and extending to a vertical line passing slightly behind the orbit. Anterior margin of dorsal fin nearer the extremity of the snout than the insertion of the caudal fins. Ground color of dorsal region olivaceous, clouded with bluish brown, and scattered about with roundish black spots which extend over the dorsal, the adipose, and the caudal fins. Upper surface of head bluish black. Sides and inferior region of the body unicolor, yellowish brown; inferior fins unicolor also. Sides of head yellowish.

SYN.—*Salmo tsuppitch*, RICHARDS, Faun. Bor. Amer. IV, 1836, 224.—DEKAY, New Y. Faun. IV, 1842.—STORER, Synops. 1846, 197.

Fario tsuppitch, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 218.

Salmon trout, VERNACULAR; *Shooshines*, WALLA-WALLA; *Iequansck*, WASCO INDIANS.

The general aspect of this fish is very much elongated and quite compressed, the profile being sub-fusiform, the depth diminishing but very gradually towards the caudal fin. The greatest depth taken in advance of the dorsal fin is contained about six times and a half in the total length, whilst the least depth, on the peduncle of the tail, enters in that same length about twelve times. The depth is very uniform between the dorsal fin and the head. The head, which constitutes the sixth of the total length, is convex superiorly, rounded upon the snout, with both jaws equal. The posterior extremity of the maxillary extends to a vertical line drawn at a very short distance from the posterior rim of the orbit. The posterior limb of that bone is quite dilated and, as usual, rounded; its teeth are the smallest, that is, more slender than even the vomerine and pterygoidian. Along the shaft of the vomer the series is somewhat irregular. The orbit is of moderate size and circular in shape; its diameter entering about five times and a half or six times in the length of the side of the head, and about once and a half in advance of its anterior rim. The limb of the preopercle is quite dilated upon its convexity; the opercle and sub-opercle both being very well developed, the latter being nearly half the size of the former. The branchiostegals are stout, short, and flattened, thirteen on the left side and twelve on the right.

The dorsal fin is a little higher anteriorly than long upon its base; its posterior margin is equal to half its base, whilst the upper margin is sub-concave. The adipose is narrower upon its base than upon its middle; its extremity extends a little more backwards than the tip of the posterior rays of the anal. The caudal is broad and well developed, and somewhat crescent-shaped posteriorly; it constitutes the seventh of the total length. The anal is deeper upon its anterior margin than long; its posterior margin, however, being but the third of the anterior, the shape of that fin differing considerably from the dorsal, although its external margin

is likewise sub-concave. The ventrals are well developed and inserted opposite the middle of the dorsal. The pectorals are longer than the ventrals, and, like the latter, conspicuously developed. The formulae of the rays is as follow :

Br. 13: 12; D 13, 0; A 14; C 5, 1, 9, 8, 1, 4; V 10; P 14.

The anterior two rays in both the dorsal and anal fins are rudimentary; the accessories in the caudal may prove more numerous, since our investigations were conducted upon a prepared skin.

The scales are of medium size, sub-elliptical, longer than deep, and somewhat irregular in the lateral line, which runs nearly straight along the middle of the flanks. The dorsal scales are a little smaller than the abdominal ones; the concentric stria in all of them being obliterated upon their posterior margins.

The ground color of the dorsal region is olivaceous, clouded with bluish brown undefined patches, and scattered over with roundish black spots, of which a few only are observed below the lateral line. The sides and inferior region of the body are unicolor, yellowish brown. The dorsal fin, the adipose, and the caudal are densely spotted with black, whilst the inferior fins are unicolor. The upper surface of the head is bluish black; the sides being yellowish brown, like the flanks.

The above description and the figure annexed thereto were made from a preserved skin. The specimen, which is two feet and two inches in total length, was caught at Fort Dalles, Columbia river, and preserved by Dr. Geo. Suckley, under Gov. I. I. Stevens. The following is from Dr. Suckley's notes :

"*Fort Dalles, O. T., April 5, 1855.*—A female salmon trout; weight five pounds; length twenty-six inches, girth eleven inches; specimen of average size; was full of roe nearly mature. Tail and upper fins olive (yellowish), spotted with round and oval black spots, about two lines in diameter. Upper part of head and back rich olive; scales reflecting bright silver. A dark pink or salmon colored band extends its whole length on each side both above and below (including) the lateral line. This last may be a post mortem change. Belly silvery white. Iris golden. Chin white. Dorsal fin same as tail. Ventrals and anal yellowish and vermilion; pectorals darker. Flesh reddish cream colored. Walla-Walla name, Shooshines; Wasco name, Iquansek (last syllable guttural 'ighk')."

This quotation shows how much the coloration may be altered on specimens either prepared as skins or else preserved whole in alcohol.

References to the figures.—Plate LXIX, fig. 1, represents the female sex of *Fario tsuppitch*, considerably reduced.

Fig. 2 is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region. Figs. 2—4 being magnified views.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|-------|-------------------------------------|-----------------|----------------------|---------------------|--------------------|
| 940 | 1 | Adult | Fort Dalles, Columbia river, Oregon | 1853 | Gov. I. I. Stevens.. | Dried skin. | Dr Geo. Suckley... |

3. FARIO ARGYREUS, Grd.

PLATE LXX.

SPEC. CHAR.—Body very much compressed, rather deep upon its middle region, and quite tapering posteriorly. Head moderate, constituting the fifth of the entire length. Jaws equal. Maxillary slightly curved; its free extremity extending to a vertical line drawn posteriorly to the orbit. Anterior margin of dorsal fin nearer the extremity of the snout than the insertion of the caudal fin. Bluish grey above; silvery along the middle of the flanks; yellowish beneath.

SYN.—*Fario argyreus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 218.

Salmo argyreus, GRD. Ms.

The specimens before us are about ten inches in total length. The body is very much compressed or flattened laterally, with its outline sub-fusiform, tapering considerably towards the tail. The head is compressed also, otherwise it would be sub-conical, since the snout is obtusely rounded and both jaws equal. The mouth is slightly oblique and but moderately cleft; the posterior free extremity of the maxillary extending to a vertical line drawn at a short distance behind the orbit. The teeth are very weak and inconspicuous. The longitudinal diameter of the eye is contained five times in the length of the sides of the head; about once and a third in advance of the anterior rim of the orbit. The sub-opercle is very much developed, quite oblique in its position, and considerably overlapped by the opercle. There are fifteen branchiostegals on the left side and fourteen on the right, short and flattened.

The fins are moderately developed; the caudal is deeply furcated and constitutes about the sixth of the total length. The dorsal is higher than long, and its posterior margin less than half the height of the anterior; its first two rays are but rudiments, and the anterior margin of that fin is nearer the extremity of the snout than the insertion of the caudal fin. The adipose is very slender, opposite the posterior portion of the anal and extends a little beyond the latter. The anal is longer than deep, its depth, moreover, diminishing rapidly backwards; its external margin being sub-concave. The insertion of the ventrals takes place opposite to the fourth developed ray of the dorsal or the sixth in the series. The pectorals are slender and their rays bifurcated also. The rays of the other fins are similarly bifurcated or branched, and in the caudal usually more so than elsewhere.

Br. 15: 14; D 12; 0; A 17; C 5, 1, 9, 8, 1, 6; V 10; P 15.

The scales are of moderate development, elongated, more or less irregular in their outlines; the concentric stria either becoming obsolete or else disappearing entirely upon their posterior extremity. The lateral line takes a straight course from the upper portion of the opercular apparatus to the base of the caudal fin, being nearer to the dorsal than the abdominal outline, until it reaches the peduncle of the tail where it becomes absolutely median.

The dorsal region is bluish or purplish grey, with a metallic lustre; the middle of the flanks are silvery white, or, perhaps, of a quicksilver hue; whilst the belly is yellowish, with a metallic lustre also. The upper region of the head is blackish or bluish black; its sides and the opercles being gold and silver. The fins are unicolor; the dorsal and caudal greyish olive and darker than the anal, ventrals, and pectorals, which are greyish yellow.

The specimens from which our plate is drawn was collected at Cape Flattery, W. T., by Lt. W. P. Trowbridge. Another was obtained at Fort Steilacoom, Puget's Sound, W. T., by Dr. George Suckley.

References to the figures.—Plate LXX, fig. 1, represents *Fario argyreus*, size of life. Fig. 2 exhibits a scale from the dorsal region, midway between the lateral line and the dorsal fin.

Fig. 3 is a scale from the lateral line. Fig. 4, a scale from the abdominal region, midway between the lateral line and the ventral fins. Figs. 2—4 are magnified views.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------|----------------------------|-----------------|------------------------|---------------------|----------------------|
| 579 | 1 | Adult. | Cape Flattery, Oregon..... | 1854 | Lt. W. P. Trowbridge. | Alcoholic. | Lt. Trowbridge..... |
| 580 | 1 | Adult. | Puget's Sound, W. T..... | 1853 | Gov. I. I. Stevens.... | do..... | Dr. Geo. Suckley.... |

4. FARIO GAIRDNERI, Grd.

PLATE LXXI, FIGS. 1—4.

SPEC. CHAR.—Body fusiform in profile, very compressed; head comprised four times in the length, the caudal fin excluded. Upper jaw longest; maxillary curved, extending to a vertical line intersecting the posterior rim of the orbit. Anterior margin of dorsal equidistant between the extremity of the snout and the base of the caudal. Caudal fin furcated. Back silvery grey, sides silvery, and belly yellowish white. Body obsoletely spotted with black; similar black spots on the dorsal and caudal fins.

SYN.—*Salmo gairdneri*, RICHARDS. Faun. Bor. Amer. III, 1836, 221.—DEKAY, New Y. Fauna, IV, 1842, 243.—STORER,

Synops. 1846, 196.

Fario gairdneri, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 219.

The body is fusiform in its outline, but very much compressed and thin, giving it a much narrower back than is generally the case with its congeners. The head constitutes the fourth of the entire length, excluding the caudal fin; it is sub-conical in shape, anteriorly rounded, the upper jaw slightly overlapping the lower. The mouth is moderately cleft, the posterior extremity of the maxillary extending to a vertical line drawn inwardly to the posterior rim of the orbit, as in *Fario clarkii*. The teeth generally are less developed than in the latter, in which respect it resembles *Fario argyreus*. Those on the tongue are exiguous and far apart in either row; the pterygoidian teeth are a little smaller than the dentar and maxillar ones; the vomerians are the stoutest of all, at least those which exist along the shaft of that bone; for, on the front they are not conspicuous at all. The eye is elongated, sub-elliptical; its diameter being contained five times and a half in the length of the sides of the head, and about once and a half in advance of its anterior rim. The nostrils are situated towards the upper surface of the rostrum, nearer the orbit than the extremity of the snout; the anterior aperture is sub-circular and larger than the posterior. Twelve branchiostegal rays may be observed on either side.

The greatest depth of the body, taken in advance of the dorsal fin, is equal to the length of the head; hence enters four times in the length, the caudal fin excluded. The anterior margin of the dorsal is equidistant between the snout and the insertion of the caudal fin; its height anteriorly is nearly equal to its length. The adipose is slender and placed opposite the posterior portion of the anal. The caudal fin is furcated and constitutes a little more than the seventh of the total length. The anal has the general shape of the dorsal, but it is deeper anteriorly than it is long. The origin of the ventrals is placed opposite the third ray of the dorsal, but the tip of its rays do not extend posteriorly as far as the tip of the posterior rays of the dorsal. The

pectorals are small and lanceolate. The rays of all the fins are more or less branched or bifurcated; their formula reads:

Br. 12: 12; D 13; 0; A 13; C 7, 1, 9, 8, 1, 6; V 11; P 13.

The anterior two rays in the dorsal fin are rather rudimentary, and so is the anterior one in both the anal and the ventrals.

The scales are small, though not of the smallest kind in the genus. Their form varies according to the regions where observed: on the dorsal region they are sub-elliptically elongated, broader anteriorly than posteriorly; in the lateral line, though similarly elongated, they are narrow and rather pointed anteriorly, and broad and rounded posteriorly; on the abdominal region they are deeper than long and vertically sub-elliptical. Their central portion is cellular in those of the dorsal and abdominal regions (figs. 2 & 4), whilst the concentric stria are obliterated posteriorly in those of the lateral line (fig. 3).

This species is almost unicolor; the back is silvery grey, whilst the sides are of a pure silvery hue and the belly yellowish white. The body is indistinctly speckled with black; black spots of a more conspicuous character are observed upon the dorsal and caudal fins, also at the end of the tail. The inferior fins are greyish upon their base, and olivaceous towards their margins.

The specimen figured and described was collected by Dr. Newberry, in Klamath river, Oregon.

References to the figures.—Plate LXXI, fig. 1, represents *Fario gairdneri*, size of life. Fig. 2 is a scale from the dorsal region, midway between the lateral line and the dorsal fin. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region, midway between the lateral line and the insertion of the ventral fins. Figs. 2—4 are magnified views.

List of specimens.

| Catal. No. | No of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|-------------|-------------------------|-----------------|--------------------------|---------------------|-------------------------|
| 578 | 1 | Klamath river, Oregon.. | 1855 | Ll. R. S. Williamson.... | Alcoholic.. | Dr. John S. Newberry... |

5. FARIO CLARKII, Grd.

PLATE LXXI, FIGS. 5—8.

SPEC. CHAR.—Body sub-fusiform; head well developed, forming the fifth of the total length. Maxillary slightly bent, extending to a vertical line drawn inwardly to the posterior rim of the orbit. Jaws equal. Anterior margin of dorsal fin a little nearer the extremity of the snout than the insertion of the caudal fin. Back bluish grey; upper surface of head blackish grey; sides silvery grey; fins ash grey; dorsal and caudal spotted. Upper regions of head and body studded with irregular black spots or specks.

SYN.—*Sa'mo clarkii*, RICHARDS. *Faun. Bor. Amer.* III, 1836, 224.—STOREY, *Synops.* 1846, 197.

Fario clarkii, GRD. in *Proc. Acad. Nat. Sc. Philad.* VIII, 1856, 219.

The profile of the body is fusiform; the head is sub-conical and proportionally well developed, forming about the fifth of the total length. The body itself, though compressed as usual in this genus, is rather full, and the sides sub-convex instead of flattened. The mouth is moderately cleft; the jaws being even anteriorly and the posterior extremity of the maxillary extending to a vertical line passing inwardly to the posterior rim of the orbit. The teeth are acute and conical, largest on the tongue; those on the lower jaw (dentary) are nearly equal in size, the

rest do not materially differ from each other. The eye is large and circular, its diameter being contained about four times in the length of the sides of the head, exactly once in advance of its anterior rim, for, the snout is blunt and rounded off. The upper part of the opercle is narrow, gradually widening towards the sub-opercle, which is largely developed and almost as large as the opercle; the longest diameter of the two being nearly at right angle with one another. There are eleven flattened branchiostegal rays.

The anterior margin of the dorsal fin is situated a little nearer the extremity of the snout than the base of the caudal fin. The fin itself is a little higher than long, composed of fifteen articulated rays, the anterior one being a mere rudiment, whilst the others are branched and well developed. The adipose is slender and situated opposite the posterior portion of the anal, but extending further back. The caudal is furcated or rather concave posteriorly; the anal is shaped like the dorsal, though smaller. The ventrals are not preserved upon the specimen before us; even their insertion has been carried away by the rupture of the abdomen, but on specimens from Fort Dallas their insertion is nearly opposite the anterior third of the dorsal fin. The pectorals are rather small, and inserted towards the inferior part of the thorax; the upper two rays are the largest, the others diminish gradually towards the inferior edge of that fin.

Br. 11; D 15; 0; A 13; C 12, 1, 8, 7, 1, 10; V?; P 14.

The scales are proportionally well developed without being large; they are irregular in their outline, sub-circular, longer than deep above the lateral line and nearly as deep as long below it, and imbricated for nearly the third of their surface. The lateral line takes a straight course along the middle of the flanks.

The ground color of the upper regions is bluish grey, with a purplish reflection; the sides are silvery grey and the abdomen white. The upper surface of the head is black; the dorsal region above the lateral line is studded with irregular black spots and specks, extending likewise to almost the entire surface of the dorsal and to the base of the caudal. Along the tail they are also observed a little way beneath the lateral line. The specimen figured and described still exhibits traces of the patches or transverse bands peculiar to the immature fish throughout this family.

This species was taken in Catlapootl river, a tributary of the Columbia, on the 2d of August, 1853, by Dr. J. G. Cooper. Two specimens, which we refer to the same species, were collected by Dr. Geo. Suckley at Fort Dalles, on the Columbia river. They are smaller still than the one just described and figured; the lateral bands and patches are more distinctly marked, whilst the spots or specks are much less distinct.

References to the figures.—Plate LXXI, fig. 5, represents *Fario clarkii*, size of life. Fig. 6, a scale taken from the dorsal region. Fig. 7, a scale from the lateral line. Fig. 8, a scale from the abdomen. Figs. 5—8 are magnified.

List of specimens.

| Catal. No. | No of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|-------------|----------------------------|-----------------|-------------------------|---------------------|-------------------------|
| 581 | 2 | Fort Dalles, Col. river... | 1853 | Gov. I. I. Stevens..... | Alcoholic.. | Dr. Geo. Suckley..... |
| 582 | 1 | Catlapootl river..... | 1854 | Dr. Jas. G. Cooper..... |do..... | Dr. Jas. G. Cooper..... |

6. FARIO STELLATUS, Grd.

PLATE LXIX, FIGS. 5—8.

SPEC. CHAR.—Body elongated and fusiform; head well developed, contained four times and three-quarters in the total length; jaws equal; maxillary gently curved, reaching a vertical line, drawn posteriorly to the orbit. Anterior margin of dorsal fin a little nearer to the extremity of the mouth than the insertion of caudal fin. Back light olive; belly light yellowish white. Head, body, and fins profusely spotted with black.

SYN.—*Fario stellatus*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 219.

Salmo stellatus, GRD.—*Oykalloo*, WASCO INDIANS.—*Common trout*, VERNACULAR.

This is one of the most characteristic species of the genus inhabiting the northwestern waters, by the numerous spots which extend all over its head, body, and fins. The body is elongated, rather slender, compressed, fusiform in its outline; the greatest depth, taken in advance of the dorsal, enters about six times in the total length, whilst the least depth, on the peduncle of the tail, is a little less than the half of the greatest. The back is rounded.

The head is proportionally well developed, constituting the fifth of the total length. It is sub-conical in shape, the snout being rounded, and the jaws equal in length. The maxillary is rather slender; its posterior half lanceolated, and slightly bent downwards; its extremity extends to a vertical line drawn at a little distance behind the orbit. The teeth are small; those on the shaft of the vomer are the most robust of all, and constitute quite an irregular series. The eye is moderate in size, sub-circular in shape; its horizontal diameter entering about six times in the length of the side of the head, once and a half in advance of the anterior rim of the orbit. The pre-opercle is much deeper than wide, narrower above than below, and slightly concave upon its external margin. The branchiostegal rays are eleven on either side, as usual very flat and short.

The fins are well developed; the caudal constitutes a little more than the seventh of the total length; it is emarginated upon its posterior margin. The dorsal is anteriorly higher than the whole fin is long; its posterior margin is equal to about the half of the height of the anterior margin, which is a little nearer the extremity of the snout than the insertion of the caudal. Its upper margin is nearly straight. A vertical line drawn through the middle of the base of the adipose would intersect the middle of the anal; its posterior extremity, therefore, does not extend as far as that of the latter fin. The anal itself is deeper than long also, but its posterior margin is only the third of the depth of the anterior; externally the fin is either straight or very slightly concave. The origin of the ventrals is situated opposite the fourth developed ray of the dorsal, the sixth in the series; these fins are quite broad, and their tips are nearly even with the extremity of the posterior rays of the dorsal when bent backwards. As to the pectorals they are lanceolated, and broad upon their middle.

Br. 11: 11; D 11; 0; A 11; C 5, 1, 9, 8, 1, 4; V 9; P 13.

The scales are of moderate development, sub-elliptical or sub-ovoid, narrowest anteriorly; largest in the lateral line, and smallest on the dorsal region, where they are likewise deeper, compared to their length, than in the lateral line and on the abdominal region. The concentric striae are obliterated upon the centre of the scale and upon the posterior margin of those of the lateral line and abdominal region. As to the lateral line itself, it starts from the posterior upper part of the opercular apparatus, and by a downward curve reaches the middle of the thoracic region; hence straightway and median to the base of the caudal fin.

Specimens of this species were collected on the first of January, 1855, Fort Steilacoom,

Puget's Sound, W. T., by Dr. George Suckley, who made the following observations as to their coloration: "Bands under chin very pale and faint vermilion; general appearance of the fish exsanguine; flesh soft and flabby, as if exhausted from spawning. Head, body, and fins profusely spotted with black. Back light olive; belly light yellowish white. The whole fish has a glistening silvery appearance, but not a healthy one; it was caught with metal squid in the brackish water of the junction of brook current and tide water. Six weeks later (in February) I caught a half dozen of these fishes in one day, one of which, a male, weighed two pounds. This I caught with a fly; it appeared almost overflowing with milt, and the females could hardly be shaken without discharging plentifully mature ova. I regret that my departure from here is so immediate that I cannot institute thorough inquiries concerning them. The settlers say that the brook trout does not run up in large quantities from the salt water until the fall. This I doubt, as I know of a stream, some fifteen miles from Fort Steilacoom, where they are plentiful in June. At any rate this trout appears to be very different in its habits from our eastern brook trout. Its flesh is more dry, and quite tasteless, compared to the latter. It rises rapidly to the fly, and appears to have but little regard whether the feathers have a natural appearance or not."

Elsewhere he says: "Specimen caught in Steilacoom creek; water brackish. Bands under the chin very pale vermilion or orange; general appearance of fish exsanguine, probably owing to the season; general aspect silvery; back light olive; belly light yellowish white. Head, fins, and body profusely spotted with black. Caught with the spoon."

And still further, under date of April 8, after preparing a skin, the Doctor records: "Brook trout, called opskalloo by the Wasco Indians, a male. Flesh yellowish pink. Spots on the body numerous, irregular, and lighter in the centre. Those on dorsal and caudal fin like those of salmon trout (*Fario tsuppitch*). Black spots are also found on the cheeks, opercle, &c.; color of back bright silvery olive, becoming lighter on the sides and bright silver on the belly. Pectoral and ventral fins orange and vermilion. Patch of vermilion on each side, under the chin." And again, under same date: "Two small brook trout, males. Caught in the same stream as preceding. Spots *less numerous*, vermilion bands and patches under chin *wanting*. Flesh white. They commenced to run up this season (1855) about the 10th of February."

The name of "brook trout" here applied to this species by Dr. Suckley is merely optional with him; it is the "common trout" of the settlers of Oregon and Washington Territories.

Other specimens were collected at Portland, Oregon Territory, by Dr. George Suckley; at Shoalwater bay, Washington Territory, by Dr. James G. Cooper; both under Governor I. I. Stevens; at Cape Flattery, Washington Territory, Astoria, Oregon Territory, and Humboldt bay, by Lieutenant W. P. Trowbridge; and finally, in the upper Des Chutes river, Oregon Territory, by Dr. John S. Newberry, under Lieutenant R. S. Williamson.

References to the figures.—Plate LXIX, fig. 5, represents *Fario stellatus*, somewhat reduced from a specimen caught at Fort Steilacoom, Puget's Sound. Fig. 6 is a scale from the dorsal region, midway between the dorsal fin and the lateral line. Fig. 7, a scale from the lateral line in the middle of its course. Fig. 8, a scale from the abdominal region, midway between the lateral line and the insertion of the ventrals.

List of specimens.

| Catal No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|-----------|--------------|-----------------------------|-----------------|-------------------------------|---------------------|-------------------------------|
| 484 | 4 | Puget's Sound, W. T. . . . | 1853 | Gov. I. I. Stevens. | Alcoholic. | Dr. Geo. Suckley. |
| 585 | 1 | Humboldt bay, Cal. | 1853 | Lt. W. P. Trowbridge. | do. | Lt. Trowbridge. |
| 586 | 2 | Cape Flattery, W. T. . . . | 1854 | do. | do. | do. |
| 587 | 3 | Astoria, Oregon. | 1854 | do. | do. | do. |
| 588 | 6 | do. | 1854 | do. | do. | do. |
| 589 | 1 | Shoalwater bay, W. T. . . | 1853 | Gov. I. I. Stevens. | do. | Dr. James G. Cooper. |
| 590 | 2 | Portland, Oregon. | 1853 | do. | do. | Dr. George Suckley. |
| 591 | 2 | Upper Des Chutes river. . . | 1855 | Lt. R. S. Williamson. | do. | Dr. John S. Newberry. |

SALAR, Valenc.

GEN. CHAR.—All the characters of the salmons, but differing from them as well as from the genus *Fario* in being provided with a double row of teeth upon the shaft of the vomer, whilst the front of that same bone is smooth and toothless.

SYN.—*Salar*, VALENC. in *Cuv. & Val. Hist. nat. des Pois.* XXI, 1848, 314.—GRD. in *Proc. Acad. Nat. Sc., Philad.* VIII, 1856, 219.

There are other trouts, spotted or speckled, which are met with in brooks and creeks, resembling more the "brook trout," properly so called, than any of the lake trouts. These constitute the third subdivision of the genus *Salmo*, to which the name of *Salar* has been applied.

1. SALAR LEWISI, GRD.

PLATE LXII.

SPEC. CHAR.—Body rather thickish upon the middle region; head moderate, constituting a little less than the fifth of the total length; maxillary gently curved; its posterior extremity reaching a vertical line drawn immediately behind the orbit. Anterior margin of dorsal fin a little nearer the extremity of the snout than the base of the caudal fin. Ground color of the upper region bluish grey, of the inferior region orange or yellow. The back, peduncle of the tail, dorsal, adipose and caudal fins are spotted with black. The belly and lower fins are unicolor, a deep orange hue existing along the rays, and also in the shape of a dot upon the abdominal scales, and which disappear in alcohol.

SYN.—*Salar lewisi*, GRD. in *Proc. Acad. Nat. Sc. Philad.* VIII, 1856, 210.—*Salmo lewisi*, GRD. Mss.

The general aspect of this fish is rather thickest, though the aspect of the body is, upon the whole, elongated, with a sub-fusiform outline. The body is quite compressed and the back sub-rounded; the greatest depth, taken in advance of the dorsal fin, is contained four times and a half in the total length, whilst the least depth, on the peduncle of the tail, is a little less than the half of the greatest depth.

The head, which is of moderate development, is contained five times and a half in the total length; it is sub-conical in shape, rounded anteriorly; both jaws sub-equal, the lower one protruding very slightly beyond the upper. The mouth is proportionally large, the free extremity of the maxillary extending to a vertical line drawn posteriorly to the orbit. The maxillary itself is slender and slightly curved. The teeth are comparatively small; the largest, as usual, are on the dentary and the tongue, the next in size on the shaft of the vomer and pterygoidians, and, finally, on the premaxillaries and maxillaries, where they are almost

exiguous. The eye is large and circular; its diameter is contained a little over four times in the length of the sides of the head. The nostrils are very large and nearer to the orbit than the tip of the snout. The inferior part of the preopercle is expanded; its external margin very convex; the opercle is very large, much deeper than wide, and a little broader below than above; the sub-opercle is rounded externally; the inter-opercle is small. There are twelve branchiostegal rays, short, very broad, and flattened.

The dorsal fin is higher than long; its upper outline is sub-convex, and its posterior margin is a little lower than the half of the anterior, which is nearer the end of the snout than the insertion of the caudal fin. The adipose is well developed, rather slender, and does not extend quite as far as the tips of the posterior rays of the anal. The latter fin has the same general aspect as the dorsal in the convexity of its external margin. The origin of the ventrals is situated opposite the posterior fourth of the base of the dorsal; the tips of its rays, consequently, extend further backwards than those of the latter fin. The pectorals are broad and lanceolated. The caudal is sub-crescentic upon its posterior margin, and constitutes a little more than the seventh of the total length.

Br. 12 : 12 ; D 11 ; 0 ; A 11 ; C 6, 1, 9, 9, 1, 5 ; V 10 ; P 16.

The scales are small, elongated, sub-elliptical, narrower anteriorly than posteriorly, and sometimes very irregular in their outline.

The ground color of the upper regions of the head and body is bluish grey, over which are spread small black spots or rather dots, extending over the dorsal, the adipose, and caudal fins, most crowded upon the latter; the ground color of these fins being olivaceous, these dots do not extend beneath the lateral line, except on the peduncle of the tail. The inferior regions are of a deep orange tint, which extends over the lower fins, much deeper along the rays. The sides of the head present a combination of the bluish grey of the back and the orange of the belly.

This is the trout alluded to in Lewis and Clarke's "Travels." Being at the Falls of the Missouri, "they caught half a dozen trouts, from sixteen to twenty-three inches long, precisely resembling in form and the position of the fins the mountain or speckled trout of the United States, except that the specks of the former are of a deep black, while those of the latter are of a red or golden color. They have long sharp teeth on the palate and tongue, and generally a small speck of red on each side behind the front ventral fins (pectorals!); the flesh is of a pale yellowish red, or, when in good order, of a rose-colored red."—(London edition of 1814, p. 192, 4to.)

And further on, p. 487, we read: "The mountain or speckled trout are found in the waters of the Columbia, within the mountains. They are the same with those found in the upper part of the Missouri, but are not so abundant in the Columbia as in that river. We never saw this fish below the mountains, but, from the transparency and coldness of the Kooskooskee, we should not doubt of its existence in that stream as low as its junction with the southeast branch of the Columbia."

It would be an interesting point to compare, side by side, specimens caught in the Columbia with others from the Missouri. We should not be surprised if the result of such a comparison should refer the specimens from the basin of the Columbia either to *Fario gairdneri*, or else prove a distinct species.

Specimens of this species were collected by Dr. Geo. Suckley at the Falls of the Missouri river, Rocky mountains.

References to the figures.—Plate LXXII, fig. 1, represents *Salar lewisi*, two-thirds the size of life. Fig. 2, a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region. Figs. 2—4 are magnified views.

List of specimens.

| Catal. No. of No. | Age. spec. | Locality. | When | Whence obtained. | Nature of specimen. | Collected by— |
|-------------------|------------|-------------------------------------|------|-------------------------|---------------------|----------------------|
| 592 | 2 | Adult. Falls of Missouri river..... | 1853 | Gov. I. I. Stevens | Alcoholic. | Dr Geo. Suckley..... |

2. SALAR VIRGINALIS, Grd.

PLATE LXXIII, FIGS. 1—4.

SPEC. CHAR.—Body sub-fusiform in profile, otherwise compressed; head comprised about four times in the total length, the caudal fin excluded; jaws sub-equal; posterior extremity of maxillary extending to a vertical line intersecting the posterior rim of the orbit. Anterior margin of dorsal nearer the extremity of the snout than the insertion of the caudal fin. Greyish brown above, with a purplish reflection and sub-circular black spots; beneath olivaceous, unicolor.

SYN.—*Salar virginalis*, GRD. in Proc. Acad. Nat. Se. Philad. VIII, 1856, 220.—*Salmo virginalis*, GRD. Mss.

The body, which is sub-fusiform when seen in profile, is very much compressed; its greatest depth, anterior to the dorsal fin, enters five times and a quarter in the total length, whilst the least depth, on the peduncle of the tail, enters about eleven times in that same length.

The head is sub-conical and proportionally well developed, constituting the fourth of the length from the tip of the snout to the insertion of the caudal fin. The mouth is moderately cleft, for, the posterior extremity of the maxillary reaches a vertical line drawn immediately posterior to the orbit. The teeth are small and acute, a little larger, as usual, on the dentary and the tongue than on other bones. They become very exiguous along the posterior portion of the maxillary. The snout is obtusely rounded and the jaws sub-equal, with a proclivity of the upper jaw to protrude beyond the lower. The eye is large, sub-circular, its diameter being contained four times and a half in the length of the side of the head, a little over once in advance of the anterior rim of the orbit. The nostrils are large, situated towards the upper surface of the head and nearer the eye than the tip of the snout. The opercle is elevated, rather narrow, a little wider beneath than above, slightly oblique, whilst the sub-opercle, moderate in development, is rounded upon its free margin. The branchiostegals are nine on either side.

The anterior margin of the dorsal fin is a little nearer the extremity of the snout than the insertion of the caudal fin. The fin itself is higher than long, its upper margin being sub-convex, and its posterior margin half the height of the anterior. The adipose is very slender, its tip being even with the tips of the middle rays of the anal. The caudal is sub-crescentic upon its margin; it is contained seven times in the total length. The anal is sub-concave

upon its external margin; its posterior margin is about the third of the depth of the deepest anterior ray. The ventrals are rather slender and inserted opposite the middle of the base of the dorsal. The pectorals are likewise slender and sub-lanceolate in shape. All the rays are articulated and the majority bifurcated and branched several times.

Br. 9: 9; D 12; 0; A 11; C 7, 1, 9, 8, 1, 8; V 8; P 14.

The anterior two rays of the dorsal are mere rudiments, as also the anterior one of the anal.

The scales are quite small; on the dorsal region they are sub-elliptical, elongated horizontally, as well as in the lateral line, but there they taper anteriorly, whilst on the abdomen they are deeper than long, sub-quadrangularly rhomboidal, and a little larger than on the dorsal region. The concentric stria are continuous; the centre of the scales is homogenous and transparent.

The ground color of the dorsal region is greyish brown with a kind of purplish hue, especially visible along the middle of the flanks; sub-circular black spots are scattered all over from the head to the tail, where they are much more crowded than on the body; on the dorsal and caudal fins these spots are likewise numerous and conspicuous; a few of these only may be observed beneath the lateral line upon the abdominal region; along the peduncle of the tail they nearly extend to the inferior outline, some of which may even be seen upon the anal fin. Along the middle of the flanks these black spots are surrounded by a light areolae. The inferior region of the body is of a uniform greenish olive or yellow. The head is greyish olive, darker above than upon the sides, with a few black spots upon the tympanic region.

Specimens of this species were collected by the party under Lieut. Beckwith in Utah creek and at Sangre de Cristo Pass, upper waters of the Rio Grande del Norte (Rio Bravo).

References to the figures.—Plate LXXIII, fig. 1, represents *Salar virginialis*, size of life. Fig. 2 is a scale from the dorsal region. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region. Figs. 2—4 are magnified views.

List of specimens.

| Catal. No. | No. of specc. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimen. | Collected by— |
|------------|---------------|--|-----------------|---------------------|-----------|---------------------|----------------|
| 593 | 3 | Utah creek, trib. to Rio Grande del Norte. | 1854 | Lt. E. G. Beckwith. | 21 | Alcoholic. | Mr. Kreuzfeld. |

3. SALAR IRIDEA, Grd.

PLATE LXXIII, FIG. 5; AND PLATE LXXIV.

SPEC. CHAR.—Body sub-fusiform in profile, otherwise compressed; head well developed, constituting a little less than the fourth of the total length. Jaws sub-equal; posterior extremity of maxillary extending to a vertical line drawn somewhat beyond the orbit. Anterior margin of dorsal fin equidistant between the extremity of the snout and the insertion of the caudal. Reddish brown above, with numerous and small black spots; yellowish white beneath.

SYN.—*Salmo iridea*, GIBBONS, in Proc. Cal. Acad. Nat. Sc. I, 1855, 36.

Salmo rivularis, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 43.

Salar iridea, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 220.

The general aspect of the body is sub-fusiform, compressed. The head is sub-conical, rather pointed, and constitutes a little less than the fourth of the total length. The jaws are sub-

equal, the upper one protruding slightly over the lower. The mouth is deeply cleft; the posterior extremity of the maxillary extending considerably beyond the orbit; it is a slender and slightly curved bone. The teeth are, generally speaking, of a moderate development; those on the shaft of the vomer are the stoutest; the next in size are on the dentary and tongue; the smallest of all are the maxillary proper. The nostrils are nearer the orbit than the end of the snout. The orbit is large, sub-elliptical, its horizontal diameter entering about five times in the length of the sides of the head, nearly once and a half in advance of its anterior rim. The branchiostegal rays are ten on either side. The opercle is well developed, and but a little narrower above than below.

The fins are all well developed; the anterior margin of the dorsal fin is equidistant between the insertion of the caudal and the extremity of the snout; its height is a little more than its length, and its posterior ray is but one-fourth shorter than the third, which is the highest; the anterior two being mere rudiments. The adipose is situated opposite the posterior portion of the anal, although its terminal margin is not quite even with the tip of the anal. The caudal is broad, deeply emarginated, not to say furcated, constituting a little less than the sixth of the entire length. The anal is much deeper than long; its anterior margin is slightly convex, and its posterior margin less than the third of its depth. The insertion of the ventrals is placed opposite the base of the third developed ray of the dorsal; their tips do not extend as far posteriorly as the tip of the dorsal. The pectorals are sub-lanceolate, oval; their rays, as in all the other fins, are bifurcated or branched.

Br. 10: 10; D 14; 0; A 14; C 7, 1, 9, 8, 1, 6; V 9; P 14.

The scales are of but moderate development, sub-elliptical in the lateral line, being a little longer than deep, (fig. 4), but deeper than long elsewhere, considerably more so on the abdominal region (fig. 5) than on the dorsal (fig. 3). They are deeply imbricated, and largest upon the middle of the flanks.

The ground color of the upper region is greyish green, the middle of the flank of a coppery hue, and the belly olivaceous grey. The upper surface of the head having the same hue as the back, and the sides coppery like the flanks; but the upper part of the body is scattered all over with irregular black specks and dots, extending somewhat beneath the lateral line. The dorsal and caudal fins are densely covered with roundish black spots. The lower fins are unicolor, like the abdomen.

The specimen above described, being the male sex, was collected in Chico creek, Sacramento valley, by Dr. John S. Newberry, under Lieutenant R. S. Williamson.

The following refers to the female sex: The snout is obtusely rounded, and the jaws nearly even. The proportions of the head towards the body are the same as in the male; the mouth is horizontal upon its anterior half and slightly oblique posteriorly. The teeth are moderate in development, very slightly larger on the tongue than on the dentary; the rest of them are pretty nearly equal, except those on the maxillary, which are quite exiguous. The posterior free extremity of the maxillary extends to a vertical line drawn posteriorly to the orbit. The eye is large and sub-circular, its diameter being contained about five times in the length of the sides of the head, exactly once in advance of the anterior rim of the orbit. The opercle is much narrower above than below and overlaps considerably the subopercle, which is well developed. There are eleven branchiostegal rays on either side, one more than in the male.

The greatest depth of the body, taken in advance the dorsal fin, is equal to the fifth of the entire length; and the least depth on the peduncle of the tail is less than the half of the greatest.

The anterior margin of the dorsal fin being equidistant between the insertion of the caudal and the extremity of the snout. The dorsal fin itself is narrower and higher than in the male. The adipose, also, holds the same relations to the anal, and such is the case with the ventrals towards the dorsal.

The pattern of coloration is very similar in both sexes; in the female now under consideration the dorsal region is greyish blue and green, the middle of the flanks being silvery white, and the abdominal region olivaceous. The head, upper region of the body, and upper fins, spotted as in the male, perhaps more densely, and also a little further below the lateral line. Transverse dark bands may yet be seen along the silvery area of the middle of the flanks. Three rather large spots may be observed, two on the opercle and one upon the subopercle.

Specimens were collected in the head waters of San Matteo creek, California, by R. D. Cutts; at Petaluma, Sonoma county, California, by E. Samuels; near Humboldt Bay, by Lieut. W. P. Trowbridge; and, finally, specimens obtained from Dr. Ayres, of San Francisco, under the name of *Salmo rivularis*, proved identical with *Salmo iridea* of Dr. Gibbons. Dr. Gibbons' description was made from a very immature specimen, but has the priority over Dr. Ayres' appellation.

References to the figures—Plate LXXIII, fig. 5, represents the female sex of *Salar iridea*, size of life, collected in San Matteo creek.

Plate LXXIV, fig. 1, represents the male sex of *Salar iridea*, somewhat reduced in size, from Chico creek.

Fig. 2 is a scale from the dorsal region, midway between the lateral line and the dorsal fin.

Fig. 3, a scale from the lateral line.

Fig. 4, a scale from the abdominal region, midway between the lateral line and the insertion of the ventral fins.

Figs. 2—4 are magnified views.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|--------------|--------|-----------------------------|-----------------|------------------------|------------|---------------------|---------------------|
| 594 | 1 | Adult. | Chico creek, Cal..... | 1855 | Lt. R. S. Williamson.. | ..... | Alcoholic. | Dr. J. S. Newberry. |
| 595 | 2 | ..... | San Francisco, Cal..... | 1855 | do..... | ..... | do.... | Dr. W. O. Ayres.. |
| 596 | 1 | ..... | Humboldt Bay, Cal..... | 1854 | Lt. W. P. Trowbridge. | ..... | do.... | Lt. Trowbridge.. |
| 597 | 6 | A.&Y. | H'd of San Matteo c'k, Cal. | 1855 | R. D. Cutts, Esq..... | ..... | do.... | R. D. Cutts, Esq.. |
| 598 | 2 | ..... | Petaluma creek, Cal..... | 1855 | Mr. E. Samuels..... | ..... | do.... | Mr. E. Samuels.. |
| 599 | 1 | ..... | San Francisco, Cal..... | 1856 | Dr. W. O. Ayres..... | 27 | do.... | Dr. W. O. Ayres.. |

OSMERUS, *Ar t e d i.*

GEN. CHAR.—Body elongated, sub-fusiform in profile, tapering posteriorly, terminated by a furcated caudal fin, and covered with well developed scales. The anal fin is opposite the adipose. Ventrals inserted under the anterior margin of the dorsal or posteriorly to it. Head elongated and tapering anteriorly. Mouth rather deeply cleft. Premaxillar teeth small and curved; maxillar teeth still smaller; vomerine teeth large, conical, and placed so much forwards that they appear as though inserted upon the jaws. A row of teeth may be observed along the external margin of the palatines, and another upon the internal margin of the pterygoidians. Tongue provided with large teeth also. Branchial apertures continuous under the throat; branchiostegals six or eight on either side.

SYN.—*Osmerus*, ART. Gen. Pisc. ed. *Walbaum*; 1792, 56; &, Synon. 1793, 21.—Cuv. Règn. Anim. II, 1817, 162; 2d ed. II, 1829; &, ed. illustr. Poiss, 257.—STORER, Rep. Fish. Mass. 1839, 108; &, Synops. 1846, 197.—DEKAY, New Y. Faun. IV, 1842, 243.—Cuv. & VAL. Hist. nat. Poiss. XXI, 1848, 367.

The following species has so much the general aspect of *Argentina* that on a former occasion we have described it under the latter heading. The argentine tint which pervades over the middle of the flanks, a comparatively smaller mouth than in the known species of *Osmerus*, the presence of six branchiostegal rays, and the position of the ventral fins, were as many traits which seemingly militated in favor of the genus *Argentina*. After considering, however, the value attached to the dentition in the family of *Salmonidae*, we have deemed it expedient to ascribe said species to the genus *Osmerus*, in which it was subsequently placed by Dr. W. O. Ayres, of San Francisco. By its small teeth it reminds us of *O. microdon*, from Scandinavia.

OSMERUS PRETIOSUS, Grd.

PLATE LXXV, FIG. 5. (Under the name of *Argentina pretiosa*.)

SPEC. CHAR.—Posterior extremity of maxillar bone extending to a vertical line drawn in advance of the pupil. Eye large and circular; its diameter contained about four times in the length of the side of the head. Origin of dorsal fin somewhat nearer the extremity of the snout than the tip of the caudal fin. The adipose is situated opposite the posterior fourth of the anal. The origin of the ventrals is placed somewhat behind a vertical line drawn from the anterior margin of the dorsal fin. Scales of moderate development. Upper surface of head and back yellowish; outline of scales dotted with black. Sides of head and middle of flanks of a shining, silvery tint; lower half of flanks and belly dull yellowish.

SYN.—*Argentina pretiosa*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, Aug. 1854, 155.

Osmerus elongatus, AYRES, in Proc. Cal. Acad. Nat. Sc. I, Dec. 1854, 17.

The body is gracefully elongated, compressed, fusiform in its outline, the largest specimens observed measuring over seven inches in total length, in which the head enters somewhat over five times. The eye is large and circular, its horizontal diameter being contained a little over four times in the length of the side of the head. The posterior extremity of the maxillar bone extends to a vertical line which would pass in advance of the pupil. The origin of the dorsal fin is a little nearer the tip of the lower jaw than the base of the caudal fin. The adipose fin is situated opposite the posterior fourth of the anal. The caudal fin is shorter than the head. The origin of the ventrals is placed somewhat behind a vertical line drawn at the anterior margin of the dorsal, their extremities not extending as far as the vent. The pectorals are a little more slender and longer than the ventrals.

Br. VI: VI; D 11; A 13; C 10, 1, 9, 8, 1, 8; V 1, 8; P 1-16.

The scales are of medium size. The upper region of the head and back are yellowish, the outlines of the scales being minutely black dotted. The sides of the head and the middle of the flanks are silvery, shining; the lower part of the flanks and the belly being dull yellowish.

Reference to the figure.—Plate LXXV, fig. 5, represents *Osmerus pretiosus*, size of life.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------|--------------------------|-----------------|-----------------------|---------------------|------------------------|
| 602 | 5 | Adult. | Presidio, Cal. | 1853 | Lt. W. P. Trowbridge. | Alcoholic. | Lt. Trowbridge |
| 603 | 2 | do. | San Francisco, Cal. | 1855 | Lt. R. S. Williamson. | do. | Dr. John S. Newberry.. |
| 604 | 2 | do. | do. | 1857 | Dr. W. O. Ayres. | do. | Dr. W. O. Ayres..... |

THALEICHTHYS, Girard.

GEN. CHAR.—Body elongated, sub-fusiform in profile, terminated by a fincated caudal, and covered with scales of moderate development. Anal fin opposite the adipose. Ventrals inserted in advance of the anterior margin of the dorsal. Head elongated, tapering towards the snout. Mouth very deeply cleft; jaws toothless; a small group of minute velvet-like teeth upon the front of the vomer, and one series along either pterygoidian bone. Teeth may also be observed at the base of the tongue. Branchial apertures continuous under the throat; branchiostegal rays eight on either side.

This genus is instituted for a species which has the external appearance of an *Osmerus*, except in the insertion of the ventrals, which is placed more in advance of the dorsal fin than usual in the latter genus. The mouth is also more deeply cleft, and the jaws are toothless, as stated to be the case in *Argentina*,¹ although maxillar teeth are represented on Plate 624 of the work just referred to in the case of *Argentina leioglossa*.

From *Argentina* it differs by the presence of teeth on the pterygoidian bones, whilst the palatines are toothless; in *Argentina* the pterygoidians being toothless and the palatines provided with one series of small teeth.

Thus the present genus stands as a connecting link between *Osmerus* and *Argentina*; and should the characters upon which it is based not be found adequate to entitle it to a place in the ichthyic method, then *Argentina* and *Osmerus* could no longer be held as differing from one another.

THALEICHTHYS STEVENSI, Grd.

PLATE LXXV, FIGS. 1—4. (Under the name of *Osmerus stevensi*.)

SPEC. CHAR.—Head sub-conical and pointed. Mouth large; posterior extremity of maxillar bone extending to a vertical line drawn posteriorly to the orbit. Eye rather small. Adipose fin placed opposite the posterior portion of the anal, which is quite elongated. The insertion of the ventral fins is situated considerably in advance of the anterior margin of the dorsal. Scales moderate, sub-elliptical. Dorsal region dark greyish olive; middle of flanks yellowish orange dotted with black; belly yellowish, unicolor; upper surface and sides of head greyish; fins unicolor.

The head constitutes about the fifth of the total length, in which the caudal enters six times. The snout is sub-conical and slender, the lower jaw protruding beyond the upper, the gape of the mouth being oblique, and the posterior extremity of the maxillar bone, which is rounded, extending to a vertical line drawn beyond the entire orbit. The posterior edge of the gill covers is rounded off, the opercle and sub-opercle being very largely developed. The branchial apertures are very wide, extending forwards as far as a vertical line drawn through the pupil. We count eight branchiostegals, as many as in certain species of *Osmerus*.

The body is quite slender and elongated, compressed and tapering gradually towards the caudal fin, which is shorter than the head. The dorsal fin is much higher than long; its anterior margin is somewhat nearer the insertion of the caudal than the extremity of the snout. The adipose is placed opposite the posterior portion of the anal fin, although the tips of the rays of the anal extend somewhat further back, in which respect the figure on plate LXXV is not quite correct. The anal fin itself is much longer than deep, its base entering five times and three quarters in the entire length. The ventrals are broad and well developed, posteriorly rounded off, inserted considerably in advance of the anterior margin of the dorsal; hence nearer the extremity of the snout than the base of the caudal, while their posterior extremities do not

¹ Histoire naturelle des Poissons, XXI, 1848, 409.

quite extend as far as the vent. The pectorals are smaller than the ventrals, posteriorly rounded, and far from reaching the origin of the ventrals.

Br. VIII: VIII; D 1, 10 + 1; A 1, 19 + 1; C 8, 1, 9, 8, 1, 7; V 1, 8; P 1, 11.

The scales are of moderate development, longer than deep, anteriorly sub-truncated, posteriorly rounded, exhibiting conspicuous concentric stria, but no radiating furrows. The lateral line is very conspicuous, linear, and nearer the back than the belly.

The upper surface and sides of the head are greyish, whilst the dorsal region is greyish olive. Upon the upper portion of the flanks, along the course of the lateral line, exists a yellowish orange streak, dotted or rather speckled with black, the abdominal region being yellowish, unicolor, with a metallic reflect. The dorsal and caudal fins assume the tint of the back; the anal, ventrals, and pectorals that of the belly.

References to the figures.—Plate LXXV, fig. 1, represents *Thaleichthys stevensi*, size of life. Fig. 2 is a dorsal scale. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------|--------------------------|-----------------|-----------------------|---------------------|----------------------|
| 605 | 1 | Adult. | Puget's Sound, W. T..... | 1856 | Dr. Geo. Suckley..... | Alcoholic. | Dr. Geo. Suckley.... |

COREGONUS, *Ar t e d i*.

GEN. CHAR.—Body more or less elongated, sub-fusiform in profile. Head sub-conical; mouth rather small; snout truncated, sometimes quite protruding beyond the lower jaw; both jaws always toothless. Teeth on the tongue. Branchial apertures continuous under the throat. Ventrals inserted posteriorly to the anterior margin of the dorsal fin, and situated opposite the adipose fin. Caudal fin fureated. Scales of moderate development.

SYN.—*Coregonus*, ART. Gen. Pisc. ed. *Walbaum*, 1792, 53; & Synon. Pisc. 1793, 18.—*Cuv. Règn. Anim.* 11, 1817, 162; 2d ed. 11, 1829; & ed. illustr. Poiss. 259.—*RICHARDS. Faun. Bor. Amer.* III, 1836, 309.—*DEKAY, New Y. Faun.* IV, 1842, 247.—*STORER, Synops.* 1846, 199.—*Cuv. & VAL. Hist. nat. Poiss.* XXI, 1848, 454.—*AGASS. Lake Super.* 1850, 336.

In order that the value of the characters assigned to the genus *Coregonus* in the above diagnosis should be fully appreciated by our readers, it must be stated that we adopt the genus *Argyrosomus* of modern writers, characterized by a pointed snout and a prominent lower jaw, which projects beyond the upper one. The mouth in *Argyrosomus* being also more deeply cleft and the teeth on the tongue more conspicuously developed than in *Coregonus*, properly so called. Moreover, the premaxillar bones in *Argyrosomus* exhibit a row of small teeth, a character which leads to the genus *Thymallus*, a species of which inhabiting some of the fresh waters of the British possessions in North America.

COREGONUS WILLIAMSONI, *G r d*.

PLATE LXVI.

SPEC. CHAR.—Head contained five times and a half in the total length. Mouth small; posterior extremity of maxillar bone not extending quite as far as the anterior rim of the orbit. Eye moderate, sub-circular; its diameter entering about five times in the length of the side of the head. Anterior margin of dorsal fin nearer the posterior edge of the base of the adipose than

the extremity of the snout. Scales well developed, disposed upon eighteen longitudinal series across the line of the greatest depth: nine between the lateral line and the base of the dorsal, and eight between the lateral line and the insertion of the ventrals. Bluish lead above; whitish beneath, with a silvery reflect.

SYN.—*Coregonus williamsoni*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 136.

Two specimens of the female sex have been preserved, the total length of either measuring about eleven inches. The body is elongated, rather stout, sub-fusiform in profile; the peduncle of the tail well developed. The head is rather small, sub-conical or sub-pyramidal, terminated by a truncated snout which protrudes beyond the lower jaw. The mouth is quite small; the maxillar bone being proportionally very broad, but so short that its posterior margin scarcely reaches, if at all, a vertical line drawn in front of the orbit. The origin of the dorsal fin is nearer the posterior margin of the base of the adipose than the extremity of the snout; its upper edge is sub-concave instead of being linear, as exhibited on the accompanying figure. The anterior portion of the same fin is higher than its base is long. The adipose is well developed, situated immediately opposite the anal fin. The latter is anteriorly deeper than long; its initial ray being nearly equidistant between the origin of the ventral fins and the insertion of the caudal. The external margin of the anal fin is sub-convex also; its own base entering about eleven times in the total length; twice in the length of the side of the head. The ventrals are inserted opposite the posterior fourth of the base of the dorsal fin; their posterior margin is sub-truncated or rounded off, and when bent backwards their extremities are very far from approximating the vent. The pectorals are sub-lanceolated, and, like the ventrals, proportionally well developed. The caudal is furcated, shorter than the head, since it enters somewhat over six times in the total length.

Br. VII: VII; D 2, 12 + 1; A 2, 12 + 1; C 5, 1, 9, 8, 1, 6; V 12; P 16.

The scales are large, deeper than long, with their anterior margin undulating, rounded sideways and posteriorly, slightly diminishing in depth. The four sections of the scales are limited by a furrow; the concentric lines are almost entirely obliterated upon the posterior section; no radiating furrows being observed on any of the sections. Eighteen longitudinal rows of scales may be counted between the anterior margin of the dorsal and the insertion of the ventrals: nine above the lateral line and eight below it. The lateral line itself is perfectly straight. Large mucous ducts may be seen on the cheeks extending from the supratympanic region to the snout.

The upper region is bluish grey or lead, whilst the sides and belly are whitish, with a silvery reflect all over.

References to the figures.—Plate LXXVI, lower figure, represents *Coregonus williamsoni*, somewhat reduced in size. Fig. at the upper left corner, a scale from the dorsal region. Middle figure, a scale from the lateral line. Fig. at the upper right corner, a scale from the abdominal region.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When coll'd. | Whence obtained. | Nat. of spec. | Collected by— |
|------------|--------------|--------------|---------------------------|--------------|-----------------------|---------------|----------------------|
| 601 | 2 | Adult ♀ | Des Chûtes river, Oregon. | 1855 | Lt. R. S. Williamson. | Alcoholic . . | Dr. J. S. Newberry . |

Family SCOPELIDAE, OWEN.

The upper arcade of the mouth is formed by the premaxillar bones, the maxillaries themselves being situated behind the former. The body is either covered with scales or scaleless. There is also an adipose fin, as in the Salmonids, most of the Siluroids, and Characinids. The pseudobranchia or accessory gills being gill-like in their structure. The swimming or air bladder is generally wanting. In most instances pyloric appendages are extant. An oviduct may also be observed, leading the eggs out of the ovary, and thus preventing the latter from falling into the abdominal cavity. This oviduct is observed in Characinids and others, but is wanting in Salmonids, in which the eggs fall into the abdominal cavity before they make their exit from the body of the female.

SYN.—*Scopelini*, MILL. in *Wieg. Archiv. f. Naturg.* 1843, I, 321; &, 1845, I, 131.

Scopelidae, OWEN, *Lect. Comp. Anat. Vertebr.* 1846, 48.—*Ed. Iconogr. Encycl.* II, 1850, 203.

In North America we have but two genera of this family, *Scopelus* and *Saurus*, the latter alone having furnished us with but one representative from the Pacific coast.

And not having had on hand specimens of it, we can simply state that it was described under the name of

SAURUS (LAURIDA) LUCIOCEPS, Ayres,

in the Proceedings of the California Academy of Natural Sciences, I, 1855, 66. But we could not ascertain from its description whether it truly belongs to the genus *Saurus*. It is likewise difficult to tell whether Aristotle's name of *Laurida* is applicable, as a substitute, to the genus *Saurus* as a whole, or else to one of its subdivisions; at any rate the objection raised against it deserves no notice from the systematic writers.

Family CLUPEIDAE, BONAP.

This, the herring family, includes fishes, the body of which is always covered with scales, although, from the very deciduous nature of the latter, they are rarely seen upon such specimens as we find preserved in the majority of the museums and private collections. The greatest care and delicate handling is required in order to secure specimens with all the scales in their natural position. The adipose dorsal fin, which we have noticed in the Siluroids, Salmonids, Scopelids, and others, is totally wanting here.

The upper arcade of the mouth is formed in front by the premaxillar bones and sideways by the maxillaries. The dentition varies according to the genera. The pseudobranchia enter into the structure of these fishes. The stomach is provided with a cul-de-sac, and the pylorus with numerous appendages (coeca); the swimming or air bladder being simple, although in communication, through an air duct, with the throat.

SYN.—*Clupes*, CUV. *Règn. Anim.* II, 1817, 171; 2d ed. II, 1829; &, ed. *Illustr. Poiss.* 271.

Clupeidae, BONAP. *Saggio Distr. metod. Anim. Vertebr.* 1831, 116.—*Storer*, *Synops.* 1846, 203.

Clupeidae, DEKAY, *New Y. Faun.* IV, 1842, 250.

Clupeoideae, RICHARDS. *Faun. Bor. Amer.* III, 1836, 229.

Clupeoides, CUV. & VAL. *Hist. nat. Poiss.* XX, 1847, 1.

Clupeoidei, MULL. in *Wieg. Archiv für Naturg.* 1843, I, 324; &, 1845, I, 136.

The herrings are anything but numerous along the Pacific coast, as far at least as the observations go. The anchovies from all appearances reach an unparalleled size, and if at all numerous, could be made a source of trade and wealth. As to the shads, they have not yet been observed, whether in the San Joaquin, Sacramento, or Columbia rivers.

CLUPEA, Artedi.

GEN. CHAR.—Body elongated, back rounded, flanks thickish, and belly more or less compressed, or sharp according to the amount of spawn the specimens may contain. Premaxillar bones provided with small teeth; maxillaries finely crenated, else serrated, rather more perceptible to the touch than the unaided eye. Small teeth at the periphery of the lower jaw, which projects beyond the upper. Stouter and more conspicuous teeth exist upon the vomer, disposed upon a longitudinal band. A similar band, opposed to the former, may be seen on the tongue. There are but a few small teeth upon the external margin of the palatines, but drop so easily off that, without attentive and repeated observations, one might be led to suppose that these bones are smooth and toothless like the pterygoidians. Dorsal fin small, situated about on the middle of the length of the body. The anal is quite low. The ventrals are inserted under the dorsal. The pectorals are rather small.

SYN.—*Clupea*, ARTEDI, Gen. Pisc. ed. *Walbaum*, 1792, 37; & Synon. Pisc. 1793, 14.—Cuv. Règn. Anim. II, 1817, 172; 2d ed. II, 1829; & ed. illustr. Poiss. 272.—STORER, Rep. Fish. Mass. 1839, 110; & Synops. 1846, 204.—DEKAY, New Y. Faun. IV, 1842, 250.—Cuv. & VAL. Hist. nat. Poiss. XX, 1847, 23.

The intestine recurs but twice upon itself. The stomach has the shape of a conical bag. The swimming or air bladder is large, acute at both extremities. Some of these traits of structure are met with to a greater or lesser extent in the other genera of this family.

CLUPEA MIRABILIS, Grd.

SPEC. CHAR.—Body rather short, deepest upon its middle, and tapering towards either extremity. Head constituting the fifth of the length. Posterior extremity of the maxillar bone extending to a vertical line drawn through the pupil. Eye large and sub-circular; its diameter entering about four times in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the apex of the upper jaw. Base of anal fin comprised about eleven times in the total length; its anterior margin being nearer the insertion of the caudal than the origin of the ventrals. Origin of ventrals placed somewhat behind the anterior margin of the dorsal, and a little nearer the apex of the lower jaw than the tip of the lower lobe of the caudal. Dorsal region bluish purple; flanks and belly metallic whitish or yellowish.

SYN.—*Clupea mirabilis*, GAD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 138, & 154.

This species is closely allied to the common herring (*Clupea harengus*) by its general appearance; the absence of teeth upon the palatines, the conspicuousness of the vomerine teeth (which are most so of all), and the presence of but two rows of them upon the tongue, will enable any one to draw the distinction between the two species.

The specimens before us are from eight to nine inches in total length, the head forming about the fifth of that dimension. The greatest depth, which corresponds to the anterior margin of the dorsal, is equal to the length of the head. The lower jaw is longer than the upper, the posterior extremity of the maxillar bone reaching a vertical line which would pass through the middle of the pupil. The eye is sub-circular and large; its diameter being contained somewhat less than four times in the length of the side of the head. The anterior rays of the dorsal fin are almost as high as the fin is long, and somewhat nearer the insertion of the caudal than the extremity of the upper jaw; its upper margin is slightly concave, or else depressed. The anal fin is very low, somewhat deeper anteriorly than farther back; its origin is situated nearer the insertion of the caudal fin than the base of the ventrals; its own base enters about eleven times in the total length. The insertion of the ventrals takes place somewhat posteriorly to the anterior margin of the dorsal, a little nearer the apex of the lower jaw

than the tip of the lower lobe of the caudal. The posterior margin of these fins is sub-truncated, else rounded off or sub-convex; the fins themselves are rather small, fan-like when expanded, and when directed backwards, their extremities are far from approximating the vent. The pectorals are of moderate development, elongated, sub-lanceolated, rounded off upon their posterior margin, which is very distant from the origin of the ventrals.

D 3, 15; A 14; C 8, 1, 7, 7, 1, 7; V 9; P 18.

The scales are very large, sub-orbicular, deeper than long, with irregular transverse stria anteriorly, and radiating furrows upon the posterior section, the very margin of which is scalloped.

The upper surface of the head and the dorsal region are of a deep bluish purple; the sides of the head and the rest of the body, exhibiting a whitish or yellowish tint, with a high metallic reflect. The fins are either greyish olive, or light straw color.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected | Whence obtained. | Orig'l No. | Nature of specimen. | Collected by— |
|------------|--------------|--------|---------------------------------------|----------------|------------------------|------------|---------------------|---------------------|
| 949 | 4 | Adult. | San Francisco, California. | 1853 | Lt. R. S. Williamson.. | ..... | Alcoholic.. | Dr. A. L. Heermann. |
| 950 | 1 | Young | ? | 1853 | Lt. W. P. Trowbridge. | ..... | do | Lieut. Trowbridge. |
| 951 | 1 | Adult. | Fort Steilacoom, Pugets' Sound, W. T. | 1856 | Dr. Geo. Suckley..... | 16 | do..... | Dr. Geo. Suckley.. |
| 952 | 1 | Adult. | Cape Flattery, W. T..... | 1854 | Lt. W. P. Trowbridge. | ..... | do..... | Lieut. Trowbridge. |

MELETTA, Valenci.

GEN. CHAR.—The various bones which enter into the structure of the mouth are toothless. A small band of asperities may be observed on the tongue alone.

SYN.—*Meletta*, VALENC. in *Cuv. & Val. Hist. nat. Poiss.* XX, 1847, 366.

This genus partakes of the characters of the herrings (*Clupea*), and shads (*Alosa*), having somewhat the external appearance of the former, and a structure of the mouth more alike that of the latter. The chief difference between *Alosa* and the present genus consists in the perfect smoothness of its tongue.

MELETTA COERULEA, Grd.

PLATE LXXV, FIGS. 5—7. (By error on the plate: Figs. 1—3.)

SPEC. CHAR.—Body slender, elongated, sub-fusiform in profile. Head constituting more than the fifth of the total length. Posterior extremity of maxillar bone extending to a vertical line drawn through the middle of the orbit. Eye large and sub-circular; its diameter entering four times and a half in the length of the side of the head. Anterior margin of dorsal fin nearer the extremity of the snout than the insertion of the caudal. Base of anal fin entering about ten times in the total length. Insertion of ventrals opposite the posterior third of the base of the dorsal fin. Bluish black above; yellowish or whitish beneath, with metallic reflects. Fins unicolor.

SYN.—*Meletta coerulea*, GRD. in *Proc. Acad. Nat. Sc. Philad.* VII, 1854, 138; &, 151.

The largest specimen observed measures ten inches in total length. The body is slender, compressed, gracefully elongated, gradually tapering towards the base of the caudal fin. The depth, measured in advance of the dorsal fin, stands in relation to the total length as one to

six. The body, as just stated, tapers away backwards from the insertion of the ventrals and the dorsal; in advance of these fins to the occiput, its depth is sensibly the same, whilst the head again gradually tapers away towards the snout, and constitutes more than the fifth of the entire length, since it enters four times in it from the snout to the last scales near the insertion of the caudal fin. The posterior extremity of the maxillary reaches a vertical line which would intersect the middle of the eye. The posterior edge of the opercular apparatus forms a uniform and rather flattened curve. The inferior branch of the preopercle exhibits small radiating stria; more conspicuous stria are observed upon the inferior and inner half of the opercle. The anterior margin of the dorsal fin is nearer the snout than the base of the caudal; it is as high as the fin is long, diminishing very rapidly in height; its upper edge being depressed or, better, concave. The anal is quite low; its base entering about ten times in the total length; its anterior margin being nearer the fork of the caudal than the origin of the ventrals, and proportionally deeper, compared to its posterior portion, than expressed upon the accompanying figure. The caudal fin is deeply furcated. The insertion of the ventrals takes place under the posterior third of the base of the dorsal; their posterior margin being subtruncated and quite broad when expanded. The pectorals are of moderate development, very broad when expanded, and sub-falciform upon their posterior margin.

D 3, 15 + 1; A 16 + 1; C 4, 1, 8, 8, 1, 4; V 8; P 18.

The scales are very large, sub-orbicular, or sub-angular, deeper than long, with sub-transverse and irregular furrow anteriorly, and very short radiating ones at the posterior margin, which is finely scalloped, and not pectinated as the aspect of the figures might lead to believe.

The back, upper part of the head, and half of the sides are deep bluish black. The sides of the head and the lower half of the flanks are yellowish or whitish, with a metallic reflect. The fins are greyish or dull yellowish.

References to the figures.—Plate LXXV, fig. 5, represents *Meletta coerulea*, from San Francisco, Cal., somewhat reduced in size. Fig. 6 is a scale from the dorsal region. Fig. 7, a scale from the abdominal region. As already stated, the last two figures give a very imperfect idea of the outline and structure of the scales.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------|----------------------|-----------------|-----------------------|---------------------|-----------------------|
| 953 | 1 | Adult. | San Francisco, Cal. | 1853 | Lt. R. S. Williamson. | Alcoholic | Dr. A. L. Heermann. |
| 954 | 3 | do | Presidio, Cal. | 1853 | Lt. W. P. Trowbridge. | do | Lt. W. P. Trowbridge. |
| 955 | 4 | do | San Francisco, Cal. | 1853 | Lt. R. S. Williamson. | do | Dr. A. L. Heermann. |
| 956 | 1 | do | do | 1853 | Lt. A. W. Whipple. | do | Dr. C. B. Kennerly. |
| 957 | 5 | Young. | California | 1853 | Lt. W. P. Trowbridge. | do | Lt. W. P. Trowbridge. |
| 958 | 2 | do | Humboldt bay, Cal. | 1854 | do | do | do |
| 959 | 2 | do | Astoria, Oregon | 1854 | do | do | do |
| 960 | 2 | do | Shoalwater bay, W.T. | 1853 | Gov. I. I. Stevens. | do | Dr. James G. Cooper. |

HYODON, Lesu.

GEN. CHAR.—Body very much compressed, deep upon its middle, covered with large scales, deeper than long, disposed upon transverse oblique series; ventral line sharp, but not serrated. Head small; snout rounded; jaws equal. Teeth on the jaws vomer, palatines, and tongue. Eyes very large. Gill apertures continuous under the throat. Dorsal fin opposite the anal. Caudal fin furcated, else crescent-shaped posteriorly. Lateral line nearly straight, running along the middle of the flanks.

SYN.—*Hyodon*, LESU. in Journ. Acad. Nat. Sc. Philad. I, 1, 1818, 361.—RAPIN Ichth. Ohiens. 1820, 41.—CUV. Regn. Anim. 2d ed. 11, 1829; & ed. illustr. Poiss. 283.—DEKAY, New Y. Faun. IV, 1842, 265.—STORER, Synops. 1846, 210.—CUV. & VAL. Hist. nat. Poiss. XIX, 1846, 307.

Glossodon, HECK. in *Russeg. Reisen*, I, 11, 1842, 1033.

Rafinesque has a genus *Glossodon*, which Heckel appears to have ignored; adopting Lesueur's genus *Hyodon*, he sub-divides it into three subgenera: *Amphiodon*, *Glossodon*, and *Clodalus*. It is not our present purpose to inquire into this subject beyond introducing here, into its natural family, a fish that was supposed at one time to belong to that of Cyprinoids, with the peculiar and exceptional characters of having teeth upon the tongue.

HYODON TERGISUS, Lesu.

Moon-eye.

PLATE LXXV, FIGS. 1—4. (By error on the plate: figs. 4—7.)

SPEC. CHAR.—Head contained five times and a half in the total length; snout rounded, sub-conical. Posterior extremity of maxillar bone extending to a vertical line drawn posteriorly to the pupil. Eye very large, sub-circular; its diameter entering about four times in the length of the side of the head. Anterior margin of dorsal fin somewhat nearer the tip of the caudal than the occiput. Base of anal fin entering about four times in the total length. Insertion of ventrals nearer the extremity of the snout than the terminus of the anal.

SYN.—*Hyodon tergisus*, LESU. in Journ. Acad. Nat. Sc. Philad. I, 1, 1818, 366.—RICHARDS. Faun. Bor. Amer. III, 1836, 235.—KIRTL. Rep. Zool. Ohio, 1838, 170, and 195; & in Bost. Journ. Nat. Hist. V, 111, 1846, 338.—DEKAY, New Y. Faun. IV, 1842, 265; pl. xli, fig. 130.—STORER, Synops. 1846, 210.—CUV. & VAL. Hist. nat. Poiss. XIX, 1846, 309.

The "moon-eye," or "lake" and "river herring," as this fish is sometimes called, has been made the subject of much comment by the various writers who have spoken of it. Several species have been put on record without criticism; adopted by some, rejected by others, so that up to the present day we are still left in doubt as to the number of species of the genus *Hyodon* inhabiting the fresh waters of North America. Let us hope that the time is not far when the Museum of the Smithsonian Institute shall be in possession of preserved specimens from every locality where these fishes are found, so as to enable us to institute a thorough examination of their zöological as well as anatomical characters, in order to settle a question so much controverted.

One fact is already clear to our mind, that the differences in the outline of the anal fin alluded to by Lesueur and Valenciennes are traits indicative of the sexes, and should *H. clodalus* prove specifically distinct from *H. tergisus* the distinction will be based upon very different characters. The above diagnosis, which we offer, of *H. tergisus*, is drawn up with a view of assisting future observers should they be prevented from forwarding specimens to Washington for ulterior comparisons.

We have carefully counted the rays of the fins of the specimens enumerated in the following list and found them to be:

No. 962, ♀. D 3, 9 + 1; A 4, 31 + 1; C 4, 1, 8, 8, 1, 5; V 1, 7; P 11.

No. 962, ♂. D 3, 10 + 1; A 4, 31 + 1; C 4, 1, 8, 8, 1, 5; V 1, 7; P 11.

No. 963, ♂. D 2, 10 + 1; A 4, 32 + 1; C 4, 1, 8, 8, 1, 5; V 1, 7; P 12.

No. 965, ♀. D 2, 9 + 1; A 2, 29 + 1; C 4, 1, 8, 8, 1, 5; V 1, 7; P 11.

A female specimen from the northern fork of the Canadian river, collected by Dr. S. W. Woodhouse, under Capt. L. Sitgreaves, and numbered 961 in the Smithsonian catalogues, has:

D 2, 9 + 1; A 3, 28 + 1; C 4, 1, 8, 8, 1, 5; V 1, 7; P 12.

These are all the specimens which we have had an opportunity of examining. The one figured on the accompanying plate was procured at St. Louis, Mo., and exhibits eighteen longitudinal series of scales between the anterior edge of the dorsal fin and the sharp ridge of the abdomen: eleven below the lateral line and six above it; an odd series occupying the dorsal region from the occiput to the dorsal fin. Moreover, the scales constitute transverse oblique series; the scales themselves being deeper than long, anteriorly uneven, with radiating furrows upon their anterior section only.

The color is yellowish or whitish, with metallic reflects, somewhat lighter beneath than above; the fins being unicolor of a tint similar to that of the region of the body where they are inserted.

References to the figures.—Plate LXXV, fig. 1, represents *Hyodon tergisus*, somewhat reduced in size. Fig. 2 is a dorsal scale. Fig. 3, a scale from the lateral line. Fig. 4, a scale from the abdominal region.

List of specimens.

| Catal. No. | No. of spec. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------------|-----------------------|-----------------|----------------------|---------------------|-----------------------|
| 962 | 2 | Adult ♂ & ♀ | St. Louis, Mo..... | 1852 | Dr. George Engelmann | Alcoholic | Dr. Geo. Engelmann.. |
| 963 | 1 | Adult ♂ | Milk river, Upper Mo. | 1853 | Gov. I I Stevens.... | do..... | Dr. George Suckley .. |
| 964 | 2 | Y'ng ♂ |do..... | 1853 |do..... | do..... |do..... |
| 965 | 1 | Adult ♀ | Fort Sarpi, Minn..... | 1854 | Col. A Vaughan..... | do..... | Dr. F. V. Hayden.... |

ENGRAULIS, Cuv.

GEN. CHAR.—Body rounded or compressed. Mouth large; snout protruding beyond the lower jaw. Premaxillaries very small, and hidden under the snout. Maxillaries slender, stretching over the cheeks. Small or minute teeth on either jaw, extending to the very extremity of the maxillary. A few teeth on the front of vomer. Palatine and pterygoidian teeth sometimes reduced to mere asperities. Gill openings very large and continuous under the throat. Branchiostegal membrane narrow and hidden under the jaw; its rays being short and variable in number. Caudal fin furcated. Ventrals very small, inserted in advance of the dorsal fin.

SYN.—*Engraulis*, Cuv. Règn. Anim. II, 1817, 174; 2d ed. II, 1829; &, ed. illustr. Poiss. 278.—Cuv. & Val. Hist. nat. Poiss. XXI, 1848, 2.—GRD. in *Gilliss*, U. S. N. Astr. Exped. South. Hemisph. II, 1855, 247.

The peculiar structure of the snout, as well as that of the mouth, will strike every one as the most characteristic feature of the small Clupeoids which constitutes this genus. The head, which is very elongated in some species, is short in others.

1. ENGRAULIS MORDAX, Grd.

SPEC. CHAR.—Body slender, elongated, and sub-fusiform in profile. Head constituting the fourth of the total length; snout sub-conical. Posterior extremity of maxillar bone extending to the sub-opercle. Eye large and sub-circular; its diameter entering four times and a half in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the tip of the snout. Base of anal fin entering a little over seven times in the total length. Vent situated opposite the base of last ray of dorsal fin. Ventral fins small, their tips not reaching the vent. Pectorals rather short, posteriorly truncated. Deep bluish brown above; silvery beneath.

SYN.—*Engraulis mordax*, Grd. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 138; &, 154.

The general physiognomy of this species is somewhat suggestive of *Engraulis encrasicolus*, the common anchovy of Europe, from which it may, however, be distinguished by characters expressed in the above diagnosis and referred to in the following description:

The body is slender and compressed, narrower on the belly than on the back, although equally rounded off. The greatest depth is comprised nearly seven times in the total length and almost twice in the length of the head. The head constitutes the fourth of the total length. The eye is large and sub-circular; its diameter entering four times and a half in the length of the side of the head. The tip of the lower jaw hardly projects beyond the anterior rim of the orbit. The posterior extremity of the maxillar bone extends as far as the sub-opercle. The anterior margin of the dorsal fin is nearer the base of the caudal than the tip of the snout, and as high as its base is long. The anal is much longer than deep; its base entering about seven times in the total length; it is quite concave upon its middle and much deeper anteriorly than posteriorly. The caudal fin constitutes a little more than the sixth of the total length. The ventrals are inserted somewhat in advance of the dorsal fin, and, being quite small, their extremities do not extend as far as the vent; their posterior margin is broad when expanded and sub-convex. An elongated membranous scale exists near the outer margin of these fins, and another between them, similar to those of the pectoral fins. The pectorals themselves are much larger than the ventrals, broad when expanded, obliquely truncated posteriorly, almost linear. The axillar membranous scale is nearly as long as the upper edge of these fins.

A vertical line dropped from the insertion of the last ray of the dorsal fin would intersect the vent, situated near the anterior margin of the anal fin.

D 1, 14 + 1; A 1, 19 + 1; C 3, 1, 9, 8, 1, 2; V 8; P 17.

The scales are very large, much deeper than long, undulating upon their anterior margin, and rounded off posteriorly, with a few irregular radiating grooves upon the anterior section.

The upper surface of the head and the back are deep bluish brown or blackish; the sides and inferior regions reflecting a uniform silvery tint. The dorsal and caudal fins are greyish yellow, whilst the anal, ventrals, and pectorals are of a light straw color.

List of specimens.

| Cat.l. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|-------|-----------------------|-----------------|--------------------|----------------------|---------------------|
| 941 | 8 | Adult | Shoalwater bay, W. T. | 1853 | Gov. I. I. Stevens | Alcoholic | Dr. Jas. G. Cooper. |
| 942 | 6 | do | Astoria, Oregon | 1854 | Lieut. Trowbridge | do | Lieut. Trowbridge |
| 943 | 10 | do | San Diego, Cal. | 1853 | do | do | A. Cassidy |
| 944 | 6 | Young | California | 1853 | do | do | Lieut. Trowbridge |
| 945 | 2 | do | San Diego, Cal. | 1857 | A. Cassidy | do | A. Cassidy |

2. ENGRAULIS NANUS, Grd.

SPEC. CHAR.—Body short and slender, tapering posteriorly, and very much compressed. Head constituting the third of the length, the caudal fin excluded. Snout sub-conical. Posterior extremity of maxillar bone extending to the interopercle. Eye large and sub-circular; its diameter entering four times and a half in the length of the side of the head, exactly once in advance of its anterior rim. Anterior margin of dorsal fin equidistant between the tip of the snout and the fork of the caudal fin. Base of anal fin entering six times and a half in the total length. Vent situated immediately in advance of the anterior margin of the anal fin and behind the base of the dorsal. Ventrals rather small, broad when expanded, sub-convex; their tips not quite reaching the vent. Pectorals slender, rather elongated, posteriorly sub-truncated, not extending to the origin of the ventrals. Reddish brown above, silvery white beneath.

This species is more closely allied to *E. mordax* than to any other species so far known on the Pacific range of North America, although less elongated, in which respect it resembles *E. delicatissimus*, although the profile of the body reminds us of that of the preceding species. The greatest depth entering about five times and a half in the total length. The dorsal is higher than long, superiorly linear and diminished less rapidly in height than in the preceding and following species. The anterior half of the anal is triangular, and rather low posteriorly to the middle of its length.

D 12; A 1, 16 + 1; C 4, 1, 9, 8, 1, 5; V 7; P 10.

The scales are not preserved upon the specimen which we have examined.

The upper surface of the head and the dorsal region are reddish brown; the sides of the head, flanks, and belly exhibiting a silvery tint. The dorsal and caudal are greyish olive; the other fins being yellowish, or light straw color.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nat. of spec. | Collected by— |
|------------|--------------|----------------------|-----------------|------------------------|---------------|---------------------|
| 946 | I | San Francisco, Cal.. | 1853 | Lt. R. S. Williamson.. | Alcoholic.. | Dr. A. L. Heermann. |

3. ENGRAULIS DELICATISSIMUS, Grd.

SPEC. CHAR.—Body very much compressed, sub-fusiform in profile. Head contained nearly five times and a half in the total length. Posterior extremity of maxillar bone extending to the gill apertures. Eye large and circular; its diameter entering three times in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the tip of the snout. Base of anal fin entering about five times in the total length. Vent situated opposite the anterior margin of the dorsal fin. Ventrals very small; their tips reaching the vent. Pectorals slender and lanceolated, not extending to the origin of the ventrals. Yellowish, with a silvery streak along the middle of the flanks.

SYN.—*Engraulis delicatissimus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 154.

The specimens of this species now before us may still be immature, and the very natural question arises, whether it is not the young of the preceding one. On close comparison, however, the characters assigned to it will strike every one as most conspicuous. Its general appearance or *fascies* is widely different from that of either *E. encrasiicholus* or *E. mordax*; the body being more compressed, less tapering, the head much shorter and the snout less acute. The entire length of the largest specimen before us is about three inches, the head being contained in it nearly five times and a half. The greatest depth of body is somewhat less than the length of head, the upper surface of which is convex and but slightly declivous. The eye

is large and circular; its diameter entering about three times in the length of the side of head. The snout is abbreviated, the apex of the lower jaw projecting considerably in advance of the orbit, and the posterior extremity of the maxillar bone extending to the gill apertures. The dorsal fin is sub-triangular, anteriorly higher than long, its origin being nearer the tip of the snout than the extremity of the caudal fin. The latter is furcated and nearly equal to the head in length. The base of the anal fin is almost twice as long as that of the dorsal, and its anterior margin situated opposite the middle region of the latter; its base entering about five times in the total length. The ventrals are small and short, posteriorly sub-truncated; their extremities reaching the vent, which is placed midway between the origin of the anal fin and the insertion of the ventrals, being just opposite the anterior margin of the dorsal fin. The pectorals are elongated, slender, and sub-lanceolated; their posterior extremities being but at a short distance from the insertion of the ventrals.

D 2, 13; A 2, 22 + 1; C 7, 1, 8, 8, 1, 6; V 5; P 12.

The few scales which still remain scattered, are very large and deeper than long. The ground color is yellowish; a silvery band, about a tenth of an inch or slightly more in width, occupies the middle of the flanks from the head to the base of the caudal fin.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|----------------------|-----------------|-------------------------|---------------------|----------------|
| 947 | 18 | San Diego, Cal. | 1853 | Lieut. W. P. Trowbridge | Alcoholic..... | A. Cassidy.... |

4. ENGRAULIS COMPRESSUS, Grd.

SPEC. CHAR.—Body very much compressed, rather short and deep. Head constituting about the fifth of the total length, snout abbreviated. Posterior extremity of maxillar bone extending to the interopercle. Eye large and sub-circular; its diameter entering about three times and a half in the length of the side of the head. Anterior margin of dorsal fin nearly equidistant between the tip of the snout and the fork of the caudal fin. Base of anal fin entering three times in the length, the caudal fin excluded. The latter is somewhat shorter than the head. Vent situated near the origin of the anal and opposite the anterior margin of the dorsal fin. Ventrals quite small, nearly reaching the vent. Pectorals broad and well developed, extending as far as the insertion of the ventrals. Yellowish brown, with a silvery streak along the middle of the flanks.

This species, in its general appearance, so closely resembles *E. delicatissimus*, that on a superficial inspection we had supposed it was identical with it. On a closer examination we became very soon acquainted with differential characters so striking, that nothing after that was easier than to tell the differences between the two species.

The greatest length of the specimens before us is scarcely four inches; the greatest depth being equal to the length of the head, hence enters about five times in the total length. The snout is sub-conical and quite abbreviated. The dorsal fin is much higher than long, and sub-triangular in shape. The anal fin is very long; its anterior third constituting a triangular figure, whilst its remaining portion is very low. Its origin is placed opposite the middle of the dorsal; the vent being quite near to it. The ventrals are rather small, posteriorly sub-truncated, and when directed backwards their extremities approximate the vent. The pectorals are well

developed, sub-falciform upon their posterior margin; their extremities reaching the origin of the ventrals. The axillar membranous scales are tapering, of moderate length, and shorter than the fin.

D 1, 11 + 1; A 2, 35 + 1; C 6, 1, 9, 8, 1, 7; V 6; P 14.

The scales are large, deeper than long, anteriorly sub-truncated, posteriorly rounded, with irregular furrows or grooves. They are, as usually, very deciduous, for, a few only remain scattered over the body.

The color is yellowish brown, with a silvery streak along the middle of the flanks. The fins being greyish olive.

List of specimens.

| Catal. No. | No. of spec | Locality. | When collected. | Whence obtained. | Nature of spec. | Collected by— |
|------------|-------------|---------------------|-----------------|------------------|-----------------|-----------------|
| 948 | 5 | San Diego, Cal..... | 1857 | A. Cassidy..... | Alcoholic..... | A. Cassidy..... |

ORDER V.

PLECTOGNATHI.

The premaxillar and maxillar bones are united into one continuous immovable bony piece. The internal skeleton is but partly ossified. The opercular apparatus is hidden under a thickened skin. Branchial apertures small. The surface of the skin is either protected with enamelled scales, (ganoid,) else with asperities or spinous productions, characters by which these fishes are always easily distinguished from those of the other orders. The swimming or air bladder has no air duct in communication with the throat.

SYN.—*Plectognathes*, CUV. Tabl. élém. Hist. nat. Anim. 1798; Règn. Anim. II, 1817, 144; 2d ed. II, 1829; &, ed. illustr. Poiss. 333.

Plectognathi, BONAP. Sagg. Distr. metod. Anim. Vertebr. 1831, 120.—RICHARDS. Faun. Bor. Amer. III, 1836, 277.—DEKAY, New Y. Faun. IV, 1842, 323.—MULL. in *Wieg.* Archiv für Naturg. 1845, I, 134, & 137.—STORER, Synops. 1846, 239.

The family of *Ostracionidae*, the third of this Order, has furnished as yet no representatives to the ichthyic fauna of our western coast, where, no doubt, some of them exist. Not being marketable fishes, they are no object of attraction except to naturalists, who, so far, have had but few opportunities to prosecute their explorations in that region of the country.

A "sun-fish," "head-fish," or "moon-fish," (*Orthogoriscus*) as sometimes called, has been observed off the harbor of San Diego, as I am informed by my friend Lieut. Trowbridge. The "moon-fish" may well be considered as the type of a fourth family (*Orthogoriscidae*) amongst the Plectognathians.

Family BALISTIDÆ, Bonap.

The body is compressed, rather short and deep, covered with either large or small scales, or else with prickles, or granules. The snout is sub-conical and prolonged, terminated by a small mouth provided with a few isolated teeth. There are two dorsal fins, the anterior one often reduced to a single spine. The pelvic bone is prominent; the ventral fins being, however, but imperfectly developed.

SYN.—*Balistidae*, BONAP. Sagg. Distr. metod. Anim. Vertebr. 1831, 120.—DEKAY, New Y. Faun. IV, 1842, 333.—STORER, Synops. 1846, 243.

Balistini, BONAP. Catal. metod. Pisc. Europ. 1846, 88.—MULL. in *Wieg.* Archiv für Naturg. 1845, I, 134 & 137.
Balistides, DUM. Ichthyol. analyt. 1856, 177.

A species of this family was received during the early part of the present year from San Diego, California, where it was collected by A. Cassidy. The specimens having been mislaid in the moving of the Smithsonian collections from one end of the building to another a few months since, we are unable at present to refer it to its proper genus, and give any further description of the species, beyond stating that the specimens were of a jet black tint, with light (either white or yellow) margined fins.

Family GYMNODONTIDÆ, Yarrell.

The skin is studded either with prickles or with granules. The shape of the body is short, thick, and rounded in some, oblong and compressed in others. The ventral fins are wanting. The snout is abbreviated and rounded. The mouth is rather small, provided with teeth of a very peculiar structure; there are either one or two in either jaw, resembling somewhat the bill of a parrot, the teeth themselves being composed of laminae, which wear off and are at the same time renewed. These laminae represent as many isolated teeth, which have combined into that compact mass, occupying the whole extent of the jaws.

SYN.—*Gymnodontes*, Cuv. R \ddot{e} gn. Anim. II, 1817, 145; 2d ed, II, 1829; &, ed. illustr. Poiss. 334.—MULL. in *Wieg.* Archiv für Naturg. 1845, I, 134 & 137.

Gymnodontidae, YARRELL, Hist. Brit. Fish. II, 1836; &, 2d ed. 1841, 457.—DE KAY, New Y. Faun. IV, 1842, 323.—STORER, Synops. 1846, 239.

Tetraodontidae, BONAP. Sagg. Distr. metod. Anim. Vertebr. 1831, 120.

Gymnognathes, DUM. Ichth. analyt. 1856, 157.

The fishes of this family have only three branchial combs, or gills, a peculiarity of organization occurring in but few others. The swimming or air bladder is composed of two regular, symmetrical, and approximated partitions, or lobes, within which small pouches, or compartments, may be observed, giving rise to the idea that they were the analogues of the lungs.

Most of the species, moreover, have the faculty of introducing atmospheric air into the stomach, to swallow air, as it were, by which process they increase in bulk, and diminish at the same time in specific gravity. In that condition they float motionless at the surface of the water, occasionally reversed so as to keep the dorsal region downwards. Hence the vernacular appellation of "balloon-fish," "globe-fish," "puffer," "swell-fish," &c. When caught, a sound or grunt is heard, caused either by the escape of the air from the stomach, else by that of the gases from the swimming bladder. We recollect having found sand, gravel, and pebbles to a considerable size in the stomach of a species of *Tetraodon* from the Atlantic coast.

TETRAODON, Linn.

GEN. CHAR.—Body short or elongated, with the abdominal region capable of much extension, and covered either wholly or partially with prickles; else smooth or studded with granules. Jaws divided upon their middle by a vertical suture, presenting the appearance as though four teeth were extant, two above and two below.

SYN.—*Tetraodon*, LINN, Syst. Nature, ed. X^a I, 1678, 332; &, Mus. Adolph. Frid. 1764, 55.—Cuv. R \ddot{e} gn. Anim. II, 1817, 147; 2d ed. II, 1829; &, ed. II, 1829; &, ed. illustr. Poiss. 337.—STORER, Rep. Fish Mass. 1839, 169; &, Synops. 1846, 241.—DE KAY, New Y. Faun. IV, 1842, 327.—MULL. in *Wieg.* Archiv für Naturg. I, 1843, 330.—DUM. Ichthyol. analyt. 1856, 160.

The genus *Tetraodon* has recently been revised by J. J. Kaup in a catalogue, still MSS., of the *Plectognathi* of the British Museum. Several new genera are proposed by him; but their description not having come to our knowledge, we are unable to tell at present whether the following species belongs to the genus *Tetraodon*, as limited and characterized by that German naturalist.

TETRAODON POLITUS, G r d .

Smooth Balloon-Fish.

SPEC. CHAR.—Body sub-cylindrical. Head very large, constituting the third of the length, caudal fin excluded. Pectorals broad, short, and rounded. Caudal posteriorly sub-convex. Skin perfectly smooth all over, the prickles remaining within the derm in the shape of indurated needles. Olivaceous brown above, maculated with black; yellowish and unicolor beneath.

The head is sub-quadrangular, sub-pyramidal, larger across the thoracic region than the anterior portion of the body. Its upper surface is gently convex and quite declivous from the eyes to the snout, which is obtusely rounded off. The lips are thick and fleshy, with their surface papillar, the mouth being proportionally large. The eyes are rather small, sub-elliptical, approximating the upper surface of the skull, their longitudinal diameter entering nearly eight times in the length of the side of the head.

The body from the thoracic belt tapers regularly backwards. The peduncle of the tail is compressed, becoming quite thin at the insertion of the caudal. The height of the dorsal fin is more than twice the length of its base; its upper margin is sub-convex; its origin is equidistant between the branchial apertures and the posterior margin of the caudal fin. The anal is inserted opposite the dorsal and somewhat further backwards; it is narrower than the dorsal, and nearly as deep as the latter is high, its inferior margin being quite convex. The caudal is posteriorly sub-truncated; else broadly rounded off, and contained short of six times in the total length. The pectorals are very broad, rather short, posteriorly rounded off, or else convex.

D 1, 7; A 1, 6; C 2, 1, 4, 4, 2; V 0; P 15.

The skin is perfectly smooth to the touch. The small spines or prickles which are observed in other species of this genus appear to remain in the present one in an undeveloped or embryonic condition within the skin.

The specimen described is somewhat over twelve inches in total length.

The upper region of the body and head is olivaceous brown, maculated with black, minutely and profusely dotted with black also; the inferior region, from the middle of the flanks, being uniform yellowish, sometimes merging into an orange tint. The dorsal and caudal fins are olivaceous brown; the pectorals and anal yellowish.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|----------------------------|-----------------|------------------|---------------------|-----------------|
| 983 | 1 | San Diego, California..... | 1857 | A. Cassidy..... | Alcoholic. | A. Cassidy..... |

ORDER VI.

LOPHOBRANCHII.

The bony frame or skeleton is but partly ossified in the fishes which compose this Order, and their body is protected by scales or plates partly bony and partly corneous in structure, polygonal in shape, articulated and movable one upon another. The jaws are produced forwards, and united into a tube, at the apex of which the mouth is situated. The swimming or air bladder has no air duct leading to the throat. The gill apertures are small, one on either side of the nape, and the gills, instead of being comb-like, assume a tuft-like or granulated structure, arranged upon two series and situated under large, convex, and bony opercles. There are no cæca to the intestine.

SYN.—*Lophobranches*, CUV. R^{egn.} Anim. II, 1817, 155; 2d ed. II, 1829; &, cd. illustr. Poiss. 329.—DUM. Ichth. analyt. 1856, 169.

Lophobranchii, BONAP. Sagg. Distr. metod. anim. vertebr. 1831, 119.—RICHARDS. Faun. Bor. Amer. III, 1836, 276.—DEKAY, New York Faun. IV, 1842, 319.—MILL. in *Wieg.* Archiv für Naturg. 1845, 1, 137.—STORER, Synops. 1846, 235.—OWEN, Lect. Comp. Anat. Vert. Anim. 1846, 50.

The members of this order are quite diversified in their external aspect. From the Sea-Horse (*Hippocampus*) to the flying sea-horse (*Pegasus*) there is a gradual transition, the orientation excepted; but from the latter to the Pipe-fish (*Syngnathus*) there is quite a step. The peculiar structure of the gills appears to be the chief binding trait between these extreme forms.

In *Hippocampus* and *Syngnathus* the muscles presiding over the movements of the dorsal and pectoral fins must assume a most perfect structure, if we are to judge of them by the action of these fins. Every ray has a range of movements almost unequalled in the class of fish. These are so rapid that the eye can hardly catch them while in motion—we were going to say in vibration. They execute a series of undulations in the longitudinal and vertical directions so as to simulate a screw in every sense of the word, and we would advise the inventive genius of our mechanics who study the screw propelling problem to pause an instant before this organic machinery, and ascertain whether nature has understood that problem as well as themselves.

In either of the genera we have just been alluding to we find that the male sex is provided with an elongated sub-caudal pouch, into which the eggs are sheltered, not merely until hatched, but where the embryos themselves remain for a certain length of time. Some very peculiar habits must be connected with this curious structure; peculiarities connected with the fecundation of the eggs themselves and the moral tendencies of either sexes, since the male is made here the exclusive guardian and protector of the progeny.

In treating of the stickle-backs (*Gasterosteus*) we have noticed traits somewhat parallel to these: we allude to the construction of a nest by the male, and the watch he institutes over the eggs therein laid by the female.—(See page 86.)

Similar facts in the class of fishes are no longer isolated, as they have been in the past history of ichthyology. The sun-fish (*Pomotis*), the cat-fish (*Pimelodus*), and the lump-fish

(*Cyclopterus*), exhibit traits of a kindred nature. In most of the minnows (*Cyprinodontidae*) and the *Anableps*, the eggs hatch within the abdomen of the female, and in the Embiotocoids there is a special pouch within which the eggs are first formed and afterwards develop until the young have undergone their fullest metamorphoses. The Embiotocoids, when observed for the first time, seemingly recalled to mind the opossum of North America, and the entire tribe of the kangaroo of Australia; but if any fish deserves the appellation of opossum-fish we venture to claim it for the tribes of *Lophobranchii* we are treating of in these pages.

The *Lophobranchii* have been recently the subject of investigations on the part of Mr. Kaup. The genera which he has established being for the present known to us only nominatively, we are at a loss to distribute them in the families we are inclined to adopt in the present Order. The generic divisions adopted by Mr. Duméril in his "Ichthyologie analytique" are not sufficiently characterised to the same purpose.

Family HIPPOCAMPIDÆ, Owen.

The "sea-horse" family being composed, to our knowledge, of but one genus (*Hippocampus*), we will not enlarge upon its characters here, since alluding to them would be a mere repetition of their enumeration further on.

SYN.—*Hippocampidae*, OWEN, Lect. Comp. Anat. Vertebr. Anim. 1846, 50.—Bd. Iconogr. Encycl. II, 1850, 232.

This family is not adopted by all systematic writers, some of whom combining it with that of *Syngnathidae*, either under the latter appellation, else designating it by the name of the Order itself. The position these fishes assume in the media in which they live is not the least of their peculiarities entitling them to the rank of a family in the ichthyic method.

HIPPOCAMPUS, Cuv.

GEN. CHAR.—Body short, deep, and compressed heptangular; tail slender, quadrangular, tapering, and coiled up inwardly. External surface of both body and tail divided into parallelograms by longitudinal and transverse ridges, with tubercular points at the angles of intersection. Head sub-pyramidal, bent downwards. One dorsal fin; neither caudal nor ventrals; an anal fin in both sexes. Pectoral fins of moderate development.

SYN.—*Hippocampus*, Cuv. Règn. Anim. II, 1817, 157; 2d ed. II, 1829; &, ed. illustr. Poiss. 331.—STORER, Rep. Fish. Mass. 1839, 167; &, Synops. 1846, 239.—DEKAY, New Y. Faun. IV, 1842, 322.—DUM. Ichthyol. analyt. 1856, 170.

Deprived of caudal fin to execute their onwards motion, the sea-horses (*Hippocampus*) are reduced to coiling up their tail and to assume a vertical position in the medium in which they live, a position unknown elsewhere in the class of fish. They progress slowly and uniformly forwards or obliquely upwards; in their descending movements the orientation is not changed; the tail remains directed downwards. The movements are executed by the means of the pectoral fins; the dorsal acting chiefly as a rudder. They appear to be easily tired, for after being active a short time they seek submarine supports to which they attach themselves by the means of their prehensile tail.

HIPPOCAMPUS INGENS, Grd.

The Great California Sea-Horse.

SPEC. CHAR.—Body composed of twelve segments; tail longer than the body and head together, divided into thirty-eight segments. Head constituting the sixth of the total length; it being contained about twice in the length of the body and thrice in that of the tail. Spiny crest at the base of the snout rather inconspicuous. Three pairs only of thoracic bony processes. Blackish or deep chestnut brown, punctulated with white.

Some of the specimens before us measure nine inches in total length, from the apex of the snout to the tip of the tail. The length of the rostrum from the anterior rim of the orbit to the tip of the snout is the half of the length of the head. The eye is circular, and its diameter enters six times in the length of the side of the head: hence thrice anteriorly to the orbit. The occipital bony process is subpentagonal, and crowned by five obtuse, nearly horizontal points, sometimes reduced to finely crenated ridges; a feature not altogether peculiar to this species. Upon the anterior declivity of the same process may be seen one or more blunt protuberances. The supra-orbital process terminates either into a crenated ridge or a double blunt knob. Between the latter processes there is a shallow inter-orbital depression converging anteriorly into an acute angle, at the summit of which may be observed the inter-olfactive crest, which is rather small and finely crenated. On either side of this crest, and close to the orbit, are situated the nostrils at the very base of the tubular rostrum. The supra-tympanic process is simple and nearly horizontal. The thoracic arch exhibits three small processes: one upon its upper extremity, nearly at the same level with the supra-tympanic one; the second or middle one in advance of the insertion of the pectoral fin immediately below its middle; the third occupies the inferior branch of the said arch, being directed downwards and backwards. The processes at the angles of intersection of the ridges of the surface of the body and tail are sometimes acute; at others, crest-like. This is especially the case over the ventral line where they assume their greatest development. The subcaudal embryonal pouch of the male is nearly equal $\frac{2}{3}$ to the body in length; hence, much shorter than the remaining portion of the tail. The vent is placed nearly opposite the middle of the dorsal fin. The dorsal fin itself is longer than high, superiorly convex, and rather higher posteriorly than anteriorly; its base entering about $\frac{2}{3}$ thrice in the length of the body, and twice and a half time between its anterior margin and the occiput. The pectorals are very broad and short, posteriorly rounded off; their longest rays being nearly equal to the insertion of the fins themselves. The anal is much deeper than broad; the middle rays are the deepest.

D 19; A 4; C 0, 0; V 0; P 15.

The ground color is either entirely olivaceous black, or yellow, maculated with deep chesnut brown; crowded whitish dots being scattered all over the body, head, and tail. About the orbits these dots are arranged upon irradiating series; and over the sides of the head, in series irregularly undulating.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|----------------------------|-----------------|------------------|---------------------|-----------------|
| 982 | 5 | San Diego, California..... | 1857 | A. Cassidy..... | Alcoholic. | A. Cassipy..... |

Family SYNGNATHIDAE, Bonap.

The same remark consigned under the head of *Hippocampidae* applies to this family, for the genus *Syngnathus* is its sole generic type, which we have had an opportunity of examining. Those established by Kaup are quite numerous, but the description of their characters has not yet come into our hands.

SYN.—*Syngnathidae*, BONAP. Sagg. Distr. metod. Anim. Vertebr., 1831, 119.—DEKAY, New Y. Faun. IV, 1842, 319.—STORER, Rep. Fish, MASS. 1839, 162; &, Synops. 1846, 238.—OWEN, Lect. Comp. Anat. Vertebr. Anim. 1846, 50.—ID. Iconogr. Encycl. II, 1850, 232.

On either coast of North America the genus *Syngnathus* is the only one of the family which has furnished us with representatives. They have been observed from the coast of Massachusetts to the Gulf of Mexico, and from San Diego, California, to Puget's Sound, Washington Territory.

SYNGNATHUS, Artedi.

GEN. CHAR.—Body elongated, slender, heptangular; tail slender, elongated, tapering, and quadrangular, continuous with the body, and longer than the body and head together. Body and tail both covered with indurated parallelogramic plates, arranged in longitudinal and parallel series, with a slight longitudinal and crested ridge along their middle. Head elongated, slender, and sub-cylindrical, in a direct line with the body. Opercular apparatus large; branchial apertures small. One single dorsal fin; one caudal, posteriorly rounded or convex; no ventrals; a vestige of an anal in the female sex. Pectorals broad and short.

SYN.—*Syngnathus*, ART. Gen. Pisc. 1738; &, ed. Walbaum, 1792, I.—LINN. Syst. Nat. ed. X^a I, 1758, 336.—CUV. Règn. Anim. II, 1817, 156; 2d ed. II, 1829; &, ed. illustr. Poiss. 330.—STORER, Rep. Fish. Mass. 1839, 162; &, Synops. 1846, 238.—DEKAY, New Y. Faun. IV, 1842, 319.—DUM. Ichth. analyt. 1856, 171.

The pipe-fish (*Syngnathus*) assume a horizontal position in the medium in which they live as usual in the class of fishes. Their onward movements depending chiefly upon the exertion of the dorsal and pectoral fins, which are the propelling organs; the caudal playing the part of a rudder.

1. SYNGNATHUS CALIFORNIENSIS, Storer.

Californian Pipe-Fish.

SPEC. CHAR.—Head contained seven times in the total length; a little short of twice in that of the body. Anterior rim of the orbit nearer the insertion of the pectoral fins than the apex of the snout. Longitudinal diameter of the orbit entering nine times and a half in the length of the side of the head. Origin of dorsal fin situated opposite the anterior edge of the vent; its base in the male sex entering twice in the length of the body, from the concavity of the thoracic belt to the vent. Dark reddish brown; yellowish beneath; lower portion of the sides dashed with white.

SYN.—*Syngnathus californiensis*, STORER, in Proc. Bost. Soc. Nat. Hist. II, 1845, 73; &, Synops. 1846, 272.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 137.

Syngnathus griso-lineatus, AYRES, in Proc. Cal. Acad. Nat. Sc. I, Dec. 1854, 14.

Having had an opportunity of studying either sex of this species comparatively, the characters assigned to it have thus served as a standard towards the discrimination of the following species, some of which being based upon male, others upon female specimens alone.

The largest specimens before us measure over eleven inches in total length; the head forming the seventh part of it. Nineteen plates may be counted anteriorly to the vent, and forty-two posterior to it; the vent itself occupying one intermediate plate. The base of the dorsal fin of the female sex entering twice and a half times on the distance between the concavity of the thoracic belt and the posterior edge of the anal aperture; its posterior margin in either sex being nearer the extremity of the caudal than the apex of the snout; much more so in the female than in the male. The length of the sub-caudal pouch being equal to the distance between the vent and the anterior third of the snout.

D 38; A 3; C 1, 4, 4, 1; V 0; P 12 or 13.

The color of the upper regions are dark reddish brown, somewhat lighter on the flanks, the lower part of which are dashed with whitish. The inferior regions are yellowish white maculated with brownish.

List of specimens.

| Catal. No. | No. of spec. | Sexes. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimen. | Collected by— |
|------------|--------------|--------|------------------------|-----------------|----------------------|-----------|---------------------|----------------------|
| 967 | 4 | ♂ & ♀ | Tomales bay, Cal..... | 1855 | E. Samuels..... | | Alcoholic. | E. Samuels..... |
| 968 | 1 | ♀ | San Francisco, Cal.... | 1856 | Dr. W. O. Ayres..... | 25 |do.... | Dr. W. O. Ayres..... |
| 973 | 1 | ..... | Monterey, Cal..... | 1855 | A. S. Taylor..... | |do.... | A. S. Taylor..... |

2. SYNGNATHUS BREVIROSTRIS, Grd.

Short-nosed Pipe-fish.

SPEC. CHAR.—Head contained eight times in the total length: a little over twice in that of the body. Anterior rim of the orbit nearer the apex of the snout than the base of the pectoral fins. Longitudinal diameter of the orbit entering seven times and a half in the length of the side of the head. Origin of dorsal fin placed opposite the anterior edge of the anal aperture; its base, in the male sex, entering twice and a half times in the length of the body. Olivaceous brown, with darker maculae above and whitish dots beneath.

SYN.—*Syngnathus brevirostris*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 156.

The total length of the specimen before us measures about six inches and a quarter; the head forming the eighth part of it. There are eighteen plates anterior to the vent, and thirty-seven posterior to it. The base of the dorsal fin enters twice and one fourth in the length of the body; the posterior margin of the same fin is nearly equidistant between the apex of the snout and the extremity of the caudal fin. The length of the sub-caudal pouch is equal to the distance between the vent and the pupil.

D 30; A 0; C 1, 4, 4, 1; V 0; P 12.

The color is olivaceous brown; the head being vermiculated, and the body maculated with blackish brown; the lower portion of the flanks and the belly are dotted with white. The caudal region assuming a darker tint than the body and the head.

List of specimens.

| Catal. No. | No. of spec. | Sex. | Locality. | Whence obtained. | When collected. | Nature of specimens. | Collected by— |
|------------|--------------|------|----------------------------|-------------------------|-----------------|----------------------|----------------|
| 969 | 1 | ♂ | San Diego, California..... | Lieut. W. P. Trowbridge | 1853 | Alcoholic... | A. Cassidy ... |

3. SYNGNATHUS LEPTORHYNCHUS, Grd.

Slender-nosed Pipe-fish.

SPEC. CHAR.—Head contained six times and a half in the total length, caudal fin excluded: twice in that of the body. Anterior rim of the orbit nearer the base of the pectoral fins than the apex of the snout. Longitudinal diameter of the orbit entering seven times and a half in the length of the side of the head. Origin of dorsal fin situated nearly opposite the anterior edge of the vent, rather posteriorly than anteriorly to that point; its base, in the female sex, entering thrice on the distance between the concavity of thoracic belt and the posterior edge of the anal aperture. Dorsal region yellowish brown; sides olivaceous and vermiculated; abdomen yellowish.

SYN.—*Syngnathus leptorhynchus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 156.

The entire length of the specimen observed measures six inches, the head forming more than the seventh part of it. There are eighteen plates anterior to the vent, and forty-one posterior

to it. The posterior margin of the dorsal fin is nearer the extremity of the caudal than the apex of the snout.

D 32; A 3; C 1, 4, 4, 1; V 0; P 10.

The dorsal region is yellowish brown; the flanks are olivaceous, the upper half maculated or streaked with blackish, the lower half vermiculated with brown; the belly being yellowish with a more open mesh work of brownish lines.

List of specimens.

| Catal. No. | No. of spec. | Sex. | Locality. | Whence obtained. | When collected | Nature of specimens. | Collected by— |
|------------|--------------|------|-------------------------------|-----------------------|----------------|----------------------|----------------------|
| 670 | 1 | ♀ | San Diego, California | Lt. W. P. Trowbridge. | 1853 | Alcoholic... | A. Cassidy |

4. SYNGNATHUS ABBOTI, Gr d.

Abbot's Pipe-fish.

SPEC. CHAR.—Head contained seven times and a half in the total length, caudal fin excluded: somewhat over twice in that of the body. Anterior rim of the orbit nearer the insertion of the pectoral fins than the apex of the snout. Longitudinal diameter of the orbit entering eight times in the length of the side of the head. Origin of dorsal fin situated rather in advance of the anterior edge of the anal aperture; its base, in the female sex, entering twice and one-third of a time on the distance between the concavity of the thoracic belt and the anterior edge of the vent. Dark or blackish brown above; brownish beneath.

A very slender and elongated species; the specimen before us measuring a little over nine inches. There are nineteen plates anterior to the vent, and forty-two posterior to it. The head constitutes more than the eighth part of the length. The posterior margin of the dorsal fin is nearer the extremity of the caudal than the apex of the snout.

D 39; A 3; C 1, 4, 4, 1; V 0; P 12.

The upper region of the head and body is blackish brown; the sides of the head and the flanks assume the same tint, but are finely streaked or dotted with yellowish golden. The inferior surface of the head and belly are yellowish golden, maculated with brown or black. The caudal region is darker than the body.

List of specimens.

| Catal. No. | No. of spec. | Sex. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|------|-----------------------------|-----------------|--------------------------|---------------------|-------------------------|
| 971 | 1 | ♀ | San Francisco, California.. | 1855 | Lt. R. S. Williamson.... | Alcoholic. | Dr. John S. Newberry... |

5. SYNGNATHUS ARUNDINACEUS, Gr d.

Reed Pipe-fish.

SPEC. CHAR.—Head contained seven times in the total length; twice in that of the body. Anterior rim of the orbit equidistant between the apex of the snout and the insertion of the pectoral fins. Longitudinal diameter of the orbit entering eight times and a half in the length of the side of the head. Anterior margin of dorsal fin situated in advance of the anal aperture; its base, in the male sex, entering twice and a quarter of a time on the distance between the concavity of the thoracic belt and the anterior edge of the vent. Blackish brown, maculated beneath with golden yellow.

This species has the general appearance of the preceding one, and the specimen referred to being of the same length, a comparison between the two species is thus made most thorough, and would be still more so had we before us the same sexes.

There are eighteen plates anterior to the vent, and forty-three posterior to it. The head constitutes the seventh of the total length. The posterior margin of the dorsal fin is equidistant between the apex of the snout and the extremity of the caudal fin.

The length of the sub-caudal pouch is equal to the distance between the vent and the apex of the snout.

D 34; A 0; C 1, 4, 4, 1; V 0; P 11 or 12.

The color is blackish brown; the lower part of the flanks and the belly being maculated with golden yellow. The sides of the head exhibit likewise yellowish streaks.

List of specimens.

| Catal. No. | No. of spec. | Sex. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|------|--------------------------|-----------------|----------------------|----------------------|-----------------------|
| 972 | 1 | ♂ | Coast of California..... | 1855 | Dr. George Suckley.. | Alcoholic .. | Dr. George Suckley... |

ORDER VII.

GANOIDEI.

In the representatives of the Ganoid order the internal skeleton is either bony or else cartilaginous, and the scales which invest the surface of their body consist either of angular or rounded plates, of a bony base, and covered with an external layer of enamel, similar in structure to the enamel of teeth, else they assume the shape of bony shields; others still are perfectly naked. The caudal fin is more or less heterocercal, and the anterior margin of the fins often provided with a double series of shingle-like plates, or points the so called fulcræ. Several of them are provided with an accessory breathing organ placed under the opercle, and which is to be distinguished from a pseudo-branchia. Some of them are likewise possessed with spiracles. The swimming or air bladder is provided with an air duct, which communicates with the throat, as in many osseous fishes; but the *rete mirabile* is wanting. There are oviducts leading the eggs out, without allowing them to fall in the abdominal cavity. Oftentimes the intestinal canal exhibits a spiral valve, as in *Plagios'omi*. The manifold valves of the aorta, the free gills protected by an opercle, an accessory gill under the gill covers, and the abdominal position of the ventrals, are characters which the ganoids alone exhibit in combination. To these may be added a peculiarity in the direction of the optic nerves, which consist in not crossing one another before entering the orbit.

SYN.—*Ganoides*, AGASS. Rech. Poiss. foss. II, 1833, IX.

Ganoidei, BONAP. Vert. Syst. 1837, 43 ; &, Catal. Pisc. Europ. 1846, 4.—AGASS. Nomencl. Zool. Pisc., 1844. MÜLL. in Wiegm. Archiv für Naturg. 1845, I, 129 & 137.

The structure and natural affinities of the fishes constituting the ganoid order have been made the subject of very special investigations by Prof. Joh. Müller, and which have somewhat modified their classification as formerly proposed by Prof. Agassiz. Müller's researches are the standard of all future investigations upon this strange and curious order of fishes, and which includes numerous extinct types, illustrated and described in the various works on Palaeontology or fossil remains.

Family AMIADAE, Baird.

Opinions are at variance regarding the systematic position this family is to occupy in the class of fishes. Its representatives are but few, perhaps reduced to a single living species, which has been placed by some writers in the herring family, whilst others have associated it with some extinct types of past eras. Still others consider it as entitled to a place amongst Holostean ganoids, on the ground of the aorta being provided with five or six valves.

SYN.—*Amiadae*, Bd Iconogr. Encyclop. II, 1850, 234.

The genus *Amia*, so far unique in this family, is exclusively confined to the fresh waters of North America, and occurs chiefly in the southern and northwestern States, where they are known under the names of "mud-fish" and "marsh-fish," and sometimes "dog-fish" also

The latter, however, is more local, and seems to have originated amongst the settlers of the western and northwestern States. In the lake Champlain, it is known as the "bowfin;" the name of "mud-fish" prevailing at the south, and that of "marsh-fish" at the extreme north, in Canada especially.

AMIA, Linn.

GEN. CHAR.—Body elongated, sub-cylindrical, somewhat deeper than broad, else compressed, covered with flexible and imbricated, posteriorly rounded or sub-angular scales, mailed or ganoid in structure. The head is rather short and rounded; its upper surface being depressed, naked, exhibiting conspicuous sutures. The mouth large, and the jaws sub-equal, provided with conical teeth and an exterior row of smaller pavement-like ones within. The gill apertures are continuous under the throat; an elongated bony buckler exists between the branches of the lower jaw, extending from its symphysis to the edge of the gill openings. There are twelve flattened branchiostegal rays on either side—else, eleven on one side and twelve on the other. A long and rather low dorsal fin; a short and proportionally deep anal. The caudal is rounded upon its posterior margin, and sub-homocercal at the base. Ventrals abdominal in position. The air bladder exhibits a cellular structure similar to that of some reptiles.

SYN.—*Amia*, LINN. Syst. nat. ed. XII, 1766, 500 —GM. in *Linn.* Syst. nat. ed. XIII, I, iii, 1788, 1352.—Cuv. Règn. Anim. II, 1817, 179; 2d ed. II, 1829; & ed. illustr. Poiss. 284.—DEKAY, New Y. Fauna IV, 1842, 270.—STOREY, Synops. 1846, 212 —Cuv. & VAL. Hist. nat. Poiss. XIX, 1846, 402.—DUM. Ichthyol. analyt. 1856, 490.

There is no genus the monographic study of which would be more desirable than that of *Amia*, for, opinions are very much at variance as to the number of species to be admitted in the ichthyic method. By some writers only one is recognized; whilst others distinguish as many as ten or twelve, all inhabitants of fresh waters of North America.

With but scanty materials before us we are ill prepared to prosecute investigations regarding specific characters, and the few specimens which we have examined are recorded further on under such headings as were thought most akin. But whenever a complete collection of these fishes shall have been brought together, it is our aim to compare critically the specimens from the various localities, with a view of ascertaining the number of species which really exist.

1. AMIA OCELLICAUDA, Richards.

Marsh-Fish, Dog-Fish.

SPEC. CHAR.—An oblong black spot, with a lighter margin, obliquely situated at the base of the upper lobe of the caudal fin and inclined forwards. Head contained four times and a half in the total length. Insertion of ventrals nearer the base of the caudal than the extremity of the snout. Anterior margin of anal fin nearer the base of the pectorals than the posterior margin of the caudal.

SYN.—*Amia ocellicauda*, RICHARDS, Faun. Bor. Amer. III, 1836, 236 —Cuv. & VAL. Hist. nat. Poiss. XIX, 1846, 422.

The specimen observed is eighteen inches in total length, in a very perfect state of preservation, save the coloration, the freshness of which is always impaired by a protracted immersion in alcohol. It is referred provisionally to Richardson's species without critical examination, until an opportunity shall be afforded us to study and compare all the species of this genus.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------|------------------------|-----------------|-------------------------|---------------------|---------------------|
| 1000 | 1 | Adult. | Lake Amelia, Minn..... | 1853 | Gov. I. I. Stevens..... | Alcoholic. | Dr. Geo. Suckley... |

2. AMIA OCCIDENTALIS, DeKay.

Western Mud-Fish, Dog-Fish.

SPEC. CHAR.—Base of caudal fin without spot of any kind. Head constituting nearly the fifth of the total length. Insertion of ventrals nearly equidistant between the base of the caudal and the extremity of the snout. Anterior margin of the anal fin nearly equidistant, also, between the base of the pectorals and the posterior edge of the caudal fin.

SYN.—*Amia occidentalis*, DEKAY, New Y. Faun. IV, 1842, 269; pl. xxxix, fig. 125.--Cuv. & VAL. Hist. nat. Poiss. XIX, 1846, 429.

A specimen, twenty-six inches in total length and in the shape of a skin, otherwise well preserved for zoölogical studies. It is referred, provisionally, to DeKay's species until further investigations into the structure and habits of the other species shall enable us to determine their systematic characters.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------|--|-----------------|---------------------|---------------------|------------------|
| 1001 | 1 | Adult. | Lake Amelia, near Fort Snelling, Minn. | 1853 | Gov. I. I. Stevens. | Alcoholic. | Dr. Geo. Suckley |

Family SAURIDAE, DeKay.

The skeleton in the fishes of this family is entirely ossified. The body is elongated, sometimes very slender, and protected by lozenge-shaped scales of a bony base, and enamelled, smooth surface, firmly united to one another, constituting one of the most impenetrable coatings ever met with in the class of fishes. The jaws are furnished with rasp-like teeth, intermingling with conical and acute ones.

The ulterior zoölogical as well as anatomical characters of the gars (*Lipidosteus*) and Bichirs (*Polypterus*) are so diversified that little else remains to be told respecting family traits ascribable to both genera, and we should rather be inclined to adopt Müller's suggestion in considering either of them as the type of a peculiar family.

SYN.—*Sauroides*, AGASS. Rech. Poiss. foss. II, II, 1833, 2 & 153.

Sauroides, AGASS. Nomencl. Zool. PISCOS, 1844.—MÜLL. in *Wiegmann's Archiv für Naturg.* 1843, I, 327.

Sauridae, DEKAY, New Y. Faun. IV, 1842, 271.—STORER, *Synops.* 1846, 213.

The fishes of this family constitute the order of *Holostean ganoids* of Professor Müller,* which he again divides into two families, the *Lepidosteini* of North America, and the *Polypterini* of Africa, the only living representatives of this most remarkable group. By far more numerous are the genera and species whose remains lie imbedded in the strata which compose the earth's solid crust.

LEPIDOSTEUS, a p.

GEN. CHAR.—Snout elongated; jaws somewhat unequal; upper one formed of numerous pieces; vomer double; lower jaw composed of as many pieces as in the reptiles. Rasp-like teeth on the surface of the jaw bones, with long conical and acerated ones at their edges. The vertebrae are anteriorly convex, and posteriorly concave. Nostrils near the apex of the elongated jaw. A gill cover and a pseudo-branchia, but no spiracles. Four branchial arches, each provided with a double combed gill, and between the last arch and the pharyngeal bones a split may still be seen. Three branchiostegal rays on either side. The

* *Wiegmann's Archiv für Naturgeschichte*, 1845, I, 119, & 137.

anterior margin of all the fins exhibits a double row of spine-like scales. The insertion of the caudal fin is oblique; a portion of its rays being inserted at the extremity of the vertebral column; the other portion under it. The dorsal is inserted far back, opposite the anal fin. The ventrals are abdominal. The stomach has no cœca; the pylorus having numerous short appendages. The intestine recurs twice upon itself. The air bladder is cellular, and through an elongated split it communicates with the upper wall of the throat.

SYN.—*Lepidosteus*, LACEP. Hist. nat. Poiss. V, 1803; ed. 800, IV, 1819, 59.—Cuv. Règn. Anim. II, 1817, 181; 2d ed. II, 1829; &, ed. Illustr. Poiss. 286.—AGASS. Rech. Poiss. foss. II, ii, 1833, 4; &, Lake Super. 1850, 254.—DEKAY, New Y. Faun. IV, 1842, 271.—MÜLL. in *Wiegm. Archiv für Naturg.* 1845, I, 119.—STOREN, Synops. 1846, 213.—DUM. Ichthyol. analyt. 1856, 434.

For years past ichthyologists have been looking forwards for a promised monograph of this genus by Professor Agassiz, and since his studies of this peculiar group must necessarily be based upon a large amount of material, they would have proved of great assistance to us in the preparation of the present report. The above diagnosis is derived chiefly from Professor Müller's description of this genus.

There are three well marked groups in the genus *Lepidosteus*; the first one is characterized by a very narrow and prolonged snout, the mouth being longer than the head, properly so called, with but one row of larger teeth at the upper as well as lower jaw: *Lepidosteus oxyurus* is the type of this group. In the second group (*Cylindrosteus*) the snout is depressed, rather broad, equal in length to the head, properly so called, with but one row of larger teeth at the upper as well as at the lower jaw: *Lepidosteus platostomus* is the type of this second group. Finally, the third group (*Atractosteus*) is characterized by a very broad snout, nearly equal in length to the rest of the head, or somewhat longer, with two rows of larger teeth at the upper jaw: *Lepidosteus ferox* being the type of this group.

1. LEPIDOSTEUS LEPTORHYNCHUS, Grd.

SPEC CHAR.—Body anterior to the ventrals cylindrical, and posteriorly deeper than broad (thick); dorsal region sub-concave, broader than the abdominal region. Peduncle of tail very much compressed. Head constituting a little less than the third of the total length. Eyes well developed, sub-elliptical; horizontal diameter of the orbit entering fifteen times and a half in the length of the side of the head; nearly thrice and a half time behind its posterior rim. Anal smaller than the dorsal; either of these fins not extending the tip of their longest rays as far as the base of the caudal. Ventrals much larger than the pectorals, inserted further apart the thoracic belt than the anterior margin of the anal, and much nearer the posterior edge of the caudal than the tip of the rostrum. Olivaceous, upper regions spotted with black.

The specimen before us measures from thirty-four to thirty-five inches. The head is slender, very much depressed, broader than deep, tapering gradually forwards into an elongated rostrum. The upper jaw projecting beyond the tip of the lower one, which is entirely overlapped when the mouth is closed. The lower jaw is a great deal more than twice the length of the rest of the side of the head, although not quite twice and a half as long. One series of large conical and acute teeth may be observed right and left on either jaw, with an external series of much smaller teeth. The inner edge of the dental groove exhibits at the lower jaw two series of rasp-like teeth, the innermost of which is more slender than the other, whilst at the upper jaw there is but one series of similar teeth, resembling those of the slender kind just alluded to.

The dorsal and anal fins are of moderate development, much higher or deeper than long. The ventrals are more stoutly built and much larger than the pectorals.

D 7; A 8; C 12; V 6; P 12.

The rays in all the fins are very strong, sub-divided and branched off; the outermost pectoral

ray alone is simple, or else not sub-divided. The fulcra extend beyond the two-thirds of the length of all the external rays.

The number of scales in an oblique series across the body, beginning under the ventrals and extending upwards and forwards, is forty-three: One dorsal median series; seven from the dorsal region to the lateral line; and thirteen from the lateral line to the median series on the abdomen.

In a similar oblique series, taken posteriorly to the ventral fins, there are thirty-seven scales: the dorsal series as usual; seven from the dorsal region to the lateral line; and nine from the lateral line to the middle region of the abdomen. The tubes of the lateral line are very conspicuously developed.

The forms of the scales constituting the middle dorsal series is quite different from all the rest: posteriorly rounded, broader than long, and sub-cordiform from the occiput to a certain distance back, becoming sub-elliptical further on and quite lanceolated as they approach the dorsal fin. On the sides of the body they are sub-rhomboid, sub-convex at their upper and posterior edge, and rather convex at their inferior edge. Towards the caudal region they are sub-trapezoid, angular, posteriorly lanceolated and acute.

The ground color is olivaceous, spotted with bluish black above and on the sides; the abdomen being light yellowish or straw color; the upper surface of the head and snout exhibiting the same spots as the back. The vertical fins are likewise spotted, whilst the pectorals and ventrals are of a uniform yellowish tint.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|---------------------------|-----------------|-------------------|---------------------|------------------|
| 1002 | 2 | Devil's river, Texas..... | 1853 | Capt. John Pope.. | Dried..... | Geo. G. Shumard. |

2. LEPIDOSTEUS (CYLINDROSTEUS) LATIROSTRIS, Grd.

SPEC. CHAR.—Body anteriorly cylindrical, deeper than broad (thick), upon its middle; dorsal region sub-convex, broader than the abdominal region. Peduncle of tail very much compressed. Head constituting the fourth of the total length. Eye rather large, circular; diameter of orbit entering about ten times in the length of the side of the head; thrice behind its posterior rim. Anal fin somewhat deeper and longer at its base than the dorsal; the tip of its longest rays extending beyond the insertion of the inferior rays of the caudal fin. Ventrals larger than the pectorals, and inserted nearly midway between the thoracic belt and the origin of the anal fin; hence nearer the extremity of the rostrum than the convexity of the caudal fin. Bluish grey above; dull yellow beneath.

The species here referred to is closely allied to *Lepidosteus platostomus*, from which it differs chiefly by a broader rostrum, tapering likewise less rapidly forwards. Its width near the apex is half that of its base, near the angle of the mouth. The base of the head is a good deal broader than deep. The number of the rays of the fins are as follows:

$$D\ 8 + 1; A\ 9; C\ 12; V\ 6; P\ 10.$$

All of them bifurcate and again sub-divide, except the last in the dorsal and anal fins, as well as the innermost in the pectorals, which are simple, else undivided.

The number of scales in an oblique series across the body, with its initial point under the base of the ventrals, is from forty-six to forty-eight or from forty-five to forty-seven: one dorsal median series; nine or ten from the dorsal region to the lateral line; and thirteen from the lateral line to the middle series along the abdomen.

In a similar oblique row taken posteriorly to the ventral fins we count from thirty-one to thirty-three scales, a dorsal series; nine or ten from the dorsal region to the lateral line, and eleven from the lateral line to the middle abdominal series. The lateral line is yet quite conspicuous upon the specimen now before us, and which measures seventeen inches in total length.

The color of the upper region is bluish grey, whilst the inferior region is dull yellow. The fins assume the uniform tint of the region to which they belong.

List of specimens.

| Catal. No. | No of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|-------------|-------------------|-----------------|-----------------------|---------------------|------------------|
| 984 | 1 | Pecos river ----- | 1855 | Capt. John Pope ----- | Alcoholic . . . | Capt. Pope . . . |

3. LEPIDOSTEUS (ATRACTOSTEUS) BERLANDIERI, G r d .

SPEC. CHAR.—Body depressed, broader (thicker) than deep. Dorsal region depressed or sub-convex. Peduncle of the tail compressed and tapering backwards. Head contained three times and a half in the total length; three times, the caudal fin excluded. Eye well developed, sub-circular; diameter of orbit entering about eight times in the length of the side of the head: about twice and a half behind its posterior rim. Anal and dorsal fins nearly alike; the extremities of their longest rays extending beyond the insertion of the outer rays of the caudal fin. Ventrals more slender than the pectorals, and inserted somewhat nearer the posterior edge of the caudal fin than the extremity of the snout. Dark greyish olive above; lighter beneath. Body and fins unicolor, except the caudal, which appears to be obsolete spotted.

We have before us a specimen nine inches and a half in total length; hence quite immature. The scantiness of the materials at our disposal forbid us entering more at length into the comparative features between this species and *L. ferox*, the type of the group to which it belongs. This can only be accomplished in the forthcoming monograph contemplated by Prof. Agassiz.

The teeth of the lower jaw are largest; the palatine series is next in size; then the maxillar series (upper jaw) properly so called; the lower jaw being somewhat longer than the rest of the side of the head.

The dorsal and anal fins are almost alike in size and shape. The pectorals are sub-lanceolated and shorter and broader than the ventrals, which are rather slender. The rays we have counted as follows:

$$D\ 9 + 1; A\ 9 + 1; C\ 12; V\ 6; P\ 13.$$

The number of the scales in an oblique series across the body, beginning under the ventrals and extending upwards and forwards, is sixty-three: one dorsal median series; nine from the latter to the lateral line, and twenty-one from the lateral line to the middle series under the abdomen.

In a similar oblique series, taken posteriorly to the ventral fins, there are fifty-nine scales: the dorsal series as usual; eleven from the dorsal series to the lateral line, and seventeen from the lateral line to the middle region under the abdomen.

The scales of the dorsal series assume a different shape from those on the rest of the body. The surface of the scales is rugose or finely granular, like sand to the touch; more so on the posterior half of the body than on the anterior half. The abdominal scales are not yet in contiguity: an area under the thorax, between the pectoral fins, is naked and scaleless; a similar but smaller

area may be observed between and behind the ventral fins. These areas exist in the immature state only, and are filled up as the specimens enlarge in size.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of | Collected by— |
|------------|--------------|-------|-----------------------|-----------------|----------------------|--------------|---------------------|
| 1003 | 1 | Young | Tamaulipas, Mex. | ----- | Lieut. D. N. Couch.. | Alcoholic... | L. Berlandier |

Family STURIONIDÆ, Swains.

The skeleton remains in a cartilaginous condition throughout life, and the vertebral column, instead of vertebrae, consists of a soft chord. The external surface of the body is either perfectly smooth (*Spatulariae*), else provided with longitudinal series of rather large, bony shields, between which much smaller dermic productions may often be observed (*Acipenserini*). The pseudo-branchiae, the accessory opercular gill, and the spiracles exist in various combinations in the several genera which constitute this family. There is but one dorsal fin, situated far back, and nearly opposite to the anal.

SYN.—*Sturioniens*, Cuv. Règn. Anim. II, 1817, 140; 2d ed. II, 1829; &, ed. illustr. Poiss. 349.

Sturionidae, Swains. Ess. Class. Fish. II, 1839, 193.—DEKAY, New Y. Faun. IV, 1842, 344.—STORER, Synops. 1846, 247.

Sturionideae, RICHARDS. Faun. Bor. Amer. III, 1836, 278.

Acipenserini, MULL. Vergl. Anat. Myxin. I, 1836; &, in Weigm. Archiv für Naturg. 1845, I, 119.

Spatulariae, MULL. Vergl. Anat. Myxin. I, 1836; &, in Weigm. Archiv für Naturg. 1845, I, 119.

Acipenseridae, BONAP. Sagg. Distr. metod. Anim. Vertebr. 1831.—AGASS. Lako Supr. 1850, 263.

Acipenserides, AGASS. Rech. Poiss. foss. II, ii, 1833, 277.

These fishes constitute the order of *Chondrostean ganoids* of Professor Müller, by whom they are further divided into two families: the *Acipenserini*, or true sturgeons, with longitudinal series of bony shields, and the *Spatulariae*, spoon-bill, or paddle-fish, as sometimes denominated, and in which the skin is naked, or else perfectly free from either shields or scales.

The generic types of the chondrostean ganoids are all represented in North America, three of them being altogether peculiar to the latter continent: *Scaphirhynchus*, amongst *Acipenserini*, *Polyodon* and *Planirostra*, which constitute the group of *Spatulariae*.

ACIPENSER, Artedi.

GEN. CHAR.—Body sub-fusiform, elongated, tapering posteriorly, provided with five longitudinal series of bony shields, the dorsal and lateral series extending from the thoracic arch to the caudal fin, whilst the abdominal series run from the base of the pectorals to that of the ventrals, whence an odd series follows the under aspect of the tail to the caudal fin. Head of moderate size, its upper surface cuirassed; snout elongated, more or less acute. Mouth situated under the snout, toothless, in advance of which are inserted four hanging down, simple or fringed barbels. Lips simple. Branchial apertures separated under the throat by an isthmus; gill covers well developed; pseudo-branchiae and spiracula both extant. Dorsal fin posterior; caudal with two unequal lobes; anal situated opposite and somewhat behind the dorsal; ventrals inserted posteriorly to the middle of the length of the body.

SYN.—*Acipenser*, ARTEDI, Gen. Pisc. ed. Walbaumi, 1792, 498.—LINN. Syst. Nat. ed. XII^a I, 1766, 403.—Gmel. in Linn. Syst. Nat. ed. XIII, I, III, 1788, 1483.—Cuv. Règn. Anim. II, 1817, 141; 2d ed. II, 1829; & ed. illustr. Poiss. 349.—RAFIN. Ichth. Olieus. 1820, 79.—FITZ. & HECK. in Ann. Wien. Mus. Naturg. I, 1835; &, in Zool. Abhandl. Ann. Wien. Mus. Naturg. I, 1841, 264.—DEKAY, New Y. Faun. IV, 1842, 344.—STORER, Rep. Fish. Mass. 1839, 178; &, Synops. 1846, 247.—Dum. Ichthyol. analyt. 1856, 156.

The monograph of the sturgeons (*Acipenser*) by Fitzinger and Heckel is replete of informations upon the natural history of these fishes. The species of the Old World especially are treated of with much detail, while a good deal is yet untold respecting those of the New World.

The short-nosed sturgeon, so abundant in the waters of California, and described under the name of

ACIPENSER BRACHYRHYNCHUS, Ayres,

in the Proceedings of the California Academy of Natural Sciences, I, 1854, 16, has not fallen under our observation. It is so much more to be regretted, as its natural affinities seem to bring it nearest to *A. transmontanus*, which we lack also in good specimens.

1. **ACIPENSER TRANSMONTANUS, Richards.**

Columbia River Sturgeon.

SYN.—*Acipenser transmontanus*, RICHARDS. Faun. Bor. Amer. III, 1836, 278, pl. xcvi, fig. 2.—DEKAY, New Y. Faun. IV, 1842, 347.—STORER, Synops. 1846, 248.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 137.

Not in possession of any other specimen but a dried skin about thirty-seven inches in total length, we refrain entering into any details as regards its structure. The species is a very characteristic one, and which requires to be carefully re-investigated in order to furnish us with new data in the determination of the species recently observed along the coast of California, within its bays and the lower waters of its rivers.

List of specimens.

| Catal. No. | No. of spec | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|-------------|----------------------|-----------------|-----------------------|---------------------|-----------------------|
| 1008 | 1 | Columbia river | 1855 | Dr. Geo. Suckley..... | Dried | Dr. Geo. Suckley..... |

2. **ACIPENSER ACUTIROSTRIS, Ayres.**

SPEC. CHAR.—Body sub-fusiform in profile. Head slender, upper surface nearly plane, depressed, declivous, with a shallow frontal groove. Snout tapering and acute. Mouth large; lips simple. Barbels filiform, simple, nearer the mouth than the apex of the snout. Ten or eleven dorsal shields from the occiput to the anterior margin of the dorsal fin; twenty-six to twenty-seven shields in the lateral series, and nine or ten between the pectorals and the ventrals. All these shields being rather close to one another, although not quite contiguous. First dorsal shield united to the cephalic cuirass.

SYN.—*Acipenser acutirostris*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1854, 15.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 137.

The museum of the Smithsonian Institution has in preservation a specimen of this species about twenty inches in total length, brought home by Lieutenant Williamson's party; and another specimen about thirteen inches long, sent by Dr. Ayres himself. Both of these specimens, therefore, are larger than the one originally described by the latter gentleman. The snout in the younger specimen is proportionally more slender and more acute still than in the older one. The head forms about the fourth of the total length, somewhat more or less according to age. A shallow groove may be observed along the middle region of its upper surface which is gradually sloping from the occiput to the extremity of the snout. The eyes are sub-circular and of moderate development, situated midway between the apex of the snout and the posterior edge of the opercle. The barbels are nearly equal in length and inserted

somewhat nearer the mouth than the apex of the snout. The mouth is very large, provided with sub-papillar or sub-corrugated lips. The margin of the jaws is protected by a sub-corneous sheath, exteriorly papillar, which on being removed leaves exposed numerous minute tentacles. These tentacles, or cilia, correspond to the papilla of the corneous sheath into which they are inserted. The anterior jaw corresponds to a vertical line drawn immediately behind the orbit.

The pectoral fins are very large, broad, sub-lanceolated and posteriorly rounded off. The ventrals are inserted opposite the twelfth lateral shield, and sub-truncated upon their posterior edge. The anal is much deeper than long upon its base, with its exterior edge sub-concave. The dorsal fin is higher anteriorly than long, sub-convex upon the latter edge, and superiorly concave; the height of its posterior margin enters twice and a half time in the length of the base of the same fin.

The periphery of the shields is very deeply indented, serrated, or digitated, especially sideways. Their spiny crest oftentimes exhibits additional small spines or points, either anteriorly or posteriorly. The stellated incrustations which are observed over the surface not covered by the shields, are likewise very prickly.

The dorsal region is purplish or bluish black, whilst the abdominal region is whitish.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|--------------|-----------------------------|-----------------|---------------------------|----------------------|-----------------------|
| 1004 | 1 | San Francisco, California.. | 1855 | Lient. R. S. Williamson.. | Alcoholic... | Dr. John S. Newberry. |
| 1006 | 1 |do..... | 1857 | Dr. W. O. Ayres..... |do..... | Dr. W. O. Ayres |

3. ACIPENSER MEDIROSTRIS, Ayres.

SPEC. CHAR.—Body fusiform in profile. Head rather stout; upper surface sub-convex, declivous, with a median, wide and shallow depression; snout anteriorly rounded and abbreviated. Eleven dorsal shields from the occiput to the anterior margin of the dorsal fin; thirty-seven shields in the lateral series, and eight or nine between the pectorals and the ventrals. All the shields more or less approximated in their respective series. First dorsal shield united to the cephalic cuirass.

SYN.—*Acipenser medirostris*, AYRES, in Cal. Acad. Nat. Sc. I, 1854, 15.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 137.

The head constitutes about the fifth of the total length. The eyes are rather small, sub-circular, and situated much nearer the apex of the rostrum than the posterior edge of the opercle. The barbels being nearly equal in length and situated much nearer the apex of the rostrum than the mouth. The latter is very large, with a structure of the lips similar to those of *A. acutirostris*; the anterior jaw, in its retracted position, corresponding to a vertical line drawn through the pupil. The insertion of the ventrals takes place opposite the fifteenth lateral shield, they being subtruncated upon their posterior edge. The base of the dorsal is equal in length to the height of its anterior margin; it is superiorly convex, and quite low posteriorly. The anal is much deeper than long, sublanceolated, somewhat concave upon its outer edge.

The periphery of the shields is entire, and the stellated incrustations which are observed over the intervening surface between the shield are likewise entire, or nearly so.

The specimen which we have examined is a little short of two feet in total length, and we believe was submitted to Dr. Ayres' inspection at San Francisco. This fact being stated merely to show that the references to the present species have an imprint of authenticity.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen | Collected by— |
|------------|--------------|-----------------------------|-----------------|---------------------------|--------------------|-------------------------|
| 1005 | 1 | San Francisco, California.. | 1855 | Lieut. R. S. Williamson.. | Alcoholic. | Dr. John S. Newberry... |

SCAPHIRHYNCHUS, Heck.

GEN. CHAR.—Body sub-fusiform, provided with five longitudinal series of pentagonal bony shields, extending from the head to the fins, posterior to which it is depressed and completely covered by these shields. Upper surface of head cuirassed; snout prolonged. Mouth situated under the snout, toothless, and in advance of which are four, hanging down, barbels. Gill covers well developed; neither pseudo-branchiae nor spiracula. Gill openings separated under the throat by a rather narrow isthmus. The vertebral column tapers off into a filament, very much elongated in the young. The general structure, aspect, and relative position of the fins, as in *Acipenser*, except the caudal, which has no upper lobe.

SYN.—*Scaphirhynchus*, HECK. in Ann. Wien. Mus. Naturg. I, 1835; &, in Zool. Abhandl. Ann. Wien. Mus. Naturg. I, 1841, 71 —MÜLL. in *Wiegmann's Archiv für Naturg.* 1845, I, 106, & 119.

This genus having been made the object of a very able monograph by Heckel, we must refer our readers to it for further informations on this subject.

SCAPHIRHYNCHUS PLATIRHYNCHUS, Bd.

Shovel-Nose Sturgeon.

SPEC. CHAR.—Head terminated by a depressed, oval, spade-shaped snout. Lips provided with eight warty-fringed tufts. Barbels nearer the mouth than the extremity of the snout, and fringed also. Anal fin nearer the vent than the caudal fin. Brownish above; whitish beneath.

SYN.—*Acipenser platyrhynchus*, RAFIN. Ichthyol. Ohiens. 1820, 80.—KIRTL. Rep. Zool. Ohio, 1838, 196; &, in Bost. Journ. Nat. Hist. V, 1845, 25. Pl. viii, fig. 1.—STORER, Synops. 1846, 249.

Scaphirhynchus rafinesquii, HECK. in Ann. Wien. Mus. Naturg. I, 1835; &, in Zool. Abhandl. Ann. Wien. Mus. Naturg. I, 1841, 72. Pl. viii.

Scaphirhynchus platirhynchus, Bd. Iconogr. Encycl. II, 1850, 238.

Shovel-fish sturgeon, spade-fish, shovel-head, flat-head, shovel-nose sturgeon, la Pelle, or Poisson pelle, VERNACULAR.

This species is accurately figured and minutely described in Heckel's monograph alluded to above. Space forbids us entering here into any kind of detail, and limit ourselves recording two immature specimens procured along one of the various railroad surveys.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|----------|---------------------------|-----------------|--------------------------|---------------------|----------------------|
| 985 | 1 | Young. | Missouri..... | 1853 | Lieut. A. W. Whipple.... | Alcoholic. | Dr. Geo. G. Shumard. |
| 986 | 1 | ...do... | Near mouth of Poteau riv. | 1853 |do..... | ...do..... |do..... |

POLYODON, Lacép.

GEN. CHAR.—Snout dilated into a thin, leaf-like blade; very much prolonged beyond the lower jaw. Mouth very large, provided with numerous small teeth upon the palatine bones, uniting with the maxillaries to form the upper jaw. Branchial apertures very widely open, continuous under the throat; spiracula extant; opercle prolonged into a membranous, very long point. Body and fins in general shape and aspect as in *Acipenser*; but the skin is naked or else perfectly smooth.

SYN.—*Polyodon*, LACÉP. Hist. nat. Poiss. I, 1798; &, ed. 8vo. I, 1819, 309.—RAFIN. Ichth. Ohiens. 1820, 82.—Cuv. Rēgn. Anim. II, 1817, 142; 2d ed. II, 1829; &, ed. illustr. Poiss. 152.—STORER, Synops, 1846, 249.
Spatularia, SHAW, Gen. Zool. V, 1804, 362.—DUM. Ichthyof. analyt. 1856, 155.

This genus appears to be very closely allied to *Planirostra*, which, however, we have not been able to compare it to, having had no specimens of the latter genus at our command. Our comparative studies, therefore, rest solely upon the descriptions of Lesueur and Rafinesque. Dr. Kirtland's own account of *Planirostra* had to be drawn up from published data, he never having had the opportunity of examining that fish.

POLYODON FOLIUM, Lacép.

Paddle-Fish.

SPEC. CHAR.—Body sub-cylindrical, compressed, tapering from the thorax to the tail. Head sub-conical, expanding horizontally into a spatuliform snout, constituting altogether more than the half of the total length, the snout itself exceeding in length the remainder of the head, or head, properly so-called. Eyes very small and circular, situated opposite the extremity of the lower jaw. The membranous expansion of the opercle or accessory gill cover extends as far as the origin of the ventral fins. Above, steel blue; white beneath; gill covers maculated by stellate impression.

SYN.—*Polyodon folium*, LACÉP. Hist. nat. Poiss. I, 1798; &, ed. 8vo. I, 1819, 309, Pl. xiii, fig. 3.—RAFIN. Ichth. Oniens 1820, 83.—Cuv. Rēgn. Anim. II, 1817, 143; 2d ed. II, 1829; &, ed. illustr. Poiss. 352.—MITCHELL, HILDRETH & CLEMENS, in Amer. Journ. of Sc. and Arts, XII, 1827, 201, 202, and 204.—KIRTL. in Bost. Journ. Nat. Hist. IV, 1842, 21, Pl. ii, fig. 1.—GRIFF. Cuv. Anim. Kingd. X, 1834, 591.—STORER, Synops. 1846, 249.

Spatularia reticulata, SHAW, Gen. Zool. V, 1804, 362, Pl. clvi.

Paddle-fish; *Spoon-billed Sturgeon*, VERNACULAR.

The specimens submitted to our examination are all immature, measuring from five to seven inches in total length. We have ascertained the presence of spiracula, one on either side, occupying the same position as in the sturgeons, close to the outer edge of the tympanic bone, between the latter and the gill covers. Whether pseudo-branchiae exist or not we have not yet had the opportunity of ascertaining.

List of specimens.

| Catal No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|-----------|--------------|-------|----------------------------|-----------------|-------------------------|---------------------|----------------------|
| 937 | 3 | Young | Fort Pierre, Nebraska..... | 1853 | Gov. I. I. Stevens | Alcoholic | Dr. John Evans |

ORDER VIII.

HOLOCEPHALI.

The skeleton is cartilaginous, and reduced to a soft vertebral chord. The teeth consist of large plates resting upon the jaws, which do not exist as separate pieces, being continuous with the rest of the uninterrupted bones of the skull. The gills are laminated, attached by their margins; with a single external aperture on either side. There is no swimming or air bladder, but the intestine is provided with a spiral valve. The sexes copulate. A spinous ray may be observed at the anterior margin of some of the fins. The ventrals are inserted behind the pectorals. The dermic productions, when existing, are of the placoid type.

SYN.—*Holocephali*, MÜLL. *Vergl. anat. Myxin.* in *Abhandl. Berl. Akad.* (1834), 1836; & in *Wiegman. Archiv für Naturg.* 1845, I, 137 & 135.—OWEN, *Lect. Comp. Anat. Vert. anim.* 1846, 50.—*Bd. Iconogr. Encycl.* II, 1850, 205.

This order is composed of two families—that of *Chimaeridae*, with a few living representatives, and that of *Edaphodontidae*, whose types are all extinct.

Family CHIMAERIDÆ, Bonap.

The body is somewhat elongated, compressed, and tapering gradually from the thoracic belt to the filamentous termination of the caudal extremity. There are two dorsal fins, the first one provided anteriorly with a spine dentated upon its posterior or inner edge. The second dorsal fin is generally low and elongated; the lobes of the caudal are lower still, rather elongated also, the upper lobe having been taken for a third dorsal fin and the lower lobe for an anal fin by Linnaeus and some of his followers. The anal fin, properly so called, is sometimes wanting and sometimes existing. The insertion of the ventral fins takes place either anteriorly or posteriorly to the middle region of the abdomen; the organs of generation so constructed as to involve a union between the sexes, in order to accomplish the act of fecundation, and hence of reproduction.

SYN.—*Chimaeridae*, BONAP. *Sagg. Distr. metod. anim. Vert.* 1831, 121.—BENN. in *Zool. Beechey's Voy. Blossom.* 1839, 71.
Chimerides, AGASS. *Rech. Poiss. foss.* III, 1842, 336.
Chimaerae, MÜLL. in *Wiegman. Archiv für Naturg.* I, 1845, 137.
Chimaeroidei, OWEN, *Lect. Comp. Anat. Vert. anim.* 1846, 51.—*Bd. Iconogr. Encycl.* II, 1850, 205.

There are but two living genera known up to the present day as constituting this family—*Chimaera*, the species of which belong to the northern hemisphere, and *Callorhynchus*, the species of which belong to the southern hemisphere.

CHIMAERA, Linn.

GEN. CHAR.—Mouth situated beneath the snout, which is sub-conical. Teeth well developed. Nostrils immediately in advance of the mouth, and extending into it. One branchial split on either side, separated under the throat by an isthmus. Two dorsal fins—anterior one situated above the pectorals, and provided with a strong spine; caudal, tapering into a point; anal fin wanting; ventrals nearly median, situated opposite the beginning of the second dorsal. Skin smooth.

SYN.—*Chimaera*, LINN. *Syst. Nat. ed. XII^a* I, 1766, 401.—GMEL. in *Linn. Syst. Nat. ed. XIII^a* I, iii, 1788, 1488.—CUV. *Règn. anim.* II, 1617, 140; 2d ed. II, 1829; & ed. illustr. *Poiss.* 354.

The genus *Chimaera* includes, so far, two species, one in the Atlantic, the other in the Pacific ocean. The Atlantic species is exclusively an Arctic fish, whilst that of the Pacific seems to be limited to the temperate zone.

A similar instance occurs in regard to the species of *Callorhynchus*; one being an inhabitant of the Antarctic, the other of the Austral temperate zone.

CHIMAERA COLLIEI, Benn.

SPEC. CHAR.—Head constituting about the sixth of the total length. First dorsal fin sub-triangular; the upper margin, which is directed posteriorly, being crescent shaped, whilst the posterior margin, properly so to be called, is horizontal and parallel with the back, to which it is united by a thin membrane. Second dorsal quite low and elongated, its origin being nearly opposite the insertion of the ventrals, which is nearly half way between the apex of the snout and the origin of the caudal fin. Its upper margin is undulating. Either lobe of the caudal tapering regularly away towards the tip of the tail, the lower lobe extending somewhat further back. Skin perfectly smooth; brownish above; dull white beneath; the back and sides exhibiting numerous dull white rounded spots, variable in size.

SYN.—*Chimaera collicii*, BENN. in Zool. *Beechey's Voy. to the Pacif.* 1839, 71., Plato xxiii, figs. 1 and 2.—RICHARDS. FAUN. Bor. Amer. III, 1836, 285.

Elephant-fish, VANCOUVER.

Skooma, INDIANS OF OREGON.

The specimens of this species which we have had an opportunity of examining are all of the female sex. The male is figured and described in "The Zoölogy of Captain Beechey's Voyage to the Pacific and Behring's Strait," as quoted above.

The body is quite compressed, deepest anteriorly and tapering rapidly away posteriorly towards the acute and thread-like extremity of the caudal region. The gill apertures extend from the upper edge of the base of the pectorals downwards and forwards, being separated under the throat by a rather wide isthmus. We regret that the state of keeping of the specimens will not allow a minute description to be drawn of the structure of the nostrils in connection with the upper or anterior lip. A similar structure is so seldom met with in this class of fish that whenever it exists anywhere it cannot but excite the curiosity of the naturalist.

The spine at the anterior margin of the dorsal fin is very finely serrated upon the upper half of its posterior aspect, which is flattened, either angle being serrated; the anterior aspect of the spine is convex and keeled.

The ventrals being free from the appendages which the male is provided with, are proportionally larger and broader, posteriorly rounded off.

The skin is perfectly smooth all over the head and body. The coloration in the female sex is similar to that of the male.

List of specimens.

| Catal. No. | No of spec. | Sex & Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Orig. No. | Collected by— |
|------------|-------------|-------------|--------------------------------|-----------------|---------------------|---------------------|-----------|------------------|
| 995 | 1 | Adult ♀ ... | Ft. Steilacoom, Puget's Sound. | 1853 | Gov. I. I. Stevens. | Alcoholic. | 15 | Dr. Geo. Suckley |
| 996 | 2 | Young ♀ .. | Cape Flattery, W. T. | 1854 | Licut. Trowbridge. | Alcoholic. | ..... | Lt. Trowbridge . |

ORDER IX.

PLAGIOSTOMI.

The sharks and rays, which are brought together under this heading, have, as common characters, an internal skeleton, cartilaginous or partly ossified, the vertebral column exhibiting greater or lesser indications of transverse separations; the cranium constituting a continuous mass, in which the individual parts are not recognizable; the jaws being likewise cartilaginous and attached to the cranium by cartilages also. The teeth are situated on the roof of the mouth and on the lower jaw. The anterior part of the head is prolonged forwards; under the snout, at a greater or lesser distance from its extremity, may be observed a broad transverse mouth, in advance of which the two nasal fossae are situated. The gills are fixed, and the branchial apertures five or more in number; the spiracles being not always present. The scapular or thoracic arch is not attached to the head. The ventrals and pectorals are always extant, although soft and fleshy like the other fins; the ventrals placed posteriorly to the pectorals. The swimming or air bladder is wanting. The intestine is provided with a spiral valve; the external investment consisting of shagreen or small indurated plates variously modified.

SYN.—*Plagiostomes*, DUM. Zool. analyt. 1806; &, Ichthyol. analyt. 1856, 113 & 120.

Sélaciens, CUV. Règn. Anim. II, 1817, 121; 2d ed. II, 1829; &, ed. illustr. Poiss. 356.—BONAP. Sagg. Distr. method Anim. Vert. 1831, 121.—DEKAY, New Y. Faun. IV., 1842, 348.

Plagiostomi, MÜLL. in *Wieg.* Archiv für Naturg. 1845, 1, 137.—STORER, Synops. 1846, 250.—Bd. Iconogr. Encyl. II, 1850, 205 and 240.

Selachii, RICHARDS. Faun. Bor. Amer. III, 1836, 287.

The order of Plagiostomi divides into two subordinate groups—the sharks on one side, and the rays on the other. The distinguishing features of either of these sub-orders will be recalled under their respective headings.

It may not be amiss to state that, under the name of Selachians (*Selachii*), were formerly included the representatives of the orders *Plagiostomi* and *Holocephala* of the present day.

SUB-ORDER I.

SQUALI.

The sharks which constitute this sub-order are slender, elongated, fusiform or sub-fusiform; a thoracic arch incomplete; pectoral fins distinct from the head, and situated on the sides of the chest, as in most osseous fishes. The eyes are provided with free or movable eyelids; the branchial fissures being lateral, situated either entirely in advance of the anterior margin of the pectorals, or a portion of them may extend over the base of these latter mentioned fins. Vertebral column exhibiting transverse divisions throughout.

SYN.—*Squalidae*, BONAP. Sagg. Dist. method. Anim. Vert. 1831, 121; Syst. Vertebr. 1837, 45; &, Selach. Tabul. anal. 1838, 4.—DEKAY, New Y. Faun. IV, 1842, 348.—MÜLL. in *Wieg.* Archiv. für Naturg. 1, 1845, 137.—STORER, Synops. 1846, 251.

Squali, MÜLL. Vergl. Anat. Myxin. I, 1836, 75.—MÜLL. & HENLE, Syst. Besch. Plagiost. 1841, 1.

Pleurotrèmes, DUM. Ichthyol. analyt. 1856, 120.

There are sharks in which the eyelid is provided with a nictitating membrane, and others in which this peculiarity of structure does not exist. The same may be stated with regard to the spiracles. As far as observations go, the spiracles and nictitating membrane are never wanting in the same group; whilst both the spiracles and the nictitating membrane may exist simultaneously. Sometimes we observe spiracles and no nictitating membrane; at others, the spiracles are wanting, while the nictitating membrane is extant.

Family SCYLLIODONTIDÆ, Girard.

The head is depressed, the snout obtuse, the nasal flap or valve broad, and rather elongated; the grooves at the angle of the mouth being large, and the lips cartilaginous; the eyelids constituting an elongated cleft. The spiracles are of medium size. The teeth, which resemble those of the genus *Scyllium*, exhibit nevertheless a more elongated central prong, with several lateral and smaller ones at the base. The general aspect of the fins is similar also to that of *Scyllium*. The inferior lobe of the caudal fin is likewise atrophied, and the caudal furrow wanting. The scales are tri-digitated and triply keeled.

SYN.—*Scylliodontes*, MÜLL. & HENLE, Syst. Besch. Plagiost. 1841, 63.—DUM. Ichthyol. analyt. 1856, 130.
Scylliodontini, Bd. Iconogr. Encycl. 11, 1850, 241.

The Scylliodonts belong to that division of the sharks in which there are two dorsal fins and one anal, the first dorsal being placed between the pectorals and the ventrals. They are provided with spiracles and a nictitating membrane, the last or last two branchial fissures being situated above the base of the pectoral fins.

TRIAKIS, Mull. & Henle.

GEN. CHAR.—This genus being the only one of its group, its diagnostic characters may be deduced from those of the family just alluded to. The teeth are rather small and numerous. There is one central fang or prong directed obliquely outwards with one or several small ones on either side of the base.

SYN.—*Triakis*, MÜLL. & HENLE, Syst. Besch. Plagiost. 1841, 63.—DUM. Ichthyol. analyt. 1856, 130.

So far but one species was on record, an inhabitant of the Japanese seas. The one whose description follows is closely allied to it, either of them apparently not reaching any very large size.

TRIAKIS SEMIFASCIATUS, Grd.

SPEC. CHAR.—Head very much depressed, constituting the sixth of the total length. Back rather arched; caudal region very much tapering. Shagreen with very acute acorated points. Color above olivaceous grey with transverse black bands and rounded spots; beneath yellowish, unicolor.

SYN.—*Triakis semifasciatus*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 196.

The general aspect of this species is elongated. In the specimen before us, and which measures twelve and two-thirds of an inch, the head, from the extremity of the snout to the first branchial aperture, constitutes the sixth of the total length. The back is rather more arched or convex than in *T. scyllium*, the caudal region being very slender and tapering.

The head is very much depressed, sub-convex and sloping sideways and forwards. The snout is rounded off, and seen either from above or from below its anterior outline is semi-elliptical; the nostrils being somewhat nearer the mouth than the extremity of the snout. The flap or valve at their anterior edge is placed more towards the inner than the outer angle; it is tapering, rounded off, and directed obliquely outwards and backwards. The outline of the mouth is semi-elliptical; its width, measured from angle to angle, is equal to the rostral distance between

its anterior convexity and the margin of the snout. The teeth are small and numerous, somewhat flattened, with a middle, sub conical, acute prong directed obliquely outwards, and generally a smaller one on either side of their base. The eyes are of moderate development, provided with a nictitating membrane, their longitudinal diameter entering a little over six times in the length of the head, as measured above, when compared to the total length. At a short distance behind the orbit, and on a level with it, may be observed a rather small spiracle. The branchial splits, five in number on either side, are vertically elongated, and diminishing gradually in size backwards; the fourth corresponds to the anterior margin of the pectoral fin, hence the fifth is situated above the same fin.

The first dorsal fin is somewhat nearer the ventrals than the pectorals, and its anterior margin nearer the second dorsal than the extremity of the snout. It is also higher than long; its upper margin being emarginated, sub-crescentic, with the anterior lobe rounded off, while the posterior lobe is acute. The second dorsal has the same shape as the first; is somewhat smaller, and its anterior margin nearly equidistant between the base of the pectorals and the tip of the caudal fin. The first anal fin is situated opposite the posterior half of the base of the second dorsal; it is deeper than long, smaller than the second dorsal, of which it has the general shape. The second anal fin is much longer than deep, and contiguous to the inferior lobe of the caudal fin, from which it is partly separated by a mere split. The caudal fin is short and proportionally rather elevated and posteriorly truncated obliquely downwards and inwardly; its lower lobe being quite small. The ventrals are short and broad, sub-triangular, slightly sub-concave posteriorly, and inserted nearer the extremity of the snout than the tip of the caudal. The pectorals are larger than the ventrals, short and very broad, sub-concave upon their posterior edge and rounded upon its angles, the outer one of which being rather prominent.

The scales, or rather the shagreen, which covers densely all the outer surface, has the middle point more acute than in *T. scyllium*, giving it a more prickly appearance. The lateral points are very exiguous and oftentimes wanting. The keels, on the other hand, are quite conspicuous.

The ground color is olivaceous grey, lighter beneath than above, becoming yellowish under the head and throat. The upper surface of the head and the dorsal region exhibit transverse bands of deep black, with intervening small rounded spots of the same color along the middle line of the back, whilst other similar spots, varying in size, may be observed along the sides of the body and alternating with the bands just alluded to. A black spot exists also at the base and upper surface of ventrals and pectorals. The caudal fin itself, the second anal and dorsal, are entirely spotted, whilst the first dorsal and anal are unicolor, except the former, the base of which is affected by the transverse bands of the back.

List of Specimens.

| Catal. No. | No of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimens. | Collected by— |
|------------|-------------|--------|---------------------------|-----------------|-------------------------|----------------------|-----------------------|
| 388 | 1 | ..... | Presidio, California..... | 1853 | Lt. W. P. Trowbridge . | Alcoholic. | Lieut. Trowbridge.... |
| 991 | 1 | Young. | Monterey, California.... | 1856 | A. S. Taylor, Esq |do.... | A. S. Taylor..... |

Family MUSTELIDÆ, Girard.

The spiracles are very large; the orbits elongated; the nictitating membrane ridge-like, appearing as though a duplicature of the lower eyelid. The teeth are pavement-like, depressed, without points or cutting edge, in which respects they resemble those of the rays or skates. Angles of the mouth protuberant and cartilaginous, with deep grooves. The upper (anterior) edge of the nostrils provided with a triangular membranous flap, rounded upon its terminal extremity, whilst its base occupies the three-fourths of the nasal edge. Exteriorly to this is a shorter and more truncated or blunt flap. The last branchial fissure is situated above the base of the pectoral fins. The first dorsal fin is situated nearly midway between the pectorals and the ventral fins. The caudal fin is rather short, the caudal furrows being inconspicuous. Intestinal valve helicoid.

SYN.—*Mustelini*, BONAP. Syst. Vertebr. 1837, 45; & Selach. Tabul. analyt. 1838, 5.—BD. Iconogr. Encycl. II, 1850, 241.
Musteli, MÜLL. & HENLE, Syst. Besch. Plagiost. 1841, 64.—DUM. Ichthyol. analyt. 1856, 130.

The genus *Mustelus* is the only representative of this family, its species occurring in the Mediterranean sea and in both the Atlantic and Pacific oceans. The one which is met with along our Atlantic coast is commonly known as the "dog-fish," "hound-fish," or "dog-fish shark." These sharks do not reach any very large size.

A species has recently been found along the Pacific coast, about the bay of San Francisco, and described under the name of

MUSTELUS FELIS, Ayres,

in the Proceedings of the California Academy of Natural Sciences, I, 1854, 17, and, since we had no opportunity of studying it from nature, we are compelled to dismiss it with the above few remarks.

Family CESTRACIONTIDÆ, Owen.

The mouth approximates the anterior margin of the snout, the nostrils extending to the mouth, through a cleft of the anterior or upper lip. The spiracles are conspicuous. The branchial apertures are small, the hind ones being situated above the base of the pectoral fins. A spine at the anterior margin of the dorsal fins. The caudal fin is short, with a slight emargination between either lobe at the posterior margin.

The division of sharks to which this family belongs are provided with two dorsals and one anal fin, the first dorsal fin being placed between the pectorals and the ventrals. The nictitating membrane is wanting, whilst the spiracles exist.

SYN.—*Cestraciontes*, AGASS. Rech. Poiss. foss. III, 1833, 173.—MÜLL. & HENLE, Syst. Besch. Plagiost. 1841, 76.—DUM. Ichthyol. analyt. 1856, 132.
Cestraciontini, BONAP. Syst. Vert. 1837, 46.
Cestracionini, BONAP. Selach. Tabul. analyt. 1838, 5.—BD. Iconogr. Encycl. II, 1850, 242.
Cestraciones, MÜLL. in Wieg. Archiv für Naturg. I, 1845, 137.
Cestraciontidae, OWEN, Lect. Comp. Anat. Vert. Anim. 1846, 51.

The genus *Cestracion* is the only one so far known of the family. The species that have been noticed are but few in number, and scattered over a wide geographical range.

CESTRACION, Cuv.

GEN. CHAR.—Head thick, short, and rounded; body fusiform, and tapering posteriorly. Nostrils split up to the edge of the mouth, surrounded by a protuberant membrane, the outer one rolled inwardly, the inner one separated from the upper lip by a groove; pupil, obliquely inclined backwards. The disposition of the teeth is pavement-like, the middle ones exhibiting from three to five prongs, the lateral ones smaller than the central. Spiracles small, situated beneath and somewhat behind the orbit. Eye placed under a ridge extending from the snout to the tympanic region. The branchial apertures diminish in size backwards, the last two placed rather high up above the pectoral fins. Caudal fin short, with well developed lower lobe.

SYN.—*Cestracion*, Cuv. R \acute{e} gn. Anim. II, 1817, 129; 2d ed. II, 1829; & ed. illustr. Poiss. 365.—AGASS. Rech. Poiss. foss. III, 1833, 168.—MÜLL. & HENLE, Syst. Besch. Plagiost. 1841, 76.—DUM. Ichthyol. analyt. 1856, 122.

Up to a rather recent period the "Port Jackson shark" stood as a solitary species in this genus. The "Voyage de la Venus" (Zool. 1855, 350, pl. x, fig. 2,) has made us acquainted with a second species. A third, whose description follows, was obtained on the coast of California.

CESTRACION FRANCISCI, Grd.

SPEC. CHAR.—Head contained six times and a half in the total length; supra-ocular ridges very compact and prominent. A cartilaginous fold or thickening at the anterior angle of the mouth as well as posteriorly. Anterior margin of first dorsal nearer the extremity of the snout than the anterior margin of the second dorsal. Origin of anal equidistant between the tips of the caudal and the insertion of the pectorals. Yellowish grey above; light yellowish beneath, with small rounded and scattered spots.

SYN.—*Cestracion francisci*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 196.

We have before us two specimens of this species, the largest of which measuring nearly twenty-seven inches. It bears a very strong resemblance to *C. philippi*, or "Port Jackson shark," from which it chiefly differs by more prominent and compact supra-ocular ridges, a more backwards position of the ventrals and anal fin with reference to the dorsals, and larger pectoral fins. So much as to the external appearance. The teeth exhibit generally three, sometimes five, prongs, the middle being always proportionally more developed than in the species to which we are comparing it.

The head is contained six times and a half in the total length. The snout is broad, very declivous, and obtusely rounded off. The supra-ocular ridge is not a mere fold of the skin, but assumes a very hard structure, and considerably more raised above the orbit than hence forwards. The inter-ocular space is depressed, sub-concave, from the occiput, where broadest, to the margin of the snout towards which it tapers. The orbit is elliptical; its longitudinal diameter entering about six times in the length of the side of the head; the pupil, as already stated, being sub-vertical, obliquely inclined backwards. The spiracles are small, situated somewhat below the eyes, and posteriorly to a vertical line drawn immediately behind the orbit. The width of the mouth is nearly equal to the inter-orbital space. The structure of the nostrils resembles very much that of the same parts in *C. philippi*. The angles of the mouth are formed, anteriorly or superiorly, by a thickened fold of the upper lip, extending somewhat beyond a thickening of the posterior or lower lip, which constitute their opposite border. A short and shallow groove may be seen directed obliquely outwards from the angles of the mouth. The second branchial aperture is placed slightly in advance of the anterior margin of the base of the pectoral fin; the three remaining ones being situated posteriorly to the same margin. The five of these apertures are placed gradually one above the other from forwards backwards, diminishing in size in the same directions.

The body, as well as the head, appears proportionally stouter than in *C. philippi*. All the

fins are more developed, although alike in shape. The anterior margin of the first dorsal is somewhat nearer the extremity of the snout than the anterior margin of the second dorsal, which is nearly equidistant between the tip of the caudal fin and the orbit. The origin of the anal fin is nearly equidistant between the tip of the caudal and the posterior end of the insertion of the pectorals; its posterior extremity reaches the anterior margin of the first portion of the lower lobe of the caudal, and which we should be inclined to consider as a second anal fin. The origin of either lobe of the caudal fin is almost even; the inferior lobe is much deeper anteriorly than the upper. The posterior portion of the lower lobe of the caudal is much smaller than the anterior portion. It is exteriorly rounded or sub-truncated, and separated from the upper lobe by a small incision, which corresponds to the tip of the vertebral column. The posterior margin of the ventrals, which is sub-truncated or sub-concave, extends somewhat beyond the origin of the second dorsal. The posterior edge of the pectorals is sub-convex or rounded off; its middle region approximating the origin of the ventrals when bent in that direction. The vent is longitudinal, and placed between the ventral fins.

The upper surface of the body and fins is very rough to the touch; the scales, or rather dermic productions, are very small, and irregular in size and shape. They are more conspicuous over the supra-ocular ridges and the dorsal region, properly so called, where some of them are raised above the others; they are smallest over the fins and sides of the body; but whether triangular, sub-rhombic, or cruciform, the angles are always acerated, the points being sometimes a continuation of a minute keel, which start from the middle of the scales. Over the inferior surface of the head, body and horizontal fins, the scales are sub-rhombic or sub-cordiform, likewise variable in size, exhibiting but one single inconspicuous keel, without angular points; hence that surface assumes quite a smooth aspect. The scales, moreover, are closely approximated, sub-imbricated, whilst on the upper surface of the body they are almost all isolated. The color above is yellowish grey, darker in the young; beneath light yellow. Small roundish, black spots, are spread all over the body and fins.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------|----------------------------|-----------------|-------------------------|---------------------|-----------------------|
| 993 | 2 | Adult. | Bay of Monterey, Cal. | 1853 | Lt. W. P. Trowbridge .. | Alcoholic .. | Lieut. Trowbridge.... |

Family NOTIDANIDAE, Owen.

The head is flat or depressed. The nostrils are provided with a small, triangular flap. A very large fold or wrinkle at the upper (anterior) angle of the mouth; a smaller one at the lower (posterior) angle; nictitating membrane wanting; tongue immovable. The spiracles are small and vertical. The branchial apertures are six or seven in number, diminishing gradually in size from forwards backwards, all of which are placed in advance of the base of the pectoral fins. A tooth at the symphysis of the lower jaw; the next five or six teeth on the lower jaw constitute on either side a saw, directed from upwards and inwards, downwards and outwards. The anterior or inner edge of the teeth is smooth or very finely serrated. The outermost teeth of the jaw are low and depressed. The teeth at the upper jaw are more elongated, smaller and more acute; the first prong or point is much longer than the rest; their outer

edge is strong, the inner edge being finely serrated towards the base. The foremost teeth constitute a group, are hook-shaped, with a broader base. The adjoining ones are provided exteriorly with one or more lateral prongs. The outermost teeth are like those at the lower jaw. The body is elongated and fusiform, with a conspicuous lateral line. There is but one dorsal fin, situated between the ventrals and the anal, and partly opposed to the latter. Caudal fin with a small lower lobe emarginated towards its extremity, the posterior margin being oblique or straight and truncated. The caudal grooves or furrows are wanting. The intestinal valve is helicoid.

SYN.—*Notidanini*, BONAP. Syst. Vertebr. 1837, 45; & Selach. Tabul. analyt. 1838, 4.

Notidani, MÜLL. & HENLE, Syst. Besch. Plagiost. 1841, 80.—MÜLL. in *Wieg.* Archiv für Naturg. 1845, I, 137.—

Bd. Iconogr. Encycl. II, 1850, 242.—DUM. Ichthyol. analyt. 1856, 133.

Notidanidae, OWEN, Lect. Comp. Anat. Vertebr. Anim. 1846, 51.

When the branchial apertures are six on either side we have the genus *Hexanchus*; and when seven of them exist, the genus *Heptanchus* (*Heptanchias*). These were the only two genera of the family described by ichthyologists.

A shark of this family having recently been observed in the bay of San Francisco, California, was erroneously erected into a third genus, under the name of *Notorhynchus*, which does not differ from *Heptanchus*. We will therefore record the species under the appellation of

HEPTANCHUS MACULATUS, G r d .

SYN.—*Notorhynchus maculatus*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 72.

In the absence of specimens we forbear drawing up a specific description, and refer our readers to the above quoted "Proceedings of the California Academy," in which Dr. Ayres has recorded the observations he has traced from nature.

Family SPINACIDAE, Owen.

The sharks which constitute this family exhibit two dorsal fins, whilst the anal is wanting, either dorsal being provided with a strong spine at its anterior margin, as is likewise the case in *Cestraciontidae*. The spiracles are extant, and the five branchial apertures situated in advance of the pectoral fins. The nictitating membrane of the eye is wanting. The intestinal valve is helicoid.

SYN.—*Spinaces*, MÜLL. & HENLE, Syst. Besch. Plagiost. 1841, 83.—MÜLL. in *Wieg.* Archiv für Naturg. 1845, I, 135 & 137.—DUM. Ichthyol. analyt. 1856, 133.

Spinacini, BONAP. Syst. Vert. 1837, 4.—Bd. Iconogr. Encycl. II, 1850, 242.

Spinacidæ, OWEN, Lect. Comp. Anat. Vertebr. Anim. 1846, 51.

Some of the representatives of this family are commonly known under the names of "Dog-fish" and "Picked Dog-fish," both in England and in America, being distinguished from *Mustelidae*, which go under the same vernacular appellation on this side of the Atlantic, by the presence of a rather strong spine at the anterior margin of the dorsal fins.

ACANTHIAS, Risso.

GEN. CHAR.—Head depressed. Outline of the mouth in the shape of a very open curve; a large groove at either angle. Two cartilaginous folds of the lips anteriorly (superiorly) and one posteriorly (inferiorly). Spiracles very large, situated behind and somewhat above the eyes, and provided within with a swelled flap arising from their anterior margin. Orbits elongated; upper and lower teeth cutting, the edge being nearly horizontal and the point directed outwardly. The root of the tooth is more

elevated at the inner part than at the outer; the inner part having, moreover, a longitudinal keel, the outer part constituting a rounded process, directed towards the point of the tooth. First dorsal fin placed between the pectorals and the ventrals; the second between the ventrals and the caudal fin. Upper lobe of caudal larger than the lower; sometimes a caudal groove or furrow is observed. In the male a movable spine or thorn, bent upon its apex, may be seen at the outer edge of the extremity of the ventral appendages. The scales are sub-cordiform, posteriorly acute, with one or several keels.

SYN.—*Acanthias*, RISSO, Hist. nat. Eur. mērid. III, 1826, 131—MÜLL. & HENLE, Syst. Besch. Plagiost. 1841, 83.—STORER, Synops. 1846, 254.—DUM. Ichthyol. analyt. 1856, 133.

Of all the genera of *Spinacidae*, the genus *Spinax* is the one to which *Acanthias* bears the closest affinities, the latter having been admitted by comparatively few writers.

ACANTHIAS SUCKLII, GRD.

SPEC. CHAR.—Head constituting somewhat more than the sixth of the entire length. Snout very much depressed and elongated; nostrils nearer its apex than the angle of the mouth. Eyes large, elliptical, situated immediately in advance of the mouth. Anterior margin of first dorsal fin nearly equidistant between the pupil and the anterior margin of the second dorsal. A shallow caudal groove along the base of the upper lobe of the caudal. Dark greyish, with a few light irregularly scattered spots.

SYN.—*Spinax* (*Acanthias*) *suckleyi*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 196.

We have examined one specimen of this species measuring nearly two feet and a half in total length, the head forming a little more than the sixth part of it. The body is very much elongated, slender, and gradually tapering posteriorly. The snout is very much depressed, elongated, and, when viewed from above, sub-conical in its outline. The nostrils consist of a circular free aperture, and of a transverse split continuing it inwardly. At the anterior edge of this split may be observed an elongated flap, tapering and rounded off, which overlaps the split at the inner edge of the circular aperture; the rest of the anterior edge of the split, as well as the entire posterior edge, exhibits a narrow, thin membranous expansion more developed at the posterior edge than at the anterior. The nostrils themselves are somewhat nearer the apex of the snout than the angles of the mouth. The latter is large; measured from angle to angle, it is a little less than the rostral distance from the middle of the anterior jaw forwards. The cartilaginous fold of the posterior (inferior) angle is shorter but thicker than the outer one at the anterior (superior) lip. The inner one at the same anterior lip is very slender and mostly covered by the outer one. The eyes are very large, elliptical, their longitudinal diameter entering about four times along the distance between the apex of the snout and the spiracles; they are situated immediately in advance of the mouth. A longitudinal groove may be seen at the anterior and at the posterior rim of the orbit. The spiracles being somewhat oblique and transversely elongated. The branchial apertures increase in size from forwards backwards; the fifth, which is conspicuously larger than the rest, is placed immediately in advance of the anterior margin of the pectorals.

The dorsal fins are of moderate development, higher than long, and superiorly concave. The spine at the anterior margin of the second dorsal is larger than that of the first dorsal. The anterior margin of the latter fin is nearly equidistant between the pupil and the anterior margin of the second dorsal, which, in its turn, is nearer the anterior margin of the first dorsal than the extremity of the caudal fin. The upper lobe of the caudal is sub-lanceolate, posteriorly rounded off; the lower lobe is much deeper, sub-triangular, and concave upon its inferior margin; the origin of either lobe is even. A shallow caudal groove may be observed along the base of the upper lobe. The ventrals are small, appearing more like a marginal expansion of the ventral appendage than fins properly so called. They are rounded off exteriorly and linear posteriorly. The anterior portion of their insertion is nearer the extremity of the caudal

fin than the nostrils. The pectorals are very large, sub-triangular, posteriorly expanded, and concave upon the latter margin; their extremities extending somewhat beyond the insertion of the spine at the first dorsal fin, when stretched alongside the body.

The scales are very small, closely approximated, and somewhat rougher on the upper surface of the body than on the lower surface, owing to a proportional development of their respective keels.

The color above is of a dark greyish tint, with a few small whitish-yellow spots, irregularly scattered; under the head and along the belly, dull yellowish; under the caudal region, of a greenish grey hue.

In the embryos the ground color is more of a bluish tint, and the lighter spots just alluded to are much more conspicuous than in the adult, constituting longitudinal series, in which the spots sometimes unite to form a continuous band, increasing in width towards the caudal region, where the lowermost merges into the uniform tint of the abdomen.

List of specimens.

| Catal. No. | No. of specs. | Sex and age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Orig. No. | Collected by— |
|------------|---------------|--------------|---------------------------------|-----------------|-----------------------|---------------------|--------------|-------------------|
| 994 | 1 | Adult ♂ | Fort Steilacoom, Puget's Sound. | 1853 | Gov. I. I. Stevens... | Alcoholic. | 17 | Dr. Geo. Suckley. |
| 997 | 5 | Young.. |do..... | 1853 |do..... |do..... |do..... |do..... |
| 998 | 1 | ..do.... |do..... | 1853 |do..... |do..... |do..... |do..... |
| 999 | 8 | ..do.... |do..... | 1855 | Dr. Geo. Suckley... |do..... |do..... |do..... |

SUB-ORDER II.

RAJAE.

The rays or skates may be distinguished from the sharks by a depressed, broad, elongated, or short body, terminated by a slender, sometimes flagelliform tail; a complete thoracic arch extending to the dorsal region; the pectoral fins confounded, or else continuous with the cephalic region; the eyelids being either absent or immovable; the branchial fissures, five on either side, situated on the ventral surface beneath the pectoral fins, and by the anterior portion of the vertebral column, which forms a continuous cartilaginous mass, without any vertebral division.

SYN.—*Rajidae*, BONAP. Sagg. Distr. metod. Anim. Vert. 1831, 122; Syst. Vertebr. 1837, 44; &, Selach. Tabul. analyt. 1838, 3.—DEKAY, New Y. Faun. IV, 1842, 366.—MULL. in *Wieg.* Archiv für Naturg. 1845, I, 137.—STORER, Synops. 1846.

Rajae, MULL. *Vergl. Anat. Myxin.* I, 1836.—MULL. HENLE, *Syst. Besch.* Plagiost. 1841, 103.

Raiadae, BD. *Iconogr. Encycl.* II, 1850, 242.

Hypotrēmes, DUM. *Ichthyol. analyt.* 1856, 137.

We have, so far, but few observations to put on record regarding the rays of the western coast of North America. If we are at all justified in expecting to find there the same approximate number of species as we are acquainted with along the Atlantic coast, many more may be pronounced undiscovered as yet.

Family RHYNOBATIDÆ, Owen.

The body is rhomboidal, elongated; the tail thick and fleshy. The mouth is straight or slightly convex forwards; the teeth being small and pavement-like, depressed, arranged in quincunx, with cutting, oblique ridges, more or less numerous. The spiracles are placed close to the posterior rim of the orbit. A series of pores may be observed under the thoracic belt. The ventral fins are inserted immediately behind the extremities of the pectorals; the latter passing gradually into the snout. Two dorsal fins, nearly equal in size, are inserted upon the posterior portion of the tail. The ventrals themselves are quadrangular, longer than broad, anteriorly rounded, and posteriorly pointed. The caudal fin is terminal, without lower flap. The caudal keels begin behind the ventrals and extend backwards, converging along the under aspect of the tail.

SYN.—*Rhinobatini*, BONAP. Syst. Vert. 1837, 45; & Selach. Tabul. analyt. 1838, 4.—Bd. Iconogr. Encycl. II, 1850, 242.
Rhinobatides, MULL. & HENLE, Syst. Besch. Plagiost. 1841, 112.—DUM. Ichthyol. analyt. 1856, 140.
Rhinobatidae, OWEN, Lect. Comp. Anat. Vert. Anim. 1846, 51.

No representatives of this family have, as yet, been observed along the Atlantic coast of the United States.

RHINOBATUS, Bl. Schñ.

GEN. CHAR.—Skull prolonged anteriorly into a keel, the intervening space between which and the inner edge of the pectorals being skinned. Snout more or less pointed. The upper (anterior) nasal flap consists of an outer—small and elongated—and an inner—broad and short—lip. The outer lip, which is not far apart from the inner one, is small, but reaches, with its rounded off extremity, the inferior (posterior) edge of the nostril; it is placed nearly in the middle of the upper (anterior) edge of the nostril, whilst the inner lip extends more or less inwardly. The inferior (posterior) nasal flap, from the outer angle extends more or less inwardly. Spiracles and eyes surrounded by a common membrane. The upper eyelid is provided upon its middle with an immovable process. The upper (anterior) maxillar membrane exhibits a notched edge, and is bent inwardly.

SYN.—*Rhinobatus*, BL. SCHN. Syst. Ichthyol. 1801.—MULL. & HENLE, Syst. Besch. Plagiost. 1841, 113.—DUM. Ichthyol. analyt. 1856, 139 & 141.

The genus *Rhinobatus* of Bloch may be subdivided into two sub-genera. When the upper (anterior) nasal flaps extend over the inner angle of the nostril inwardly without uniting in their middle we have the sub-genus *Syrrhina* of Müller and Henle; whilst in the sub-genus *Rhinobatus*, as understood by the same writers, the upper (anterior) nasal flaps do not extend as far as the inner angle of the nostrils.

The following species, from the Pacific coast, belongs to the sub-genus *Rhinobatus*, properly so called.

RHINOBATUS PRODUCTUS, Ayres.

A male specimen, thirty-eight inches in total length, brought this species to our knowledge. The rostral distance, from the eyes forwards, is of a much lighter tint than the rest of the body. A blackish band exists along the middle of the back, with diffused blotches upon the sides, and a double band of the same color along the middle of the snout.

SYN.—*Rhinobatus productus*, AYRES, in Proc. Cal. Acad. Nat. Sc. 1, 1854, (MSS.)—GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 196.

The specimen above referred to, preserved in the museum of the Smithsonian Institution, being temporarily packed away and unavailable just at this time, and the present report having

to pass through the press without any further delay, we must defer to another opportunity of describing this species more fully.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------|-------------------------------------|-----------------|-----------------------|---------------------|-------------------|
| 1409 | 1 | Adult. | Bay of Monterey or Presidio, Cal... | 1853 | Lt. W. P. Trowbridge. | Alcoholic. | Lt. Trowbridge... |

Family TORPEDINIDÆ, OWEN.

The body is rounded off, sub-orbicular, naked, else without scales, spines or prickles. The ventral fins are situated immediately behind the pectorals. The tail is moderately elongated, fleshy, depressed at the base, cylindrical towards its extremity, which is terminated by a well developed, triangular caudal fin. There are either one or two dorsal fins, or none at all. On either side of the tail a membranous ridge, more or less elongated, may be observed. The upper eyelid is immovable, without median process. The nasal flaps of either side coalesce into a quadrilateral lip, free upon its edge, leaving but the outer angle of the nostrils uncovered, being at the same time united by a small frenum to the upper (anterior) lip. The teeth are small, acute or depressed. An electrical apparatus exists between the head, the gills and the inner margin of the pectorals, consisting of vertical columns, the terminal surface of which being oftentimes observed through the skin of the back and belly.

SYN.—*Torpedinini*, BONAP. Syst. Verteb. 1837, 44, &, Selach. Tabul. analyt. 1838, 4.—BD. Iconogr. Encycl. II, 1850, 242.

Torpedines, MÜLL. & HENLE, Syst. Besch. Plagiost. 1841, 126.—MÜLL. in Wieg. Archiv für Naturg. 1845, I, 137.—DUM. Ichthyol. analyt. 1856, 141.

Torpedinidæ, OWEN, Lect. Comp. Anat. Vert. Anim. 1846, 51.

The genera *Torpedo* and *Narcine*, which are provided with two dorsal fins, differ from one another by characters which may be best appreciated when respectively compared. Not in possession of any specimens from the western coast, it is not to be expected that we should enlarge upon this topic. We will simply state that the species described by Dr. Ayres belongs to *Narcine* instead of *Torpedo*, and consequently we record it under the name of

NARCINE CALIFORNICA, GRAD.

SYN.—*Torpedo californica*, AYRES, in Proc. Cal Acad. Nat. Sc. Philad. I, 1855, 70.

hoping at a future time to complete the history of this fish in connexion with its Atlantic representative described by my esteemed friend Dr. D. H. Storer, of Boston, now engaged upon an illustrated edition of his "History of the Fishes of Massachusetts."

Family RAIIDÆ, OWEN.

The pectoral fins are combined with the snout, and their insertion extends as far as the ventrals. The body is broad, rhomboidal in general appearance; the tail is slender and elongated, depressed and provided on either side with a membranous keel or fold extending to its whole length, the two dorsal fins being situated towards its extremity; the terminal fin, or caudal, either exists as border to the caudal process, else is entirely wanting. The upper eyelid

is immovable; the eyes and the spiracles separated by a small bridge; the spiracles exhibiting a smooth border. The nasal flaps coalesce into a quadrangular lip, which is united to the edge of the anterior jaw, a small portion alone remaining free on either side, under the shape of a rounded angle more or less fringed. At the outer edge of the nasal apertures may be observed a small membranous border. The mouth is bent forwards, without cartilaginous lips. The teeth are acute or pavement-like, depressed, although pointed or acute in the male sex during the breeding season. A maxillar membrane at the upper (anterior) jaw only, emarginated in the middle, and fringed upon its edge. The skin is either smooth or covered with small, curved spines directed backwards, more or less crowded according to the species. Larger spines are also occasionally intermixed along the dorsal line and tail, on the sides of the tail, the eyelid, or around the orbit, on the rostral ridge, and at the anterior edge of the pectoral fins. In the male sex, during the breeding season, are developed two sharp spines at the anterior margin of the pectoral fins. The female sex lays eggs.

SYN.—*Rajini*, BONAP. Syst. Vert. 1837, 44; & Selach. Tabul. analyt. 1838, 4.—Bd. Iconogr. Encycl. II, 1850, 243.

Rajae, MULL. & HENLE, Syst. Besch. Plagiost. 1841, 132.—MULL. in *Wiegman's Archiv für Naturg.* 1845, 1, 137.

Raiidae, OWEN, Lect. Comp. Anat. Vertebr. Anim. 1846, 51.

The rays properly so called, and which constitute the present family, are the only ones in the sub-order to which they belong that lay their eggs; the latter being, in the other families, retained in the abdominal cavity till after hatching.

RAJA, A r t e d i.

GEN CHAR.—The snout is produced into a keel, to which the inner margin of the pectorals is parallel. The intervening space between the rostral keel and the inner margin of the pectorals is skinned. The ventral fins subdivide into an inner and an outer lobe, resulting from a deep emargination of their posterior margin; the outer lobe being thicker but smaller than the inner. The tail is provided with a low terminal fin, more conspicuous at the upper than at the lower aspect, and generally interrupted towards the apex.

SYN.—*Raja*, ARTEDI, "Gen. Pisc. ed. *Walbaumii*, 1792, 523.—LINNÆ, Syst. Nat. ed. XII^a I, 1766, 399.—GMEL. *Linn. Syst. Nat.* XIII^a I, iii, 1788, 1504.—CUV. *Règn. Anim.* II, 1817, 134; 2d ed. II, 1829; & ed. iii. *Poiss.* 373.—MULL. & HENLE, Syst. Besch. Plagiost. 1841, 132.—DE KAY, N. Y. Faun. IV, 1842, 366.—STORER, Rep. Fish. Mass. 1839, 191; & Synops. 1846, 258.—DUM. *Ichthyol. analyt.* 1856, 137 & 142.

The species of the genus *Raja*, even as restricted by modern writers, are still very numerous, distributed nearly all over the globe. Müller and Henle have made two divisions of them. 1. Those in which the snout is rather blunt and the rostral keel not extending to the edge of the disc; and 2. Those in which the snout is more pointed or acute and more or less elongated: the latter division including more species than the former. The species hereon alluded to, would belong to the second division, and should future observations restore the genus *Laeviraja*, it is to that genus that it will revert.

RAJA COOPERI, G r d.

This species came to our knowledge through a sketch made by Dr. James G. Cooper, accompanied by the following remarks:

"In June and July, 1854, several large skates were washed ashore on the sand flats near the entrance of Shoalwater bay, and which I had no means of preserving. I took a sketch of one of the largest, of which the inclosed is a copy.

"Though I did not see any of them alive, I think they had entered the bay and were left by the ebb-tide on some of the extensive sand bars, where they had died. I have never heard of

their occurrence at any other season. The Indians will not eat them very often, but say they are not poisonous.

“Length from tip of snout to root of tail, three feet six inches. Length of tail, two feet. Breadth across middle of belly, four feet two inches. Tip of snout to margin of mouth, eleven inches.

“Color, above entirely dark brown; below dull white. Iris yellow.

“Snout and top of head thickly covered with short, recurved, hooked prickles, diminishing in size from the centre of head towards the circumference. Tail also thickly covered with the same, above and on the sides.

“No spine in tail. Cartilaginous expansions along its upper ridge, near the end.

“Convexity about the same on each surface of the body; snout rounded above, flat below. Tail nearly cylindrical; blunt.”

URAPTERA, Müll. & Henle.

GEN. CHAR.—Aspect and structure of the snout and of the ventral fins as in *Raja*, from which it is to be distinguished by a slender tail, and without terminal or caudal fin.

SYN.—*Uraptera*, MÜLL. & HENLE, Syst. Besch. Plagiost. 1841, 155.—DUM. Ichthyol. analyt. 1856, 143.

It is a matter of more than common interest when a genus, originally framed upon a single and isolated species, makes the accession of others previously unknown.

URAPTERA BINOCULATA, Grd.

SPEC. CHAR.—Three orbital and one dorsal spines; sixteen along the tail; rest of the body smooth. Dorsal fins situated very far back, sub-equal, longer than deep, approximated, and placed near the end of the tail. Posterior margin of ventral fins moderately emarginated, the edge scalloped or undulating, owing to the concavity of the interradiial membrane. Olivaceous brown above, with two large black rings upon the middle of the pectorals; beneath yellowish white.

SYN.—*Raja binoculata*, GRD. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 196.

The form is sub-rhomboid; slightly undulated upon the anterior margins, and rounded off posteriorly. The angles formed by the pectoral fins being likewise rounded. The transverse diameter is much greater than the longitudinal. The snout is tapering anteriorly, without being pointed or protruding. The distance between the nostrils and the apex of the snout is somewhat greater than the interval between the nostrils themselves. The eyes are moderate sized; the orbits surrounded with three spines, two anteriorly and one posteriorly and inwardly. A small spine is also observed upon the dorsal line, near the origin of the trunk. The tail from the vent to its tip is nearly equal in length to the rest of the body and head together; it is slender and depressed over most of its extent, provided above with a series of sixteen spines, beginning at the very origin of that organ, extending to the anterior margin of the first dorsal fin. Laterally is observed a membranous expanded ridge, which may be traced to its very tip. The second dorsal fin is nearly as large as the first dorsal, and separated from it by a quite narrow space; both being longer than deep, and superiorly sub-convex. The portion of the tail extending back of the second dorsal fin is equal to the two-thirds of the base of the same fin. The ventrals are broad and short, emarginated or bilobed posteriorly and scalloped; the inner lobe being larger than the outer one.

With the exception of the few spines alluded to above, the upper surface of the body is perfectly smooth.

The ground color is olivaceous brown; the snout dull whitish. A large sub-circular black

ring at the base of pectorals inclosing a large sub-circular black spot. Beneath dull yellowish white; the external margin of the ventrals being blackish. The dorsal fins are olivaceous; the extremity of the tail blackish with a lighter margin.

List of specimens.

| Catal No. | No of spec. | Age. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|-----------|-------------|--------|------------------------|-----------------|-------------------------|---------------------|---------------------|
| 989 | I | ..... | San Francisco, Cal.... | 1853 | Lieut. J. G. Parke | Alcoholic.... | Dr. A. L. Heermann. |
| 990 | I | Young. | Presidio, Cal..... | 1853 | Lieut. W. P. Trowbridge | do..... | Lieut. Trowbridge . |

Family MYLIOBATIDÆ, Owen.

The rays of the pectoral fins disappear altogether on the sides of the head, but develop again in front of it, constituting a kind of cephalic fin, which forms the anterior extremity of the disc. The head, therefore, from the region occupied by the spiracles forwards, is separated from the discoid body; it is likewise more developed than in the other families of this sub-order. The nasal flaps of either side coalesce into a quadrilateral, posteriorly fringed membrane, or lip, which extends to the mouth. The nasal apertures approximate interiorly, being separated by a narrow frenum, which tapers away towards the angles of the mouth. The latter is straight. The dentated portion of the jaws extends deep inwardly. The teeth are large, depressed, mosaic pavement-like. The upper maxillar membrane extends from the palate and the cheeks outwardly, it being very long, with a convex margin, which is fringed upon its middle. The lower maxillar membrane is close to the dental margin. Behind these membranes may be observed some papillae still. The eyes and the spiracles are situated on the side of the skull; the spiracles being separated from the eyes by a wide bridge. The eyelids are wanting. The tail is elongated, flagelliform, with a dorsal fin at its base, and a depressed spine behind the latter, directed horizontally backwards.

SYN.—*Myliobatini*, PONAP. Syst. Vertebr. 1837, 44; & Selach. Tabul. analyt. 1838, 3.—Bl. Iconogr. Encycl. 11, 1850, 243.

Myliobatides, MÜLL. & HENLE, Syst. Besch. Plagiost. 1841, 176.—MÜLL. in *Wiegman's Archiv für Naturg.* 1845, 1, 137.

DUM. Ichthyol. analyt. 1856, 145.

Myliobatidae, OWEN, Lect. Comp. Anat. Vertebr. Anim. 1846, 51.

The Myliobatides are quite numerous along the Atlantic coast of the United States, where we find species of *Myliobatis*, of *Aëtobatis*, and *Rhinoptera*, the chief representatives of this family.

RHINOPTERA, Kuhl.

GEN. CHAR.—Snout more or less emarginated anteriorly. The cranial fin not in a same level with the pectorals, being directed more downwards, and fixed to the inferior edge of the base of the pectorals. The rays of the cranial fin begin, likewise, more backwards than the termination of the rays of the pectorals. The lower edge of the nasal flap is straight, whilst its exterior angle is pointed. On the dorsal surface a longitudinal fissure on either side. Either margin of the jaws straight. The teeth are broader than long, hexagonal, depressed, placed side by side, constituting from three to five series, diminishing in size laterally. Alongside and exteriorly to the former there are a few series of smaller teeth, not broader than long; they occupy the entire width of the jaws.

SYN.—*Rhinoptera*, KÜHL.—MÜLL. Vergl. Anat. Myxin. 1, 1836, 76.—MÜLL. & HENLE, Syst. Besch. Plagiost. 1841,

181.—DEKAY, New Y. Faun. IV, 1842, 375.—STORER, Synops. 1846, 263.—DUM. Ichthyol. analyt. 1856, 145.

Whenever an opportunity shall be afforded us for comparing the species from our Atlantic coast to the one recorded hereon, we may be better prepared in pointing out the characters which

are truly specific. For the present printed documents alone have served as standard to the few comparative hints which have been attempted with an allied species of a more southern clime.

RHINOPTERA VESPERTILIO, G r d .

SPEC. CHAR.—Cephalic region equal to the rest of the body. Snout sub-elliptical upon its periphery instead of being notched. Eyes prominent, and raised above the surface of the head. Transverse diameter of body more than twice its length. Tail very slender and tapering. Above purplish blue or slate-colored ; beneath dull olivaceous.

SYN.—*Rhinoptera vespertilio*, G r d . in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 137 ; and, in Bost. Jour. Nat. Hist. VI, 1857.
Plate xxvi.

This species is closely allied to *R. javanica*, from which it differs by the shape or outline of the head, which is semicircular anteriorly, very slightly emarginated instead of being deeply notched or concave, and by the lateral extremities of the pectoral fins which are less pointed. The ventrals, on the other hand, are broader or more expanded.

The specimen before us measures nineteen inches and a half from the extremity of the snout to the tip of the tail ; six inches and three-quarters being the length of the body and head together. The width from the tip of one pectoral fin to the other is twelve inches.

The cephalic region is as long as the rest of the body ; its anterior outline, as already stated, is rounded, and but very slightly emarginated. The eyes are quite prominent, and somewhat raised above the surface of the head. The lips are fringed and the edge of the maxillar membrane scalloped. The branchial apertures, five pairs in number, are transversely elongated and disposed upon an open curve.

There is a small dorsal fin situated posteriorly to the ventrals upon the anterior portion of the tail, and followed by a lanceolated, horizontally flattened spine, serrated upon its edges. The tail is very attenuated, flagelliform, tapering into a filiform extremity.

The color above is of a purplish blue or of a slate tint, lighter towards the periphery than upon the dorsal region ; beneath dull olivaceous.

List of specimens.

| Catal. No. | No. of spec. | Age. | Locality. | When collected. | Whence obtained. | Original No. | Nature of specimen. | Collected by— |
|------------|--------------|-------|------------------------|-----------------|------------------|--------------|---------------------|-----------------|
| 364 | I | Adult | Tomales bay, Cal. | 1855 | E. Samuels..... | 348 | Alcoholic. | E. Samuels..... |

ORDER X.

DERMOPTERI.

The body is vermiform or worm-like to such a striking extent that Linnaeus himself got deceived, placing one of the species in the class of worms. This external resemblance to worms is rendered the more deceiving as the lateral fins (pectorals and ventrals) are altogether wanting, the skin naked or scaleless, either verticillated or annulated. The vertical fins themselves are reduced to a mucous fold of the derm or skin, which is moreover mucous throughout. The internal skeleton being unossified, without distinct vertebræ, instead of which a central cartilaginous cord, and the head so much blended with the body that in various cases it is not easily distinguishable. The pancreas and air bladder, both, are absent. The intestine is straight, without either fold or appendages.

SYN.—*Dermopteri*, OWEN, Lect. Comp. Anat. Vertebr. anim. 1846, 47.—Bp. Iconogr. Encycl. II, 1850, 203.
Chondrichthes trématopnēs, DUM. Ichthyol. analyt. 1856, 104.

The Dermopterians subdivide into two sub-orders; the *Pharyngobranchii seu Cirrhostomi* and the *Marsipobranchii seu Cyclostomi*.

The Cirrhostomians constitute but one family, that of *Amphioxidae* (Lancelet), which has no representatives in North America.

SUB-ORDER.

MARSIPOBRANCHII s. CYCLOSTOMI.

The heart is extant, but the accessory arterial heart, known as the *bulbus arteriosus*, is wanting. The *truncus arteriosus* consists merely of the ordinary membranes which enter into the structure of the arteries. The gills are fixed, inclosed within cavities either simple or multipartite, receiving the respiratory streams through apertures usually numerous and lateral.

SYN.—*Marsipobranchii*, BONAP. Syn. Vert. Syst. 1837, 43.

Marsipobranchii s. Cyclostomi, MÜLL. in Weigm. Archiv für Naturg. 1845, 1, 137.—OWEN, Lect. Comp. Anat. Vertebr. anim. 1846, 48.

Exotremes.—DUM. Ichthyol. analyt. 1856, 110.

The Cyclostomians constitute two families; that of *Myxinidae* (Myxine, Hag, or Borer), which is not represented in the ichthyic fauna of North America, and that of the Lampreys, which follows.

Family PETROMYZONTIDÆ, OWEN.

The general form of the body is elongated, cylindrical, or sub-cylindrical, eel-shaped. The dorsal, caudal, and anal fins are continuous; the gills fixed or immovable, and situated in a sort of chest. There are seven lateral branchial openings on either side, admitting the water to bathe the gills. A single spiracle situated on the upper surface of the head.

SYN.—*Petromyzonidae*, BONAP. Sagg. Distr. metod. Anim. Vertebr. 1831, 123.—DEKAY, New Y. Faun. IV, 1842, 379.—STORER Synops. 1846, 265.

Petromyzontidae, OWEN, Lect. Comp. Anat. Vertebr. anim. 1846, 48.—BD. Iconogr. Encycl. II, 1850, 206.—AGASS. Lake Super. 1850, 249.

Petromyzonini, BONAP. Sagg. Distr. metod. Anim. Vertebr. 1831, 123.—MULL. in *Weigm. Archiv für Naturg.* 1845, I, 137.

Two out of the four genera which at present compose this family (*Petromyzon* and *Ammocætes*) have representatives on the western as well as eastern coast of North America.

PETROMYZON, Linn.

GEN. CHAR.—Buccal disk funnel-shaped, sub-terminal, inferior, sub-circular or sub-elliptical, sometimes ciliated or fringed upon its periphery. Two vertical, finely denticulated, jaw pieces, one on either side of the esophagus; a similar piece placed horizontally below the former. Teeth within the buccal disk disposed upon concentric series, largest inwardly, simple, bicuspid and tricuspid. Two distinct dorsal fins; second one united to the caudal and the anal. Gills in separate partitions of the chest.

SYN.—*Petromyzon*, LINN. Syst. Nat. ed. XII^a 1766, 394.—GMEL. in *Linn. Syst. Nat.* ed. XIII^a I, III, 1788, 1513.—DUM. Zool. analyt. 1806; in *Mag. Encycl.* 1808; & *Ichthyol. analyt.* 1856, 112.—Cuv. *Règn. anim.* II, 1817, 117; 2d ed. 1829; & ed. illustr. Poiss. 380.—STORER, Rep. Fish. Mass. 1839, 195; & *Synops.* 1846, 265.—DEKAY, New Y. Faun. IV, 1842, 379.

The genus *Petromyzon*, as characterized above, is restricted within narrower limits than those assigned to it by all previous writers on this subject. Such as it is given here it will include *P. marinus*, L.; *P. fluviatilis*, L.; *P. americanus*, LESU.; *P. nigricans*, LESU.; *P. tridentatus*, GAIRDN.; *P. ciliatus*, AYRES; *P. plumbeus*, AYRES; *P. niger*,* and *P. borealis*.† The first two on the list being European; the rest belonging to North America.

1. PETROMYZON TRIDENTATUS, Gairdn.

SPEC. CHAR.—Body anteriorly sub-cylindrical, deeper than broad; posteriorly compressed, especially the caudal region. Buccal disk sub-circular, longitudinal diameter somewhat greater than the transversal, not fringed upon its periphery. Head constituting about the tenth of the total length. Anterior dorsal fin much lower than the second and separated from it by a space equal to the third of its own length; its origin being nearer the extremity of the snout than the tip of the caudal fin. Upper lobe of caudal somewhat deeper than the lower lobe.

SYN.—*Petromyzon tridentatus*, GAIRDN. in *Lit. : RICHARDS. Faun. Bor. Amer.* III, 1836, 293.—DE KAY, N. Y. Fauna, IV, 1842, 382.—STORER, *Synops* 1846, 266.

We refer to this species a specimen from eighteen to nineteen inches in total length, since it agrees better with the description given by Sir John Richardson than any of the others from western America with which we are, so far, acquainted; it being in such a very precarious state of preservation that we cannot enlarge upon the above diagnostic characters, which we offer as approximative until they can be verified upon specimens in a better state of keeping. The head is nearly as long as the chest. The branchial orifices are smaller than in the following two species, and their structure, as far as a superficial examination may determine, is different also. The "circular row of small nipple-like papillæ, about fifty-six in number, and standing in the middle of little circular depressions having a raised margin," &c., are the base of insertion of very small and acute teeth. The "transverse row of four teeth" consists of six in the specimen before us, the two middle ones being the largest of the series.

The coloration is too far gone to allow any allusion in regard to it.

**Petromyzon nigrum*, RAFIN. *Ichthyol. Olieus.* 1820, 84.

†*Petromyzon fluviatilis*, RICHARDS. *Faun. Bor. Amer.* III, 1836, 294.

List of specimens.

| Catal. No. | No. of spec | Locality. | When collected. | Whenec obtained. | Nature of specimens. | Collected by— |
|------------|-------------|---|-----------------|--------------------|----------------------|------------------|
| 974 | 1 | Ft. Reading, Cow co., Sacramento river, California..... | 1856 | Dr. J. F. Hammond. | Alcoholic.. | Dr. Hammond..... |

2. PETROMYZON CILIATUS, Ayres.

SPEC. CHAR.—Body sub-cylindrical, deeper than broad, caudal region very much compressed. Buccal disk sub-elliptical, fringed upon its periphery. Head constituting about the tenth of the total length. Anterior dorsal fin lower than the second, and separated from it by a space equal to the fifth of its length; its origin being nearer the extremity of the snout than the tip of the caudal. Inferior lobe of caudal fin deeper than the upper. Color olivaceous brown, rather dark above and more greenish beneath.

SYN.—*Petromyzon ciliatus*, AYRES, in Cal. Acad. Nat. Sc. I, 1855, 44.

Having before us a specimen twenty-four inches and a half in total length, labelled by Dr. Ayres himself, there is no room to doubt as to species which we record in this paragraph.

The body anterior to the dorsal fin is sub-cylindrical, deeper than broad, whilst it is compressed posteriorly to it, becoming more and more so towards the caudal region, which is very much compressed and quite thin.

The head is sub-conical, tapering anteriorly, and smaller than the chest. Measured from the extremity of the snout to the first branchial orifice it forms about the tenth of the total length. The buccal disk is of moderate development, sub-elliptical in shape, continuous all around; its periphery being provided with a series of small tentacles or fringes, with filiform tips and somewhat flattened bases, inserted upon the black edge of the thickened lips. Immediately within these fringes may be observed a continuous circular series of very small acute teeth, from fifty-five to sixty in number, each surrounded by a little circular depression, with a raised margin. When removed these teeth leave behind them small nipple-like papillae as the base upon which they were inserted. Within these teeth or papillae, as the case may be, we observe larger teeth. Seven rather small acute and conical ones occupy the anterior portion of the buccal ellipsis, disposed upon two series—five belonging to the continuous series and two forming an additional series in front; four larger ones on either side, the two middle ones tricuspid, the upper and lower pair being bicuspid; eighteen very small, simple, conical, acute teeth like the preceding row complete this series, standing in a circular depression like those above alluded to. The buccal orifice, properly so called, is provided anteriorly with a tridentate transverse piece, the middle tooth being considerably smaller than the lateral ones; posteriorly or inferiorly is another transverse piece armed with five teeth, the three middle ones being somewhat smaller than the exterior two. At the entrance of the esophagus we observe three elongated, finely serrated pieces, the uppermost two placed vertically, the inferior one horizontally. The eyes are sub-elliptical; the longitudinal diameter of the orbit entering about eight times in the length of the side of the head from the first branchial orifice forwards. They are nearer the latter than the extremity of the snout. The seven branchial orifices are vertically sub-elliptical, extending over a space somewhat longer than the cephalic region. The structure of these orifices is quite complex; they are surrounded interiorly by a smooth

and rather thin membrane, which would constitute a kind of tube were its posterior portion not divided into two free, moveable, rounded off flaps, behind which exist a concavity, edged posteriorly with a series of small papillar fringes. A tentacular-like papilla is situated more inwardly, between the edges of the flaps already alluded to.

The anterior dorsal fin is lower than the second; its origin is somewhat nearer the extremity of the snout than the tip of the caudal fin; its base measuring less than the sixth of the total length; the intervening space between it and the second dorsal being equal to the fifth of its base. The second dorsal itself, which begins in advance of the vent, is highest behind that orifice. It gradually tapers away to the upper lobe of the caudal, where a shallow depression marks the point of continuity of these two fins. There is no trace of anal ridge behind the vent; the lower lobe of the caudal, beginning more anteriorly than the upper, becomes also deeper near the apex of the tail, which resembles a contracted spear.

The color is olivaceous brown, rather blackish along the dorsal region, with a metallic green tint over the belly; the fins being of a dark hue.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Orig. No. | Nature of specimen. | Collected by— |
|------------|--------------|----------------------------|-----------------|----------------------|-----------|---------------------|----------------|
| 975 | 1 | Bay of San Francisco, Cal. | 1856 | Dr. W. O. Ayres..... | 2 | Alcoholic. | Dr. Ayres..... |

3. PETROMYZON LIVIDUS, Grd.

SPEC. CHAR.—Body sub-cylindrical, deeper than broad, caudal region very much compressed. Buccal disk sub-elliptical, fringed upon its periphery. Head contained a little over eight times and a half in the total length. Anterior dorsal fin lower than the second, and separated from it by a space equal to the third of its length; its origin being nearer the tip of the caudal fin than the extremity of the snout. Inferior lobe of the caudal slightly deeper than the upper. Uniform bluish black, lighter beneath than above.

This species is closely related to the foregoing one, from which it differs chiefly by the fringes at the periphery of the buccal disk, and which are disposed upon a double, very crowded series, rather more developed at the anterior margin, where they are also more of a flattened shape. The head is nearly as long as the chest; the branchial orifices exhibiting the same structure as in *P. ciliatus*. The first dorsal is placed more anteriorly, else the tail is shorter, and the transition of the second dorsal to the upper lobe of the caudal is less gradual than in the species just alluded to. The specimen described is about fifteen inches in total length.

The color is of a uniform deep bluish black above, somewhat lighter beneath, with a greenish metallic reflect.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|-------------------------------|-----------------|-----------------------|---------------------|-------------------------|
| 976 | 1 | Wahlahmath river, Oregon..... | 1855 | Lt. R. S. Williamson. | Alcoholic. | Dr. John S. Newberry .. |

4. PETROMYZON PLUMBEUS, Ayres.

SPEC. CHAR.—Body anteriorly sub-cylindrical, somewhat deeper than broad, posteriorly compressed. Buccal disk sub-circular, provided with papillar fringes upon its periphery. Head entering somewhat over eight times and a half in the total length. Anterior dorsal fin much lower than the second, and separated from it by a space equal to the half of its own length; its origin being nearer the tip of the caudal than the extremity of the snout. Tail tapering into a point. Upper region of a uniform lead tint; bright silvery beneath.

SYN.—*Petromyzon plumbeus*, AYRES, in Proc. Cal. Acad. Nat. Sc. I, 1855, 28.

The specimen now before us is the very one described by Dr. Ayres, from whom it was obtained by Lieut. Williamson's party.

It measures four inches and three-fourths in total length, and, being the only one so far observed, it is rather difficult to say whether it is the fullest size the species ever reaches.

At any rate it is widely distinct from *P. tridentatus* and more closely allied to the other now known species from California and Oregon, since, like them, it is provided with tentacular fringes at the periphery of the buccal disk; a feature which has escaped Dr. Ayres' notice. Another very distinctive trait between this species and *P. tridentatus* consists in the presence of but two teeth upon the transverse piece at the anterior margin of the buccal orifice. This latter feature will distinguish *P. plumbeus* not only from *P. tridentatus* but also from all the other species so far observed in Oregon and California. Again: the transverse piece at the posterior margin of the buccal orifice exhibits eight, nearly equal teeth, whilst in *P. tridentatus* and *P. ciliatus* five only are observed, the three middle ones being smaller than the outermost two. In that respect it is allied to *P. astori*, in which six of these teeth exist, of nearly equal development. Right and left of the buccal orifice may be seen a single bicuspid tooth.

For further particulars regarding the zoölogical features of the present species, we refer our readers to Dr. Ayres' description, which was drawn up while the specimen was in a better state of keeping.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|--------------------------------|-----------------|--------------------------|---------------------|---------------------|
| 977 | I | Bay of San Francisco, Cal..... | 1855 | Lieut. R. S. Williamson. | Alcoholic.... | Dr. W. O. Ayres ... |

5. PETROMYZON ASTORI, G r d.

SPEC. CHAR.—Body anteriorly sub-cylindrical, deeper than broad; posteriorly compressed, especially at the caudal region. Buccal disk sub-circular, slightly longer than broad, provided upon its periphery with tentacular fringes. Head contained a little over six times and a half in the total length. Anterior dorsal fin lower than the second, and separated from it by a space less than the third but more than the fourth of its own length; its origin being somewhat nearer the tip of the caudal than the extremity of the snout. Inferior lobe of the caudal more developed than the upper lobe. Yellowish brown; lighter beneath than above.

The unique specimen of this species which has come to our knowledge measures seven inches in total length. Its head is somewhat longer than the chest. The branchial orifices being sub-triangular, surrounded with papillar tentacles or fringes. The dentition is similar to that of *P. tridentatus*, *P. ciliatus*, and *P. lividus*, except in the transverse piece at the posterior

margin of the buccal orifice, which exhibits six nearly equal teeth, in which respects it resembles more *P. plumbeus*. The eyes are large, sub-circular, and rather inconspicuous. The base of the second dorsal fin enters seven times in the total length, being, therefore, exactly an inch long. The second dorsal passes to the upper lobe of the caudal fin by a shallow and gradual depression. There is no trace of anal fin, and the lower lobe of the caudal is more extended, and posteriorly deeper than the upper lobe. The caudal itself is lanceolated, tapering into a point. The vent is placed somewhat posteriorly to the origin of the second dorsal fin.

The color is yellowish brown, of a deeper tint along the dorsal region and upper surface of the head than beneath.

List of specimens.

| Catal No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|-----------|--------------|----------------------|-----------------|--------------------------|---------------------|---------------------|
| 978 | 1 | Astoria, Oregon..... | 1854 | Lieut. W. P. Trowbridge. | Alcoholic ... | Lieut. Trowbridge.. |

ICHTHYOMYZON, Girard.

GEN. CHAR.—Buccal disk funnel-shaped, sub-terminal, inferior, sub-circular or sub-elliptical, fringed upon its periphery. Two vertical, finely denticulated jaw pieces, one on either side of the esophagus; a similar horizontal piece below the former. Teeth within the buccal disk generally simple, curved, disposed upon lateral edges, largest inwardly. Gills in separate partitions within the chest. One single dorsal fin united to the upper lobe of the caudal. No anal fin.

This genus differs from *Petromyzon* by the form and disposition of the teeth, and by the presence of one dorsal fin instead of two. The horizontal jaw piece has the shape of two arcs of a circle soldered together, whilst in *Petromyzon* the same cartilaginous piece is nearly transverse. A rather large, tricuspid tooth, may be observed at the anterior margin of the buccal aperture, instead of a transverse sub-crescentic piece, armed with three distinct hooks; and at the posterior margin of the same aperture is a series of uniform teeth, closely set together upon an arc of a circle, instead of the five distant unequal teeth as observed in *Petromyzon*.

To this genus belong: *P. planeri*, BL. of Europe; and *P. lamottenii*, LESU; *P. argenteus*, KIRTL; *P. appendix*, DEKAY; and the following two species.

1. ICHTHYOMYZON CASTANEUS, Girard.

SPEC. CHAR.—Head depressed, constituting the ninth of the total length; body and tail compressed. Buccal disk sub-elliptical, provided with a double series of short, tentacular fringes upon its periphery. Posterior margin of buccal aperture exhibiting a series of nine teeth, disposed upon an arc of a circle. Eyes small and inconspicuous. Spiracle sub-tubular, raised above the surface of the head. Origin of the dorsal fin equidistant between the anterior margin of the buccal disk and the apex of the tail. Vent situated immediately in advance of the most elevated portion of the dorsal fin. Chestnut colored, of a darker tint above than beneath.

What we have termed head is measured from the anterior extremity of the buccal disk to the first branchial orifice, the chest being the region occupied by the entire series, seven in number, of the same branchial orifices.

The length of the head is equal to that of the chest. The tentacles, at the periphery of the buccal disk, are inserted into a shallow groove, formed exteriorly by the thickened edge of the disk, and interiorly by a soft and flexible membranous ridge. The fringes themselves are more developed posteriorly than anteriorly. The branchial orifices are sub-circular, provided with

two semi-circular lips, an anterior and a posterior one, fringed upon their edge, and somewhat raised above the surface of the chest.

The dorsal fin exhibits two convex elevations, one anterior to the vent, the other posterior to it. Its continuity with the caudal is marked by a gradual shallow depression. The lower lobe of the caudal is rather more developed than the upper lobe. The tail itself is bluntly spear-shaped.

The color is of a uniform chesnut tint, somewhat lighter along the abdominal region than over the sides and back, which is much darker.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|------------------------|-----------------|-------------------------|---------------------|-----------------------|
| 979 | 1 | Galena, Minnesota..... | 1853 | Gov. I. I. Stevens..... | Alcoholic..... | Dr. Geo. Suckley..... |

2. ICHTHYOMYZON, HIRUDO, G r d.

SPEC. CHAR.—Head depressed, constituting the seventh of the total length, body and tail compressed, with irregular transverse folds. Buccal disk sub-elliptical, provided with a crowded series of short tentacular fringes. Posterior margin of buccal orifice exhibiting a series of seven teeth disposed upon an arc of a circle. Eyes small, inconspicuous. Spiracle sub-tubular, raised above the surface of the cranium. Origin of dorsal fin nearer the apex of the tail than the anterior extremity of the buccal disk. Vent placed opposite the most elevated portion of the dorsal fin. Gr yish brown above; yellowish beneath.

The head is longer than the chest; the tentacles are likewise more developed posteriorly than anteriorly. The rounded edge of the lip, which borders exteriorly the shallow groove in which the tentacles are inserted, is minutely scolloped, especially sideways. The branchial apertures are vertically sub-elliptical, each provided posteriorly with a crescent shaped lip raised above the surface of the chest, and fringed upon its edge. A few inconspicuous fringes are likewise observed at the anterior edge of the same apertures.

The portion of the dorsal fin anterior to the vent is somewhat convex in its outline; immediately posterior to the vent it is the most elevated, diminishing again towards the upper lobe of the caudal, into which it passes through a shallow depression. The upper lobe of the caudal fin is rather deeper than the lower lobe; the tail itself being posteriorly sub-elliptical in its outline.

The dorsal region is greyish brown; the lower portion of the sides and the belly being of a dull yellowish tint.

List of specimens.

| Catal. No. | No. of spec. | Locality. | When collected. | Whence obtained. | Nature of specimen. | Collected by— |
|------------|--------------|----------------------|-----------------|---------------------------|---------------------|----------------------------|
| 980 | 1 | Fort Smith, Ark..... | 1853 | Lieut. A. W. Whipple..... | Alcoholic. | Dr. George G. Shumard..... |

AMMOCOETES, D u m.

GEN. CHAR.—Mouth sub-terminal, inferior, toothless, but provided within the buccal disk with numerous short membranous cirrhi. Upper lip semi-circular or semi-elliptical; lower lip transverse and nearly straight. Eyes inconspicuous, scarcely perceptible. All the gills situated within a simple cavity of the chest. Two distinct dorsal fins; second one united to the upper lobe of the caudal. Anal reduced to a mere ridge, gradually merging into the lower lobe of the caudal.

SYN.—*Ammocoetes*, DUM. Dissert. Poiss. Cyclost. in Mag. Encycl. 1808; & Ichth. analyt. 1856, 112.—Cuv. Règn. Anim. II, 1817, 119; 2d ed. II, 1829, 406; & ed. illustr. Poiss. 383.—GUER. Iconogr. du Règn. Anim. Pl. lxx, figs. 3 & 4.—STORER, Rep. Fish Mass. 1839, 198; & Synops. 1846, 266.—DEKAY, New Y. Fauna, IV, 1842, 383.

To this genus belong *Ammocoetes branchialis*, DUM, from the fresh waters of Europe. In the northeastern States we find *Ammocoetes bicolor*, LÆS., as another representative of this genus; and at the northwest of this continent the species whose description follows.

AMMOCOETES CIBARIUS, G r d.

SPEC. CHAR.—Body sub-cylindrical, somewhat compressed posteriorly, with its surface annulated. Buccal disk sub-elliptical, interiorly papillar. Head and chest together, contained four times and a half in the total length. Anterior dorsal fin lower than the second, and separated from it by a space not quite the half of its length. Anal fin very low. Deep olivaceous brown above; lighter beneath.

The only specimen of this species which we have so far examined measures four inches in total length. The body anterior to the first dorsal fin is sub-cylindrical, somewhat deeper than broad, whilst it is compressed posteriorly, and the more and more so as it approaches the tip of the tail, which is acute. The surface of the body exhibits numerous, hence closely approximated, transverse or annular segments, which make the general resemblance to a leach most striking. The head is sub-conical, as thick as the body, and rounded off anteriorly. The buccal disk is small, sub-elliptical, the lower rim describing an open curve instead of being perfectly straight. The inner surface of the funnel is provided with proportionally large and closely set papillae. The cephalic region, measured from the apex of the snout to the first respiratory aperture, constitutes about the tenth of the entire length. The seven respiratory apertures, which are somewhat vertical, occupy a space longer than the head; the interval between one another is equal to the diameter of the inconspicuous orbit, which enters four times and a half in the length of the side of the head.

The anterior dorsal fin is lower than the second, resembling in its outline a depressed curve. Its origin is equidistant between the apex of the snout and the tip of the caudal fin; its base entering nearly eight and a fourth of a time in the total length. The intervening space between it and the second dorsal is somewhat less than the half of its length. The vent is situated at one and a fifth of an inch from the extremity of the tail, and somewhat posteriorly to the origin of the second dorsal fin, the anterior third of which is more elevated than the rest, and forms an open curve with its upper edge, similar to that of the first dorsal. It diminishes gradually to the upper lobe of the caudal; the latter again rising, then diminishing towards the tip where the lower lobe of the caudal likewise converges in a like manner.

The anal fin commences close to the vent under the form of a mere inconspicuous and thickened ridge less than half an inch in extent, with a groove on either side; both upper and lower lobe of the caudal are somewhat higher and deeper near the apex of the tail, giving the latter a spear-shaped appearance.

The color is dark olivaceous brown above, the inferior region, from the chest to the vent being

of a lighter, rather more yellowish tint. The caudal region is dark above and below. The fins are likewise dark.

List of specimens.

| Catal. No. | No. of spec. | Locality. | Whence obtained. | When collected. | Original Number | Nature of specimen. | Collected by— |
|------------|--------------|-------------------------------------|---------------------|-----------------|-----------------|---------------------|-------------------|
| 981 | 1 | Fort Steilacoom, Puget's Sound..... | Dr. Geo. Suckley... | 1855 | 37 | Alcoholic. | Dr. Geo. Suckley. |

SCOLECOSOMA, Girard.

GEN. CHAR.—All the characters of *Ammocoetes* except the presence of one single dorsal fin instead of two, continuous with the upper lobe of the caudal. The anal is likewise rudimentary, else reduced to a mere ridge extending from the vent to the inferior lobe of the caudal.

Three species, so far known, compose this genus: *Ammocoetes concolor*, KIRTL., from the hydrographic basin of the Ohio river; *Ammocoetes unicolor*, DEKAY, from the fresh waters of the northeastern States; and *Ammocoetes borealis*, AGASS., from Lake Superior. No representatives of it have, as yet, been observed west of the Mississippi valley.

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¹ By error: *MYLOPHARODON ROBUSTUS*, Agass.

² This species is described in the Report of the United States and Mexican Boundary Commission, in the accompanying plates of which *Gobio gelidus* of the present report is figured.

³ By error: figs. 5—8.

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¹ By error: PLARGYRUS BOWMANNI, Grd.

² By error: LEUCOSOMUS MACROCEPHALUS, Grd.

³ By error: figs. 12—15.

⁴ By error: PTYCHOCHEILUS GRACILIS, Grd.

⁵ By error: figs. 4—7.

⁶ By error: figs. 1—3.

⁷ By error: OSMERUS STEVENSI, Grd.

⁸ By error: ARGENTINA PRETIOSA, Grd.

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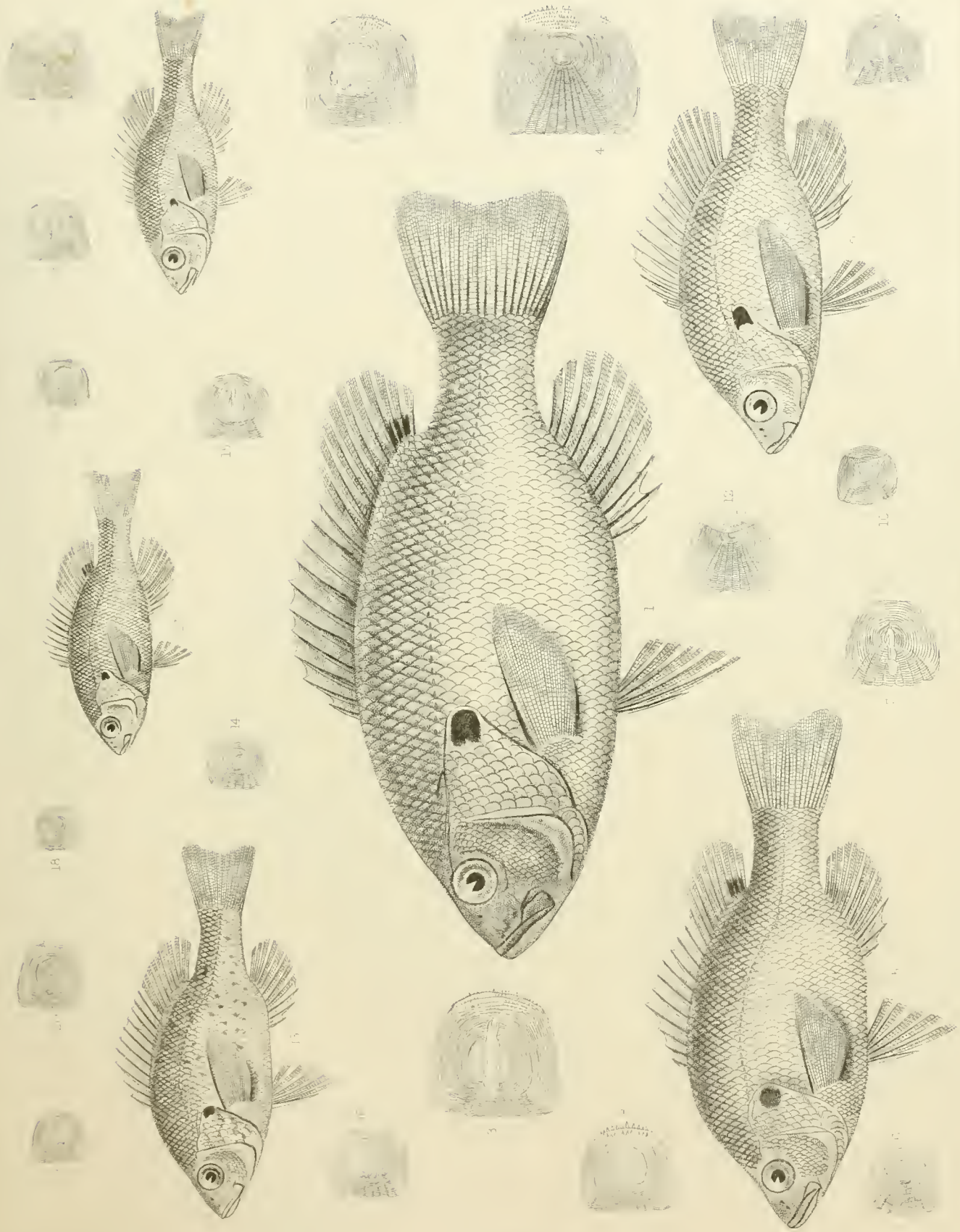
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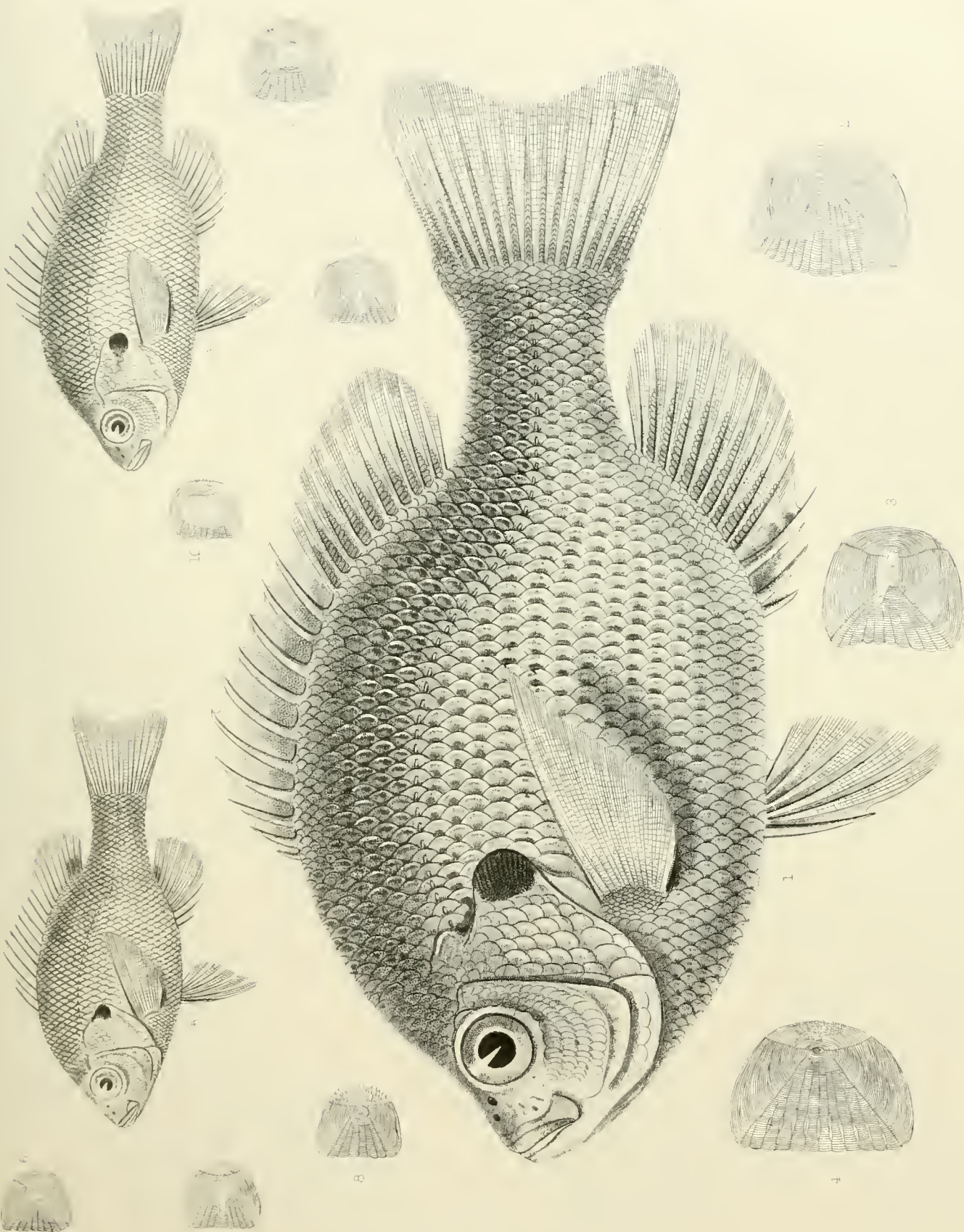
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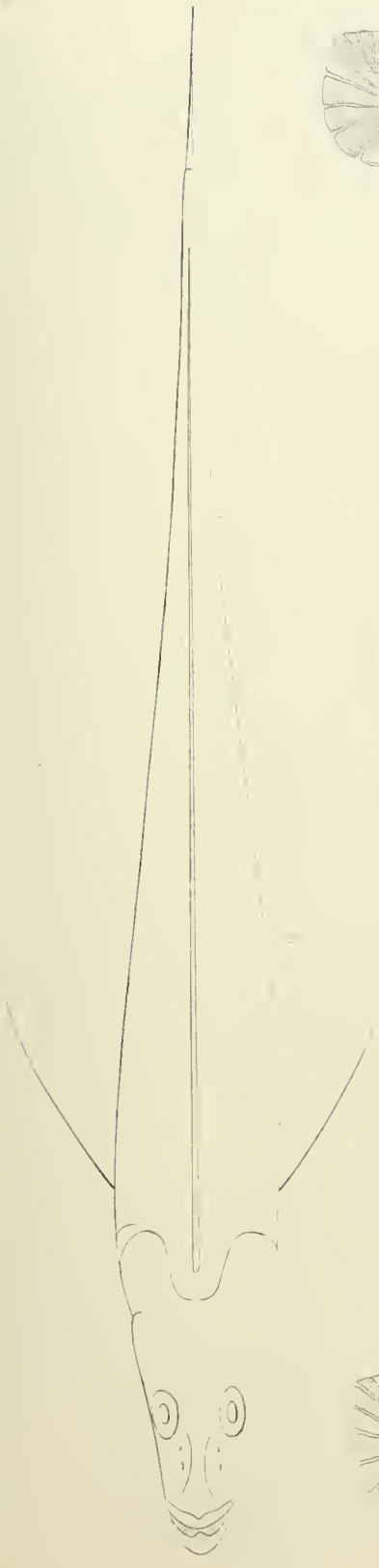
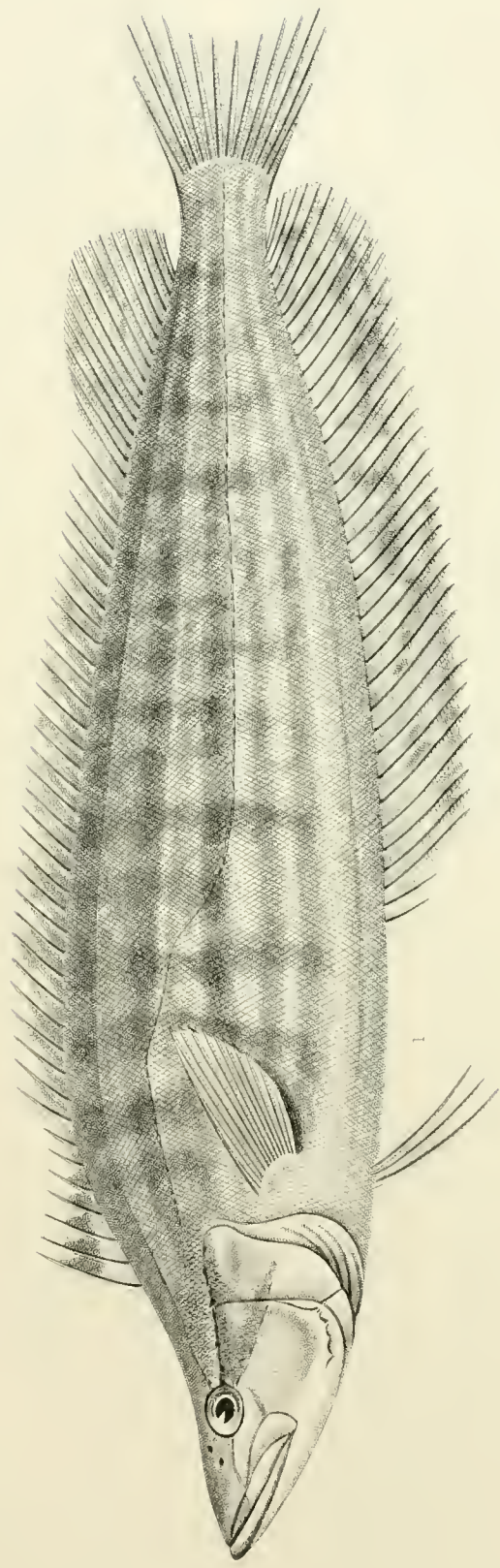
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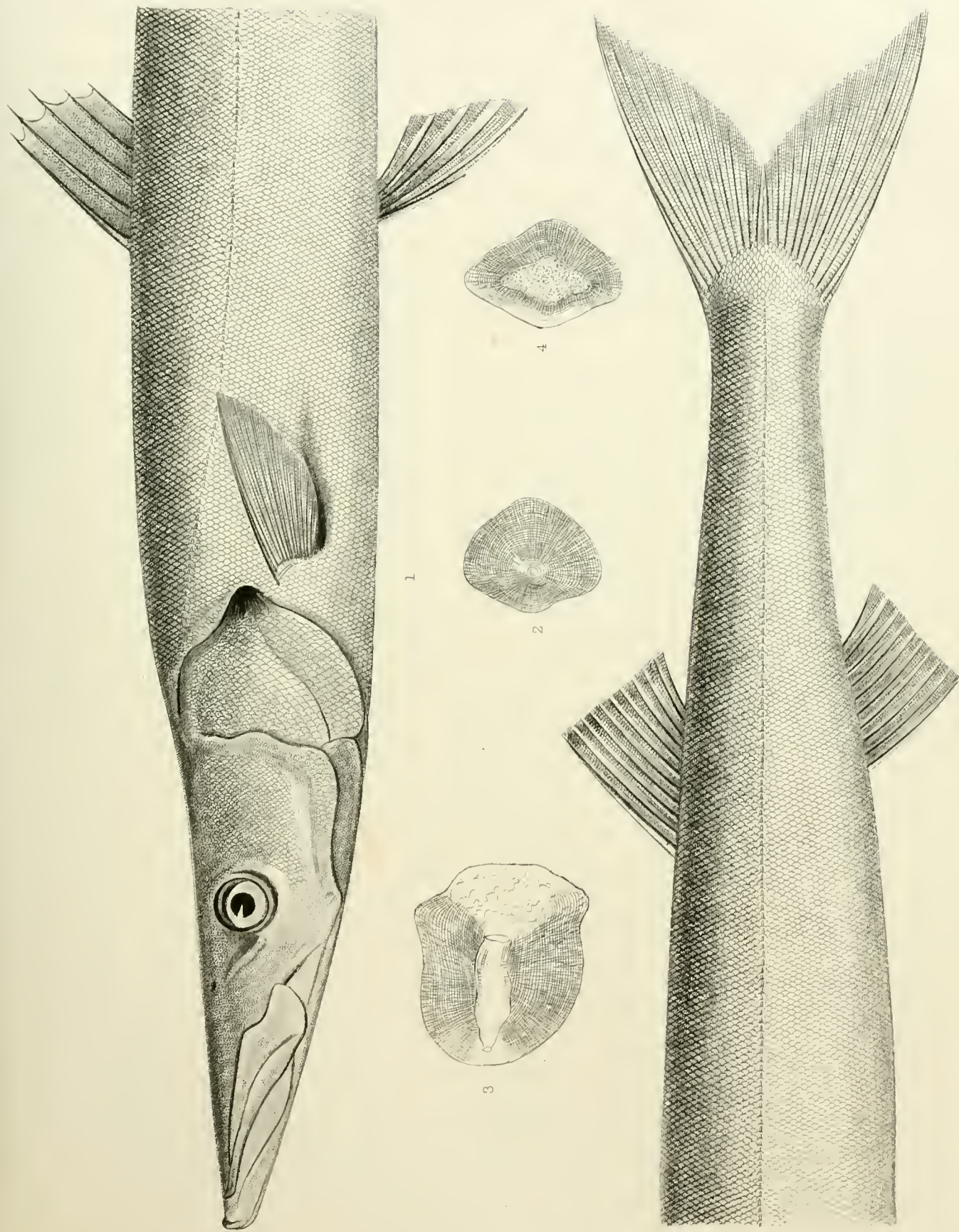
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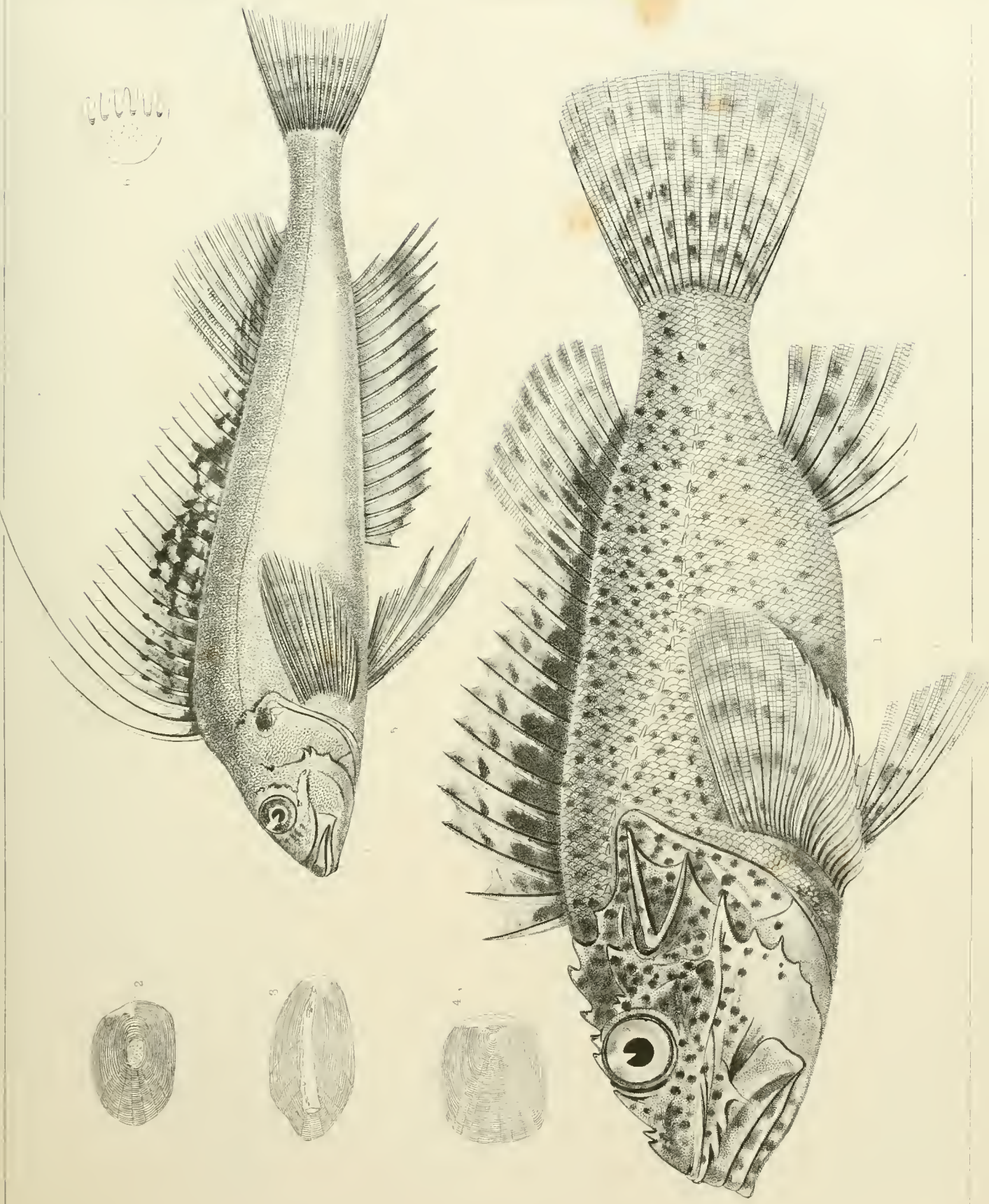
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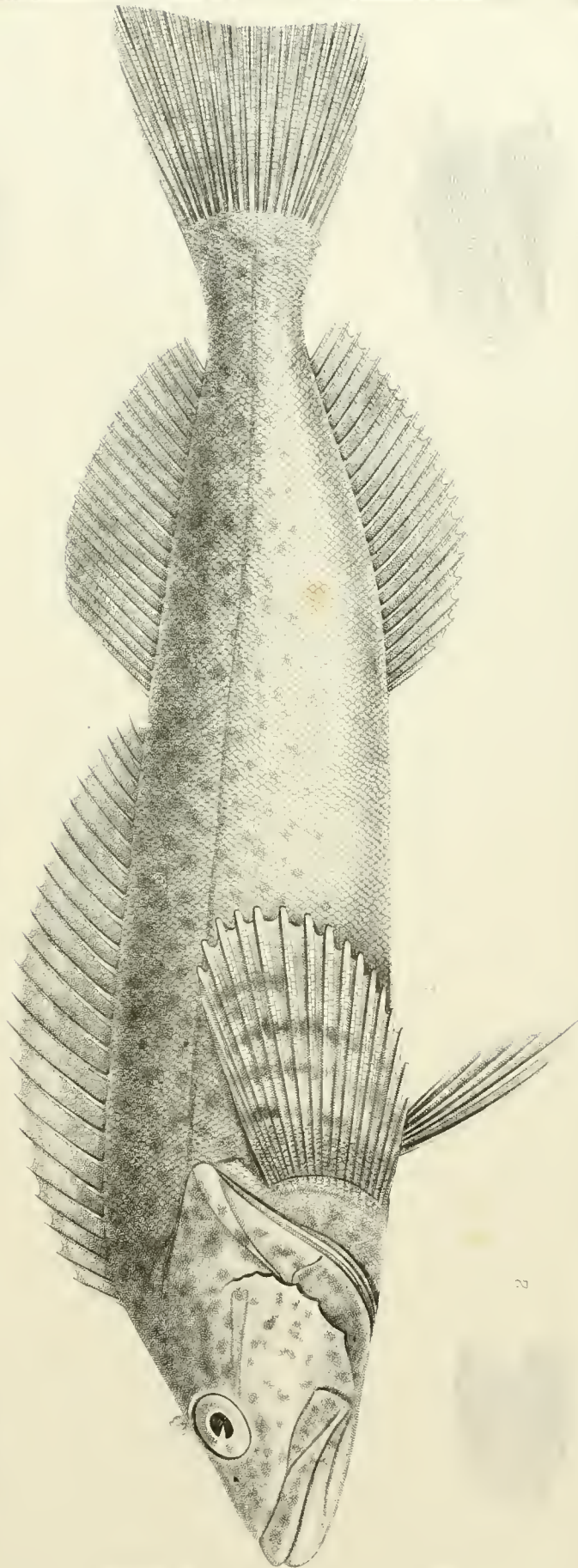
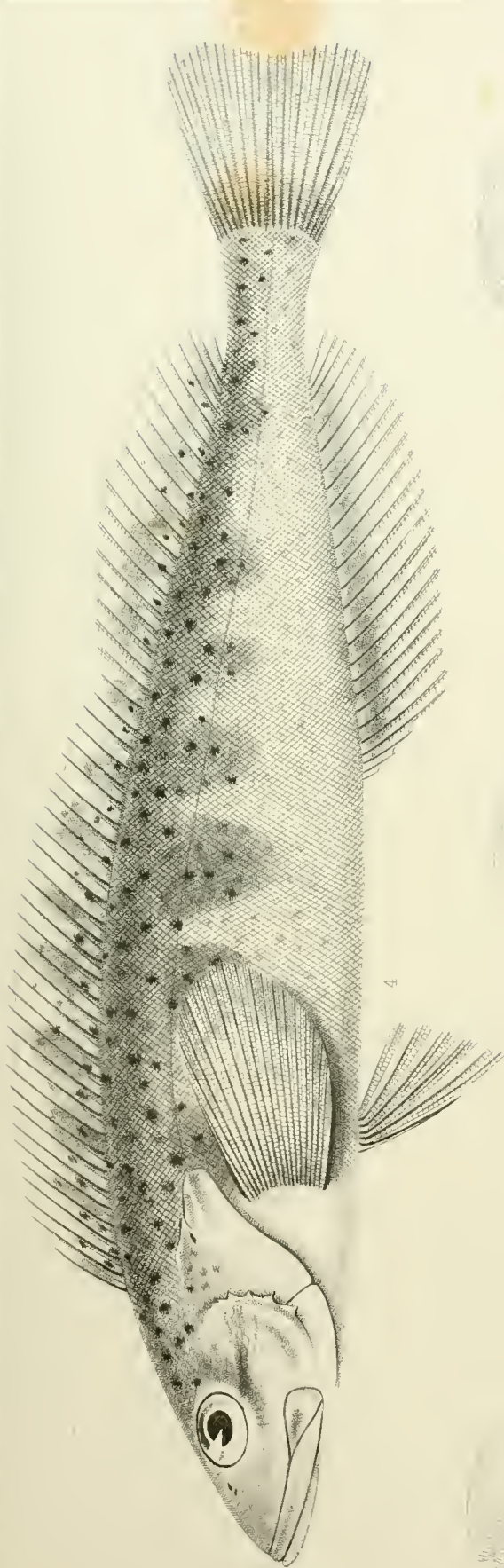




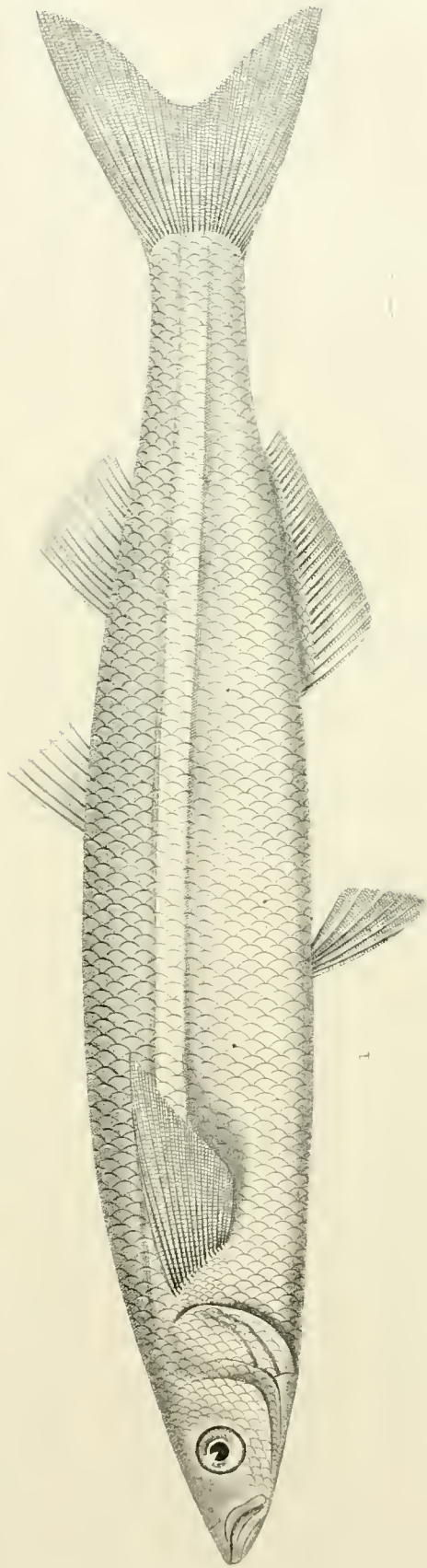




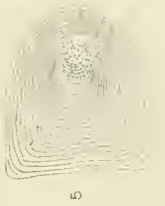




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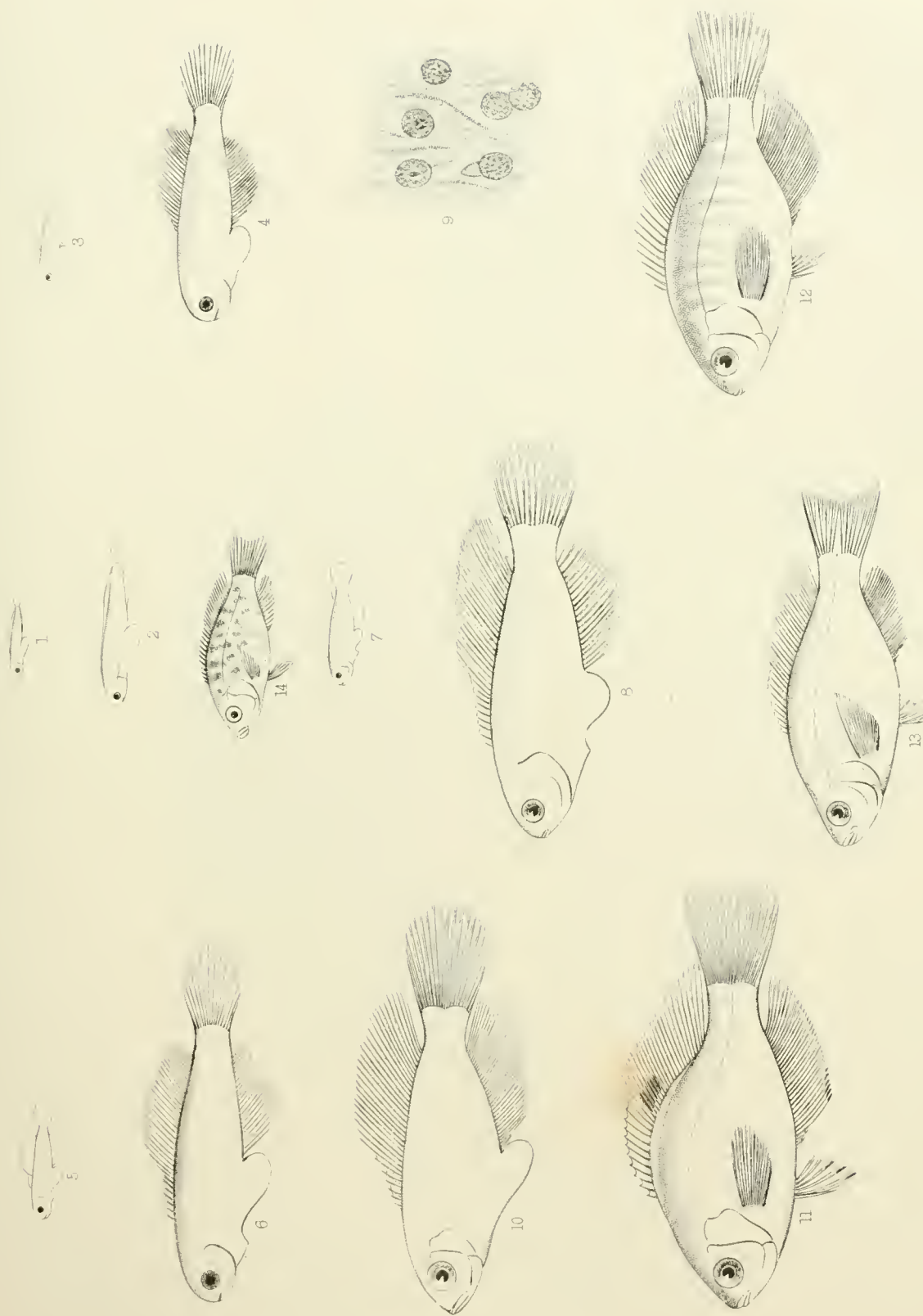


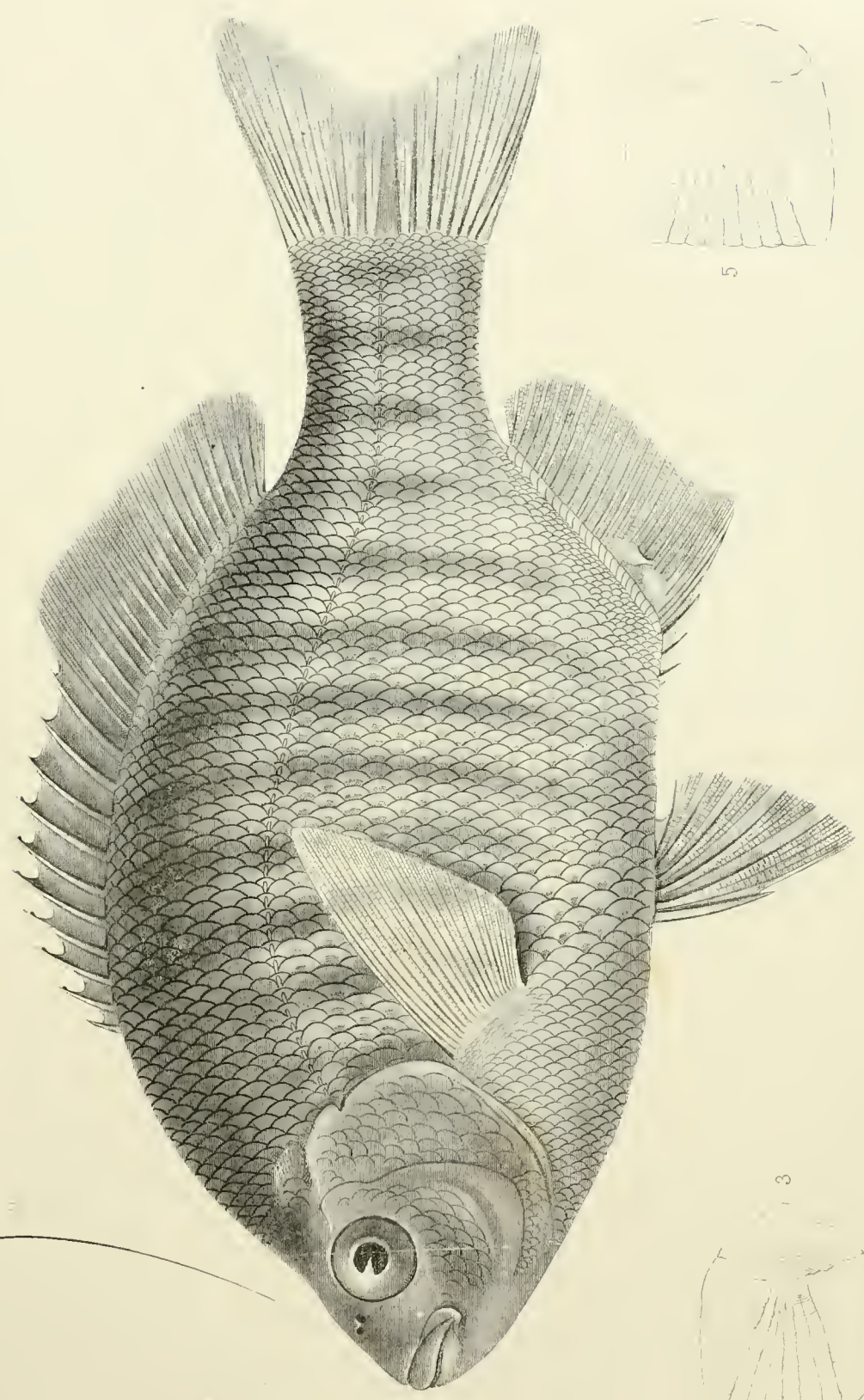
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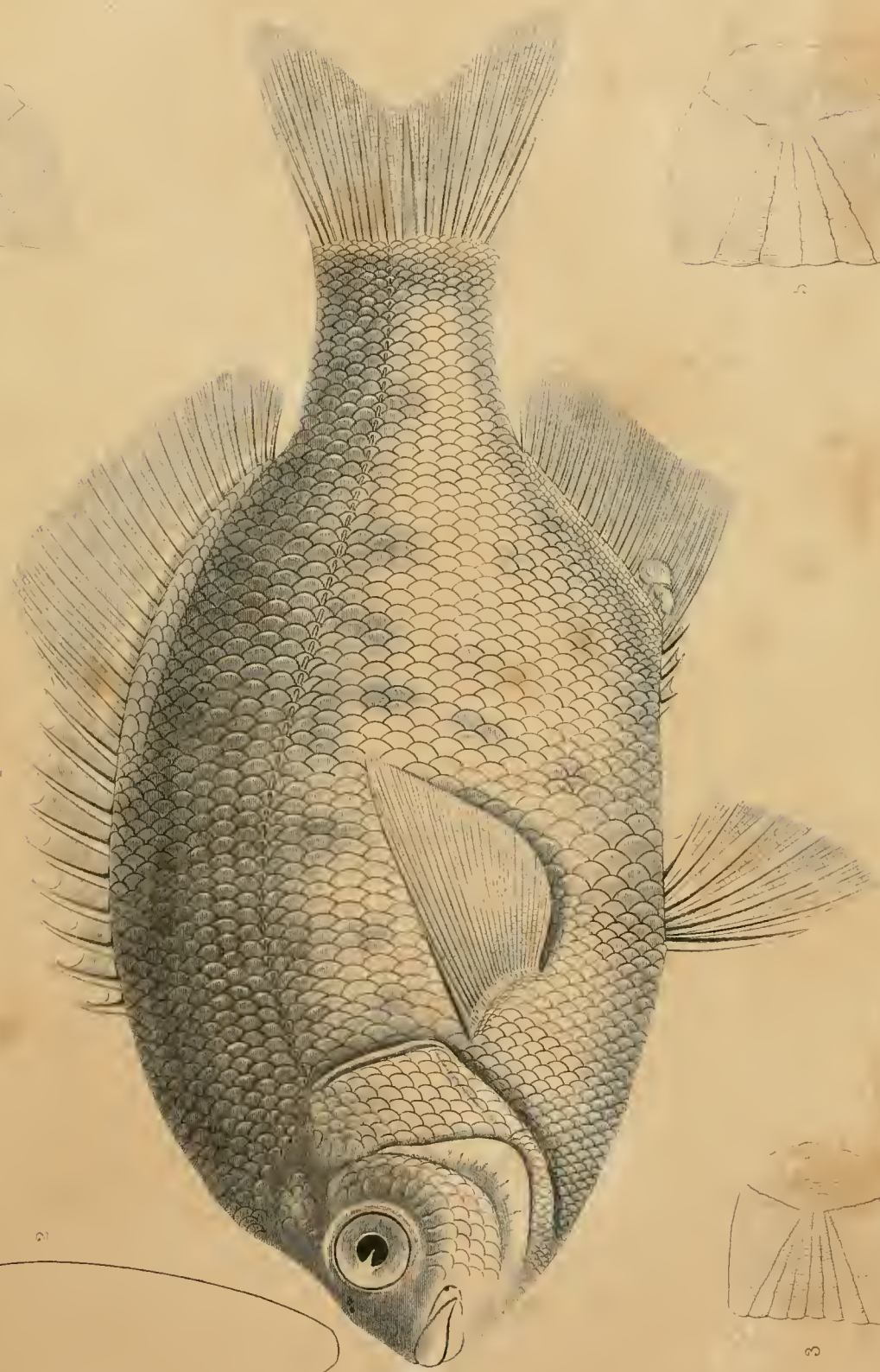


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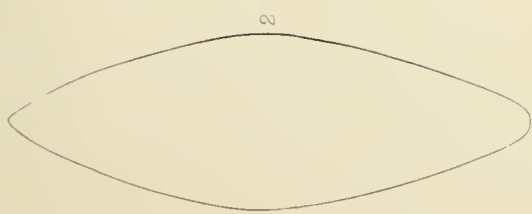
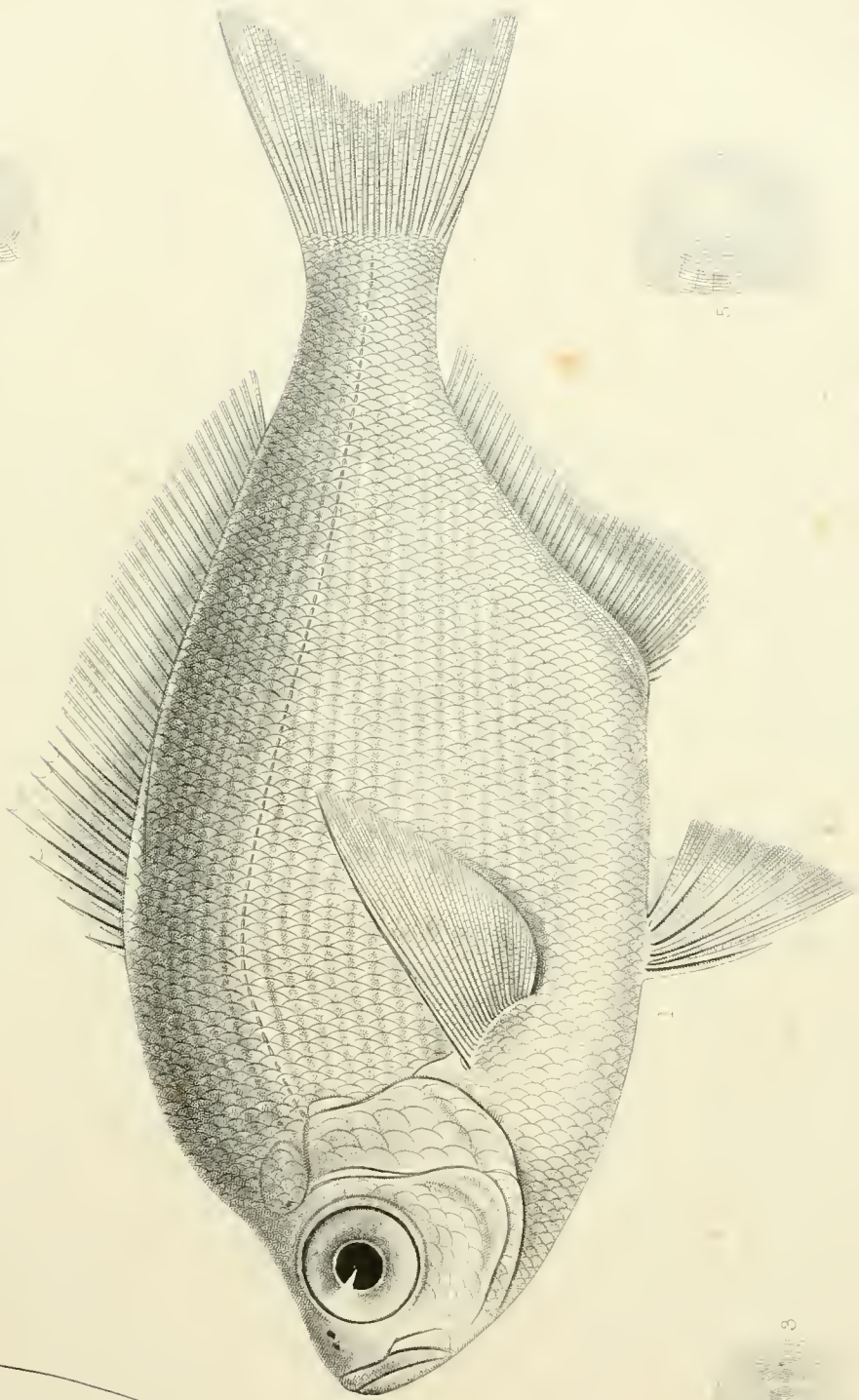


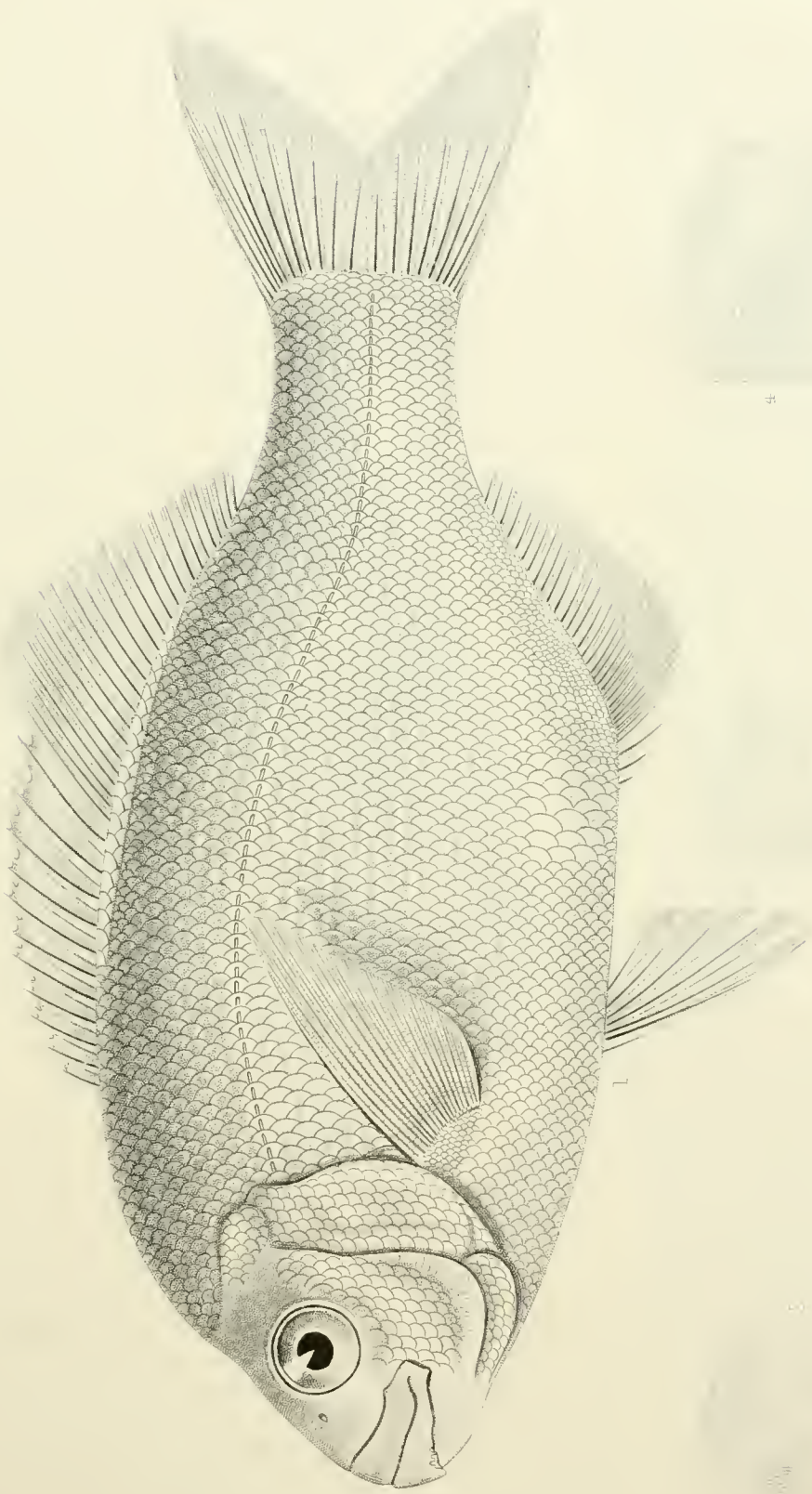






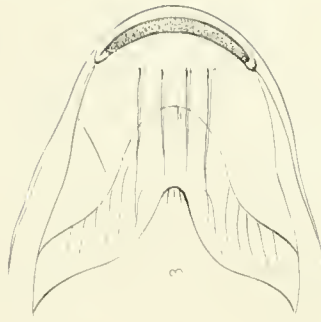




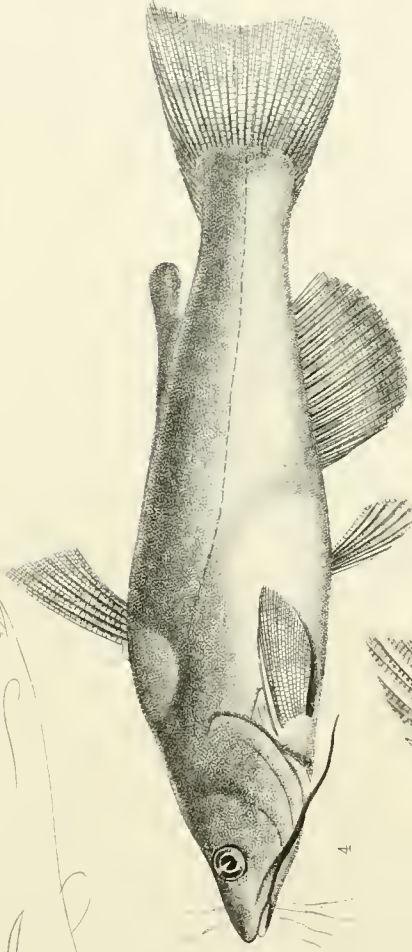




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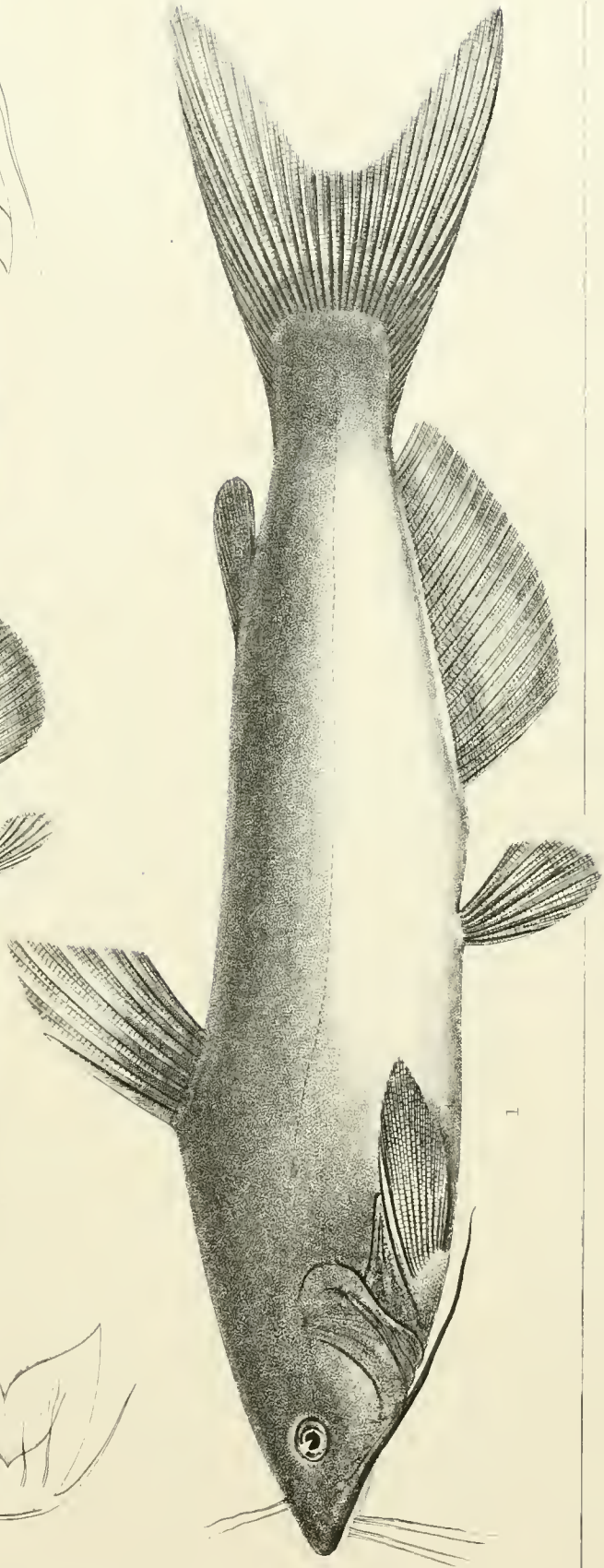
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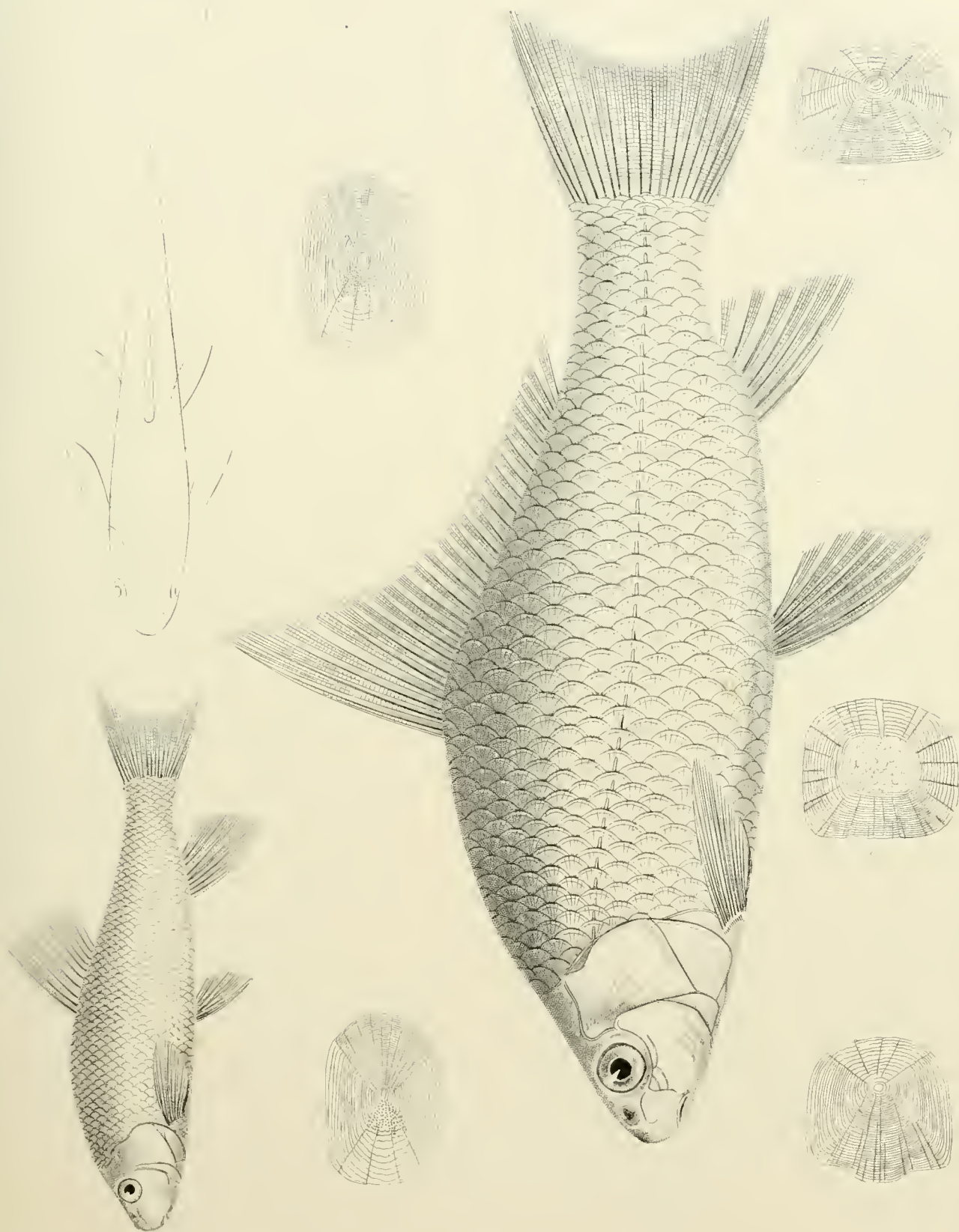
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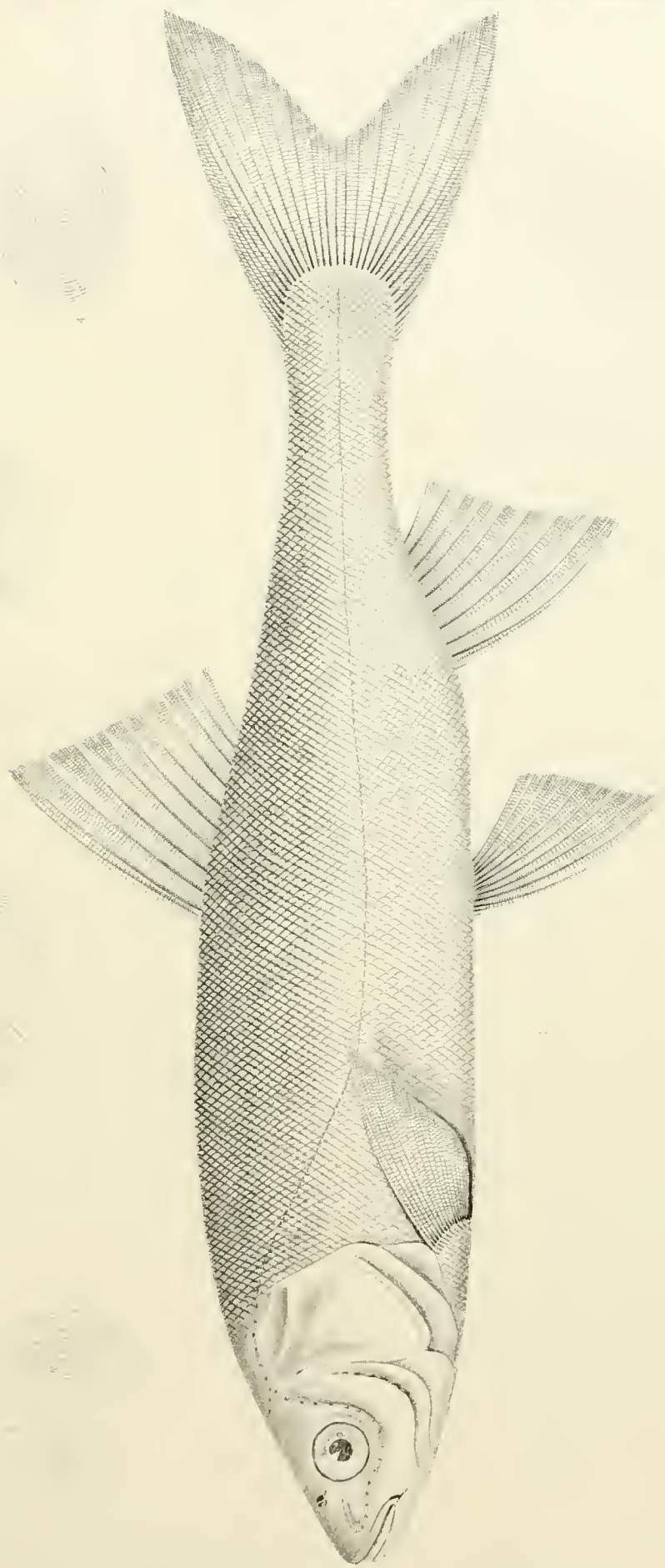
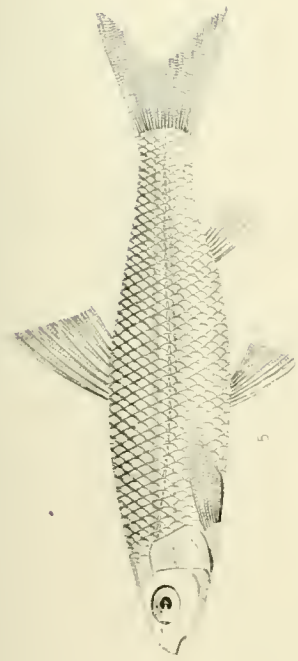


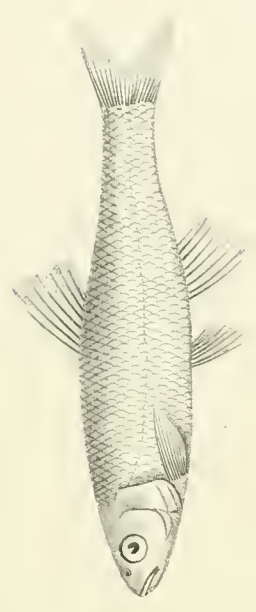
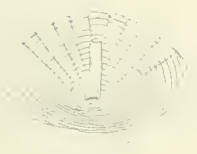
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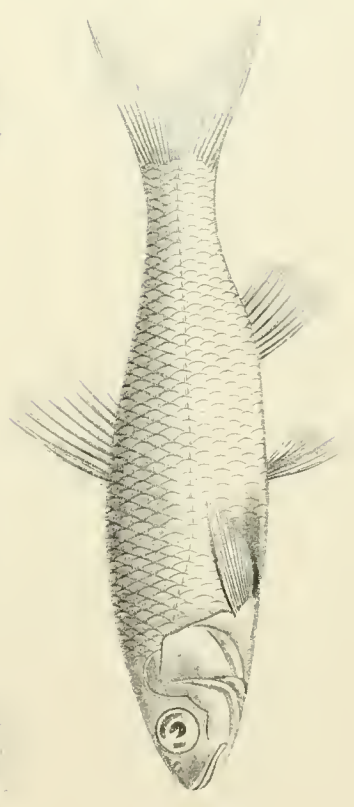
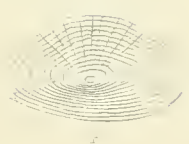
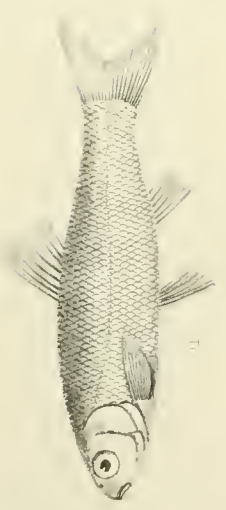
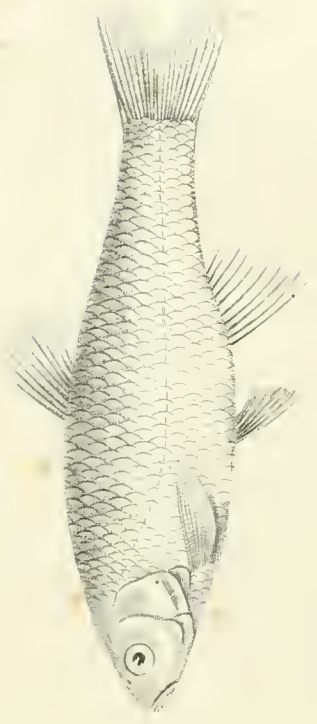
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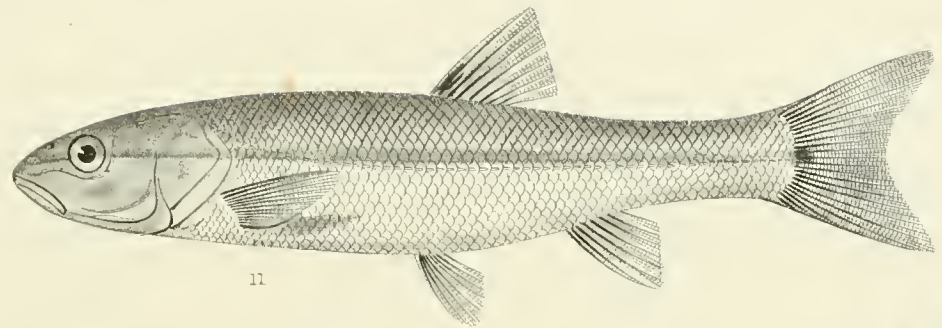
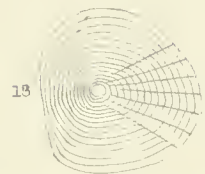




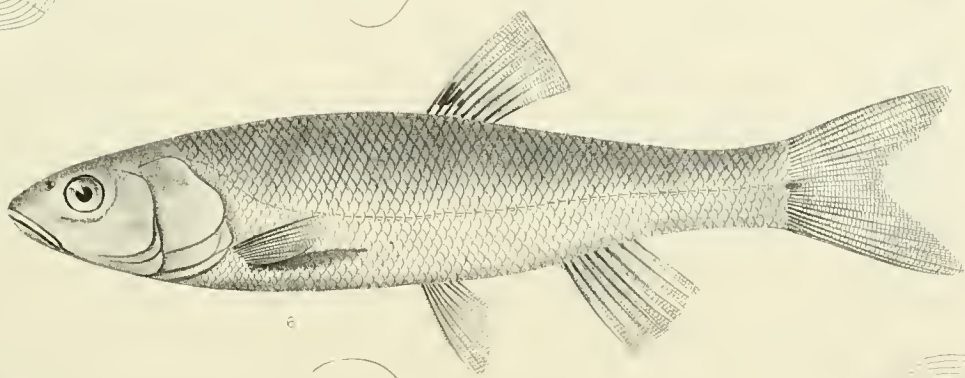
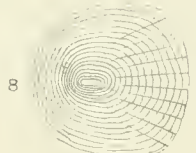
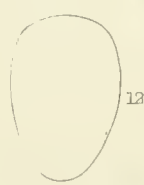
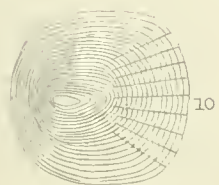


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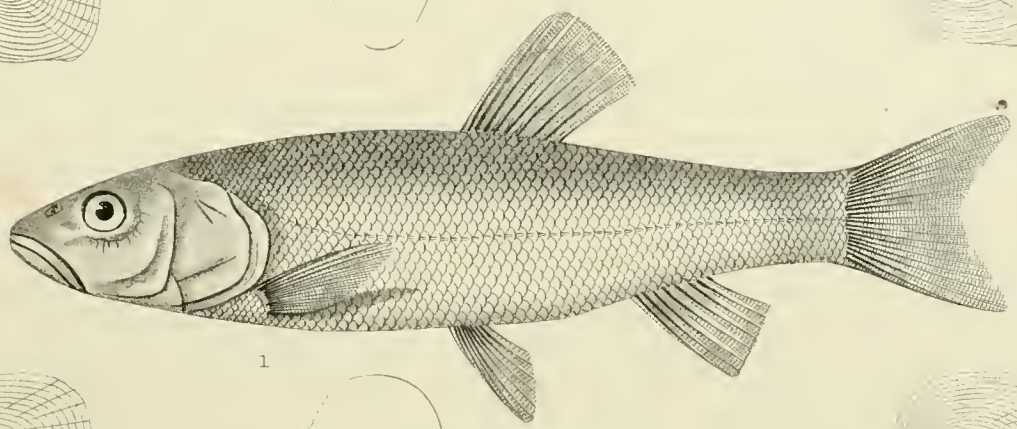
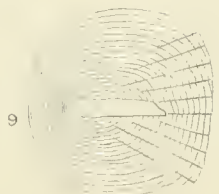




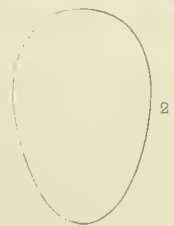
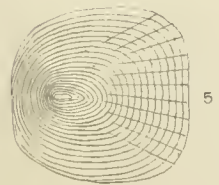
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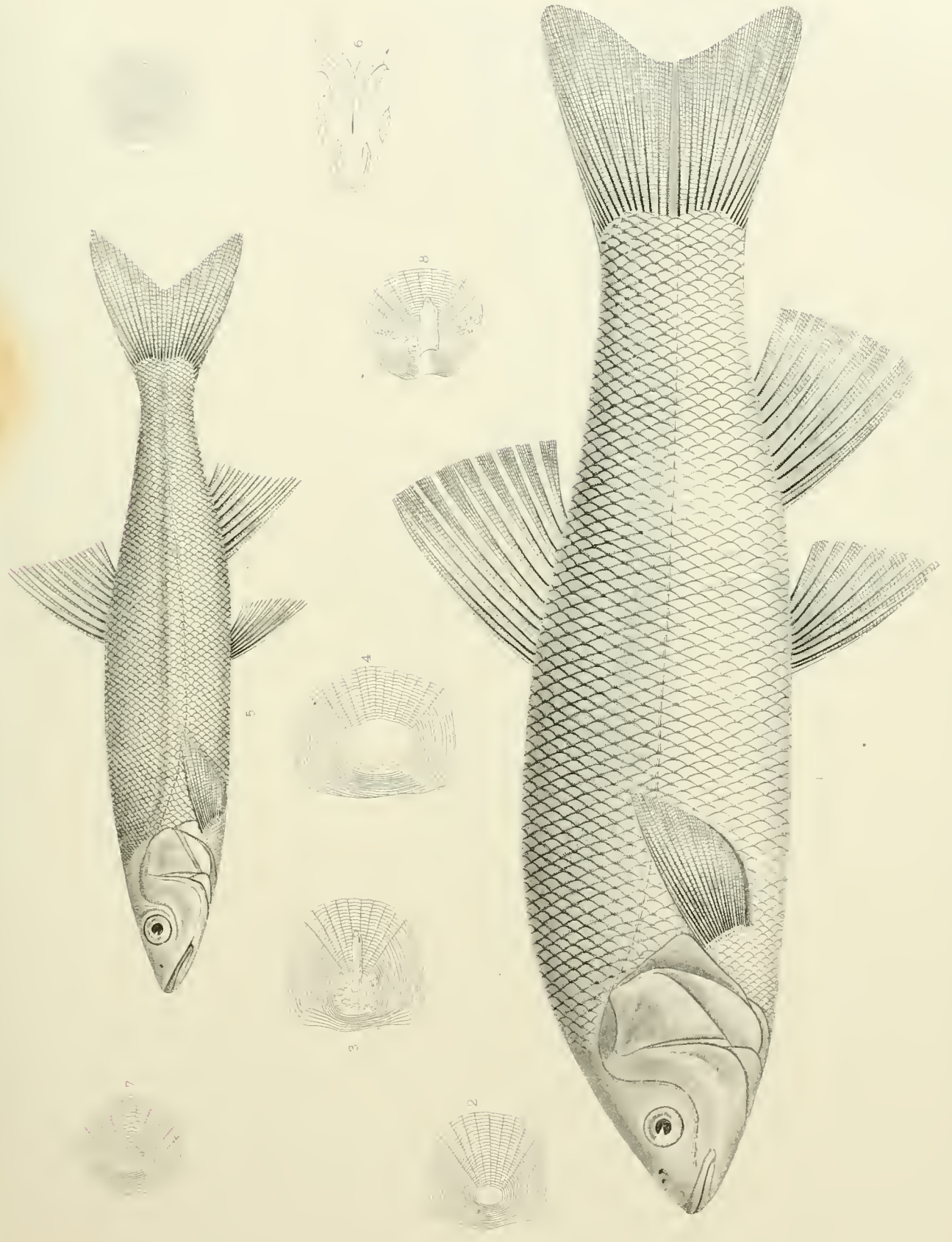


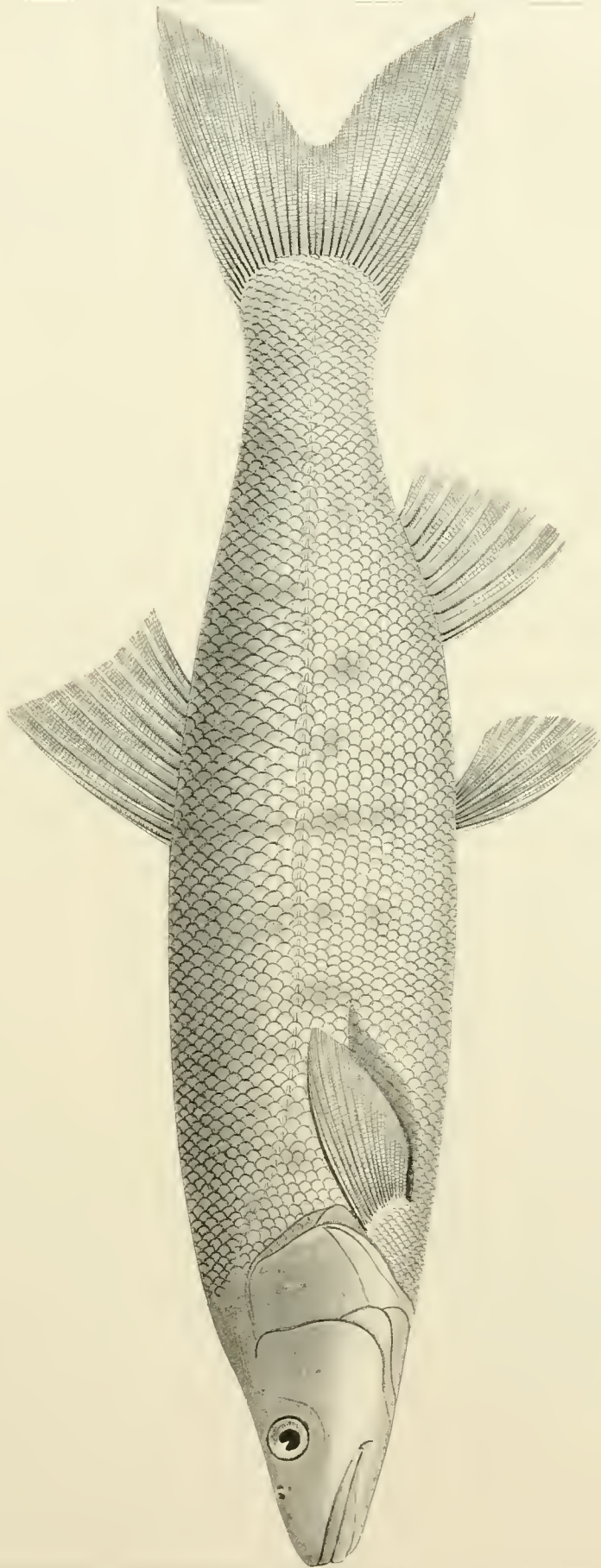
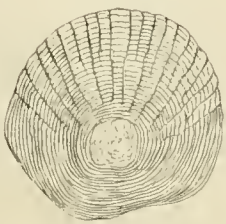
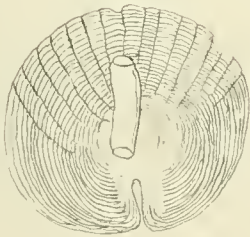
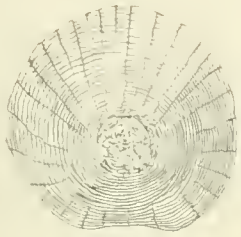
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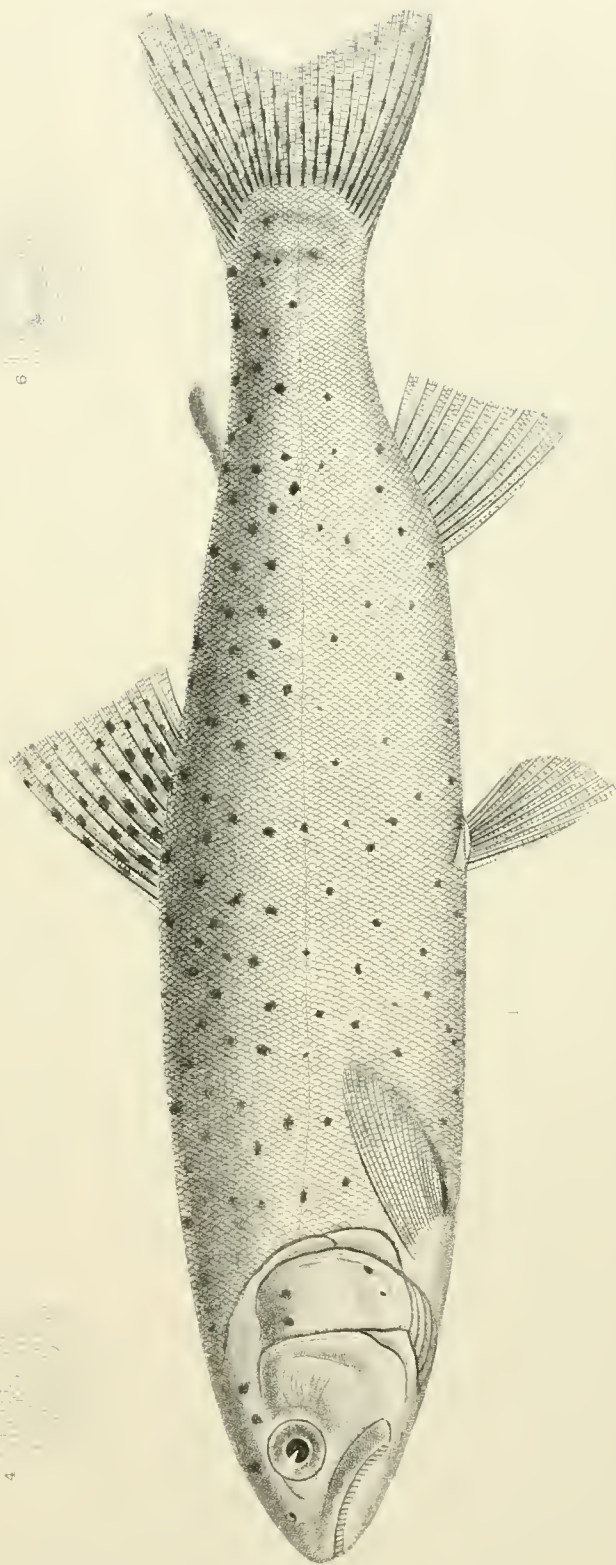
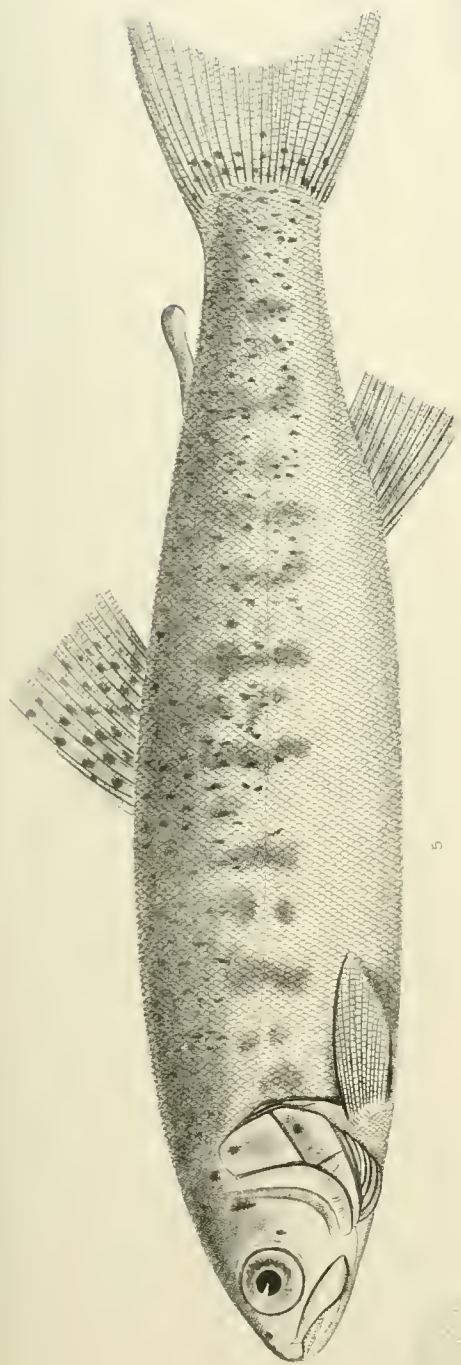


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EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.
WAR DEPARTMENT.

REPORT

OF

LIEUT. E. G. BECKWITH,

THIRD ARTILLERY,

UPON

EXPLORATIONS FOR A RAILROAD ROUTE,

NEAR

THE 38TH AND 39TH PARALLELS OF NORTH LATITUDE,

BY

CAPTAIN J. W. GUNNISON,

CORPS OF TOPOGRAPHICAL ENGINEERS,

AND NEAR

THE FORTY FIRST PARALLEL OF NORTH LATITUDE,

BY

LIEUT. E. G. BECKWITH,

THIRD ARTILLERY.

1854.

EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.
WAR DEPARTMENT.

ROUTE NEAR THE 38TH AND 39TH PARALLELS, EXPLORED BY CAPTAIN J. W. GUNNISON, AND NEAR THE 41ST
PARALLEL, EXPLORED BY LIEUTENANT E. G. BECKWITH.

ZOOLOGICAL REPORT.¹

WASHINGTON, D. C.

1857.

¹ The report to which the present article belongs will be found in Vol. II of the series.

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No. 1.

REPORT UPON MAMMALS COLLECTED ON THE SURVEY.

BY S. F. BAIRD.

SCIURUS FREMONTII, TOWNSEND.—Small Mountain Gray Squirrel.

PLATE XI.

Sciurus fremontii, ("Townsend,") AUD. & BACH. N. Am. Quad. III, 1853, 237; pl. cvlix, fig. 1.
BAIRD, Gen. Rep. Mammals. 1857, 272.

SP. CH.—About the size of the Hudson's Bay squirrel, *S. hudsonius*. Tail shorter than the body. Ears tufted in winter, but not in summer. Above mixed brown, gray, and pale rusty, the prevalent tint similar to that of the gray squirrel; beneath bluish white; a dark line along the sides. Eyelids white. Tail entirely black at end, the hairs tipped with light gray; on other parts of the tail a mixture of plumbeous and grayish rusty at the base of the hairs. No rusty visible externally.

The only specimen of this species collected by any of the recent expeditions was obtained in the Sawatch Pass. (No. 18.)

TAMIAS QUADRIVITTATUS, WAGNER.—Missouri Striped Squirrel.

Sciurus quadrivittatus, SAY, in Long's Exped. R. Mts. II, 1823, 45.
Tamias quadrivittatus, WAGNER, Suppl. Schreb. III, 1843, 234.
AUD. & BACH. N. Am. Quad. I, 1849, 195; pl. xxiv.
BAIRD, Gen. Rep. Mammals. 1857, 297.

SP. CH.—Tail, with the hairs, nearly or quite as long as the body. A grayish white stripe along the top of the head, with branches passing above and below the eye. The stripe bordered above and below by darker ones, and separated behind the eye by a dark line. A gray or hoary patch behind the ears. Sides of body deep ferruginous; back with five about equidistant dark stripes, nearly black on the posterior part of the body, their intervals forming four grayish white lines of similar dimensions to them. Tail, when flattened out, ferruginous externally, then black, then ferruginous. Body beneath, dirty grayish white. Length, 4 to 5 inches. Hind foot, 1.20 inch.

A specimen was collected in the Sangre del Christo Pass.

CYNOMYS GUNNISONII, BAIRD.—Short-tailed Prairie Dog.

PLATE IV, FIG. 2.

Cynomys gunnisonii, BAIRD, Pr. A. N. Sc. Phil. VII, April, 1855, 334.—Ib. Gen. Rep. Mammals, 1857, 335.
?? *Arctomys columbianus*,¹ ORD, in Guthrie's Geog. 2d Am. ed. II, 1815, 292, 302.
?? *Anisonyx brachyura*, RAF. Am. Month. Mag. II, 1817, 45.
?? *Arctomys brachyura*, HARLAN, F. Amer. 1825, 304.
FISCHER, Synopsis, 1829, 345.
?? *Burrowing squirrel of Columbia*, LEWIS and CLARKE, II, 1815, 173.

SP. CH.—Size less than that of the *S. ludovicianus*, general proportions similar. Ears very short; thumb armed with a well developed claw. Tail short, the vertebral portion less than one-sixth the length of the body; with the hairs, less than one-fourth: Color above rather light liver brown, mixed intimately with ash, light brown, and black; beneath pale yellowish brown. Tail

white along the edges and at the tip, with a subterminal margin of black; the hairs at the tip are white to the base, with a narrow central bar of black. The black bar sometimes wanting.

A specimen of this new species was collected in the Cochetope Pass. (No. 22.)

GEOMYS CASTANOPS, L e c o n t e.—Chestnut-faced Gopher.

PLATE X, FIG. 2.

Pseudostoma castanops, BAIRD, in Rep. Stansbury's Exped. G. S. Lake, June, 1852, 313. (Bent's Fort.)

AUD. and BACH. N. Am. Quad. III, 1854, 304.

Geomys castanops, L E C O N T E, Pr. A. N. Sc. Phil. VI, Sept., 1852, 163.

BAIRD, Gen. Rep. Mammals, 1857, 384.

SP. CH.—Upper incisor with a single deep groove bisecting the surface, the portions on either side similar. Fore feet shorter than the hinder. Second claw extending as far as the fourth. Cheek pouches small. Color, pale brownish yellow; the fore part of head and sides of neck yellowish chestnut, sharply defined. Pouches whitish.

This species was found near Bent's Fort.

THOMOMYS RUFESCENS, M a x i m.—Fort Union Gopher.

PLATE X, FIG. 1.

Thomomys rufescens, Pr. MAXIMILIAN, Nova Acta Acad. C. L. C. XIX, 1, 1839, 393.

BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 335.—IB. Gen. Rep. Mammals, 1857, 397.

SP. CH.—Check pouches rather small; densely furred. Tail nearly half as long as the body; thick at base. Upper incisors very large; the groove very shallow and obsolete. Feet very stout and broad. Claws of hand stout; not very long; much curved. Third claw 4 lines long above; beneath, occupying barely two-sixths of the total length; the claw of the thumb reaching over two-fifths the hand.

Color.—Above, ashy or grayish yellow brown; sides similar. Beneath, with the pouches and surrounding area, yellowish white. Tail whitish; dusky above at the base.

This species is found on the upper Missouri, as far as Fort Union.

DIPODOMYS ORDII, W o o d h o u s e.—Kangaroo Rat.

Dipodomys ordii, BAIRD, Gen. Rep. Mammals, 1857, 410.

Dipodomys montanus, BAIRD, Pr. A. N. Sc. VII, Ap. 1855, 334.

A *Dipodomys* was collected near Fort Massachusetts, which was at first supposed to be distinct from *D. ordii* and characterized as *D. montanus*. Subsequent investigations seemed to render it probable that the variation from the typical characters is not of specific value. Another specimen from the Huerfano river is more like the typical *D. ordii*.

PEROGNATHUS FLAVUS, B a i r d.

Pterognathus flavus, BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 332.

BAIRD, Gen. Rep. Mammals, 1857, 423.

SP. CH.—Considerably less than the common mouse. Tail equal to or less than the head and body, scarcely different in color above and below. Hind feet short. Above, yellowish buff, with dusky tips to some of the hairs; clearer on the sides. Beneath, snowy white to the roots of the hairs. Fore leg white to the shoulders. Hairs on the back plumbeous only on their basal half.

Two specimens of this species were collected on Grand White river, near Little Salt Lake, Utah. (6.)

JACULUS HUDSONIUS.—Jumping Mouse.

Dipus hudsonius, ZIMMERMANN, Geographische Geschichte, II, 1780, 358, (based on Pennant's long-legged mouse.)

Meriones hudsonius, AUD. & BACH. N. Am. Quad. II, 1851, 251; pl. lxxxv.

Jaculus hudsonius, BAIRD, Gen. Rep. Mammals, 1857, 430.

SP. CH.—Above, light yellowish brown; lined finely with black; entire sides yellowish rusty, sharply defined against the colors of the back and belly. Beneath, pure white; feet and under surface of tail, whitish. Body measuring 2.75 to 3.50 inches; tail, 4.50 to 6.00 inches; hind feet, 1.10 to 1.30 inches.

One specimen of this species was collected in the Rocky Mountains near the 38th parallel. Like all other western specimens, it is considerably larger than more eastern ones.

REITHRODON MONTANUS, Baird.

Reithrodon montanus, BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 335.—IB. Gen. Rep. Mammals, 1857, 449.

SP. CH.—Tail very little less than head and body, which barely exceed two inches. Hind foot .50. Ears small, the membrane thickened, and with long coarse hairs. Above, brown and pale yellowish gray, much lighter than mouse color. Outside of ears and flanks, pale yellowish brown, without any rufous. Beneath, dull whitish.

A specimen was collected in the Rocky mountains, in the parallel of 39°.

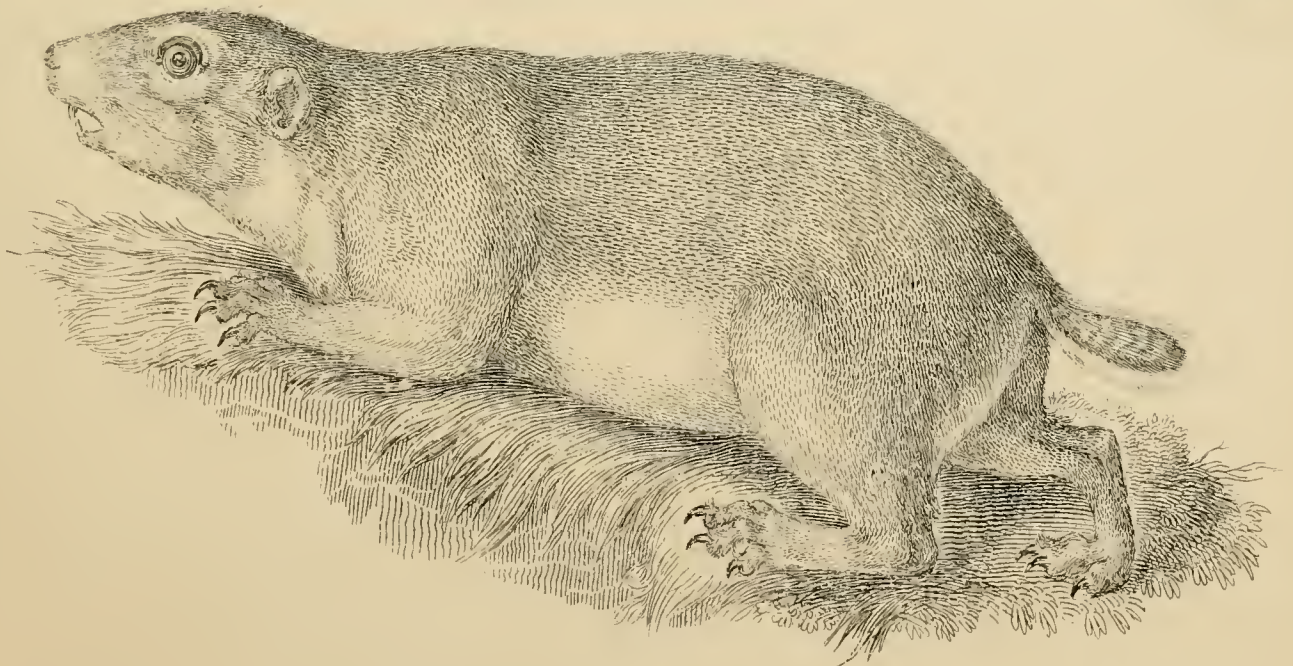
ARVICOLA MODESTA, Baird.

Arvicola modesta, BAIRD, Gen. Rep. Mammals, 1857, 535.

SP. CH.—Size of *A. pinctorum*, or larger. Ears moderate, well furred, rather shorter than the large fore feet, (.35 to .40) Tail vertebræ scarcely longer than the head, (.9:) with the hairs, one-third the head and body. Fur long, soft, .4 of an inch. Above, almost black, hairs with faint yellowish brown tip. Beneath, hoary plumbeous, the line of separation not very distinct. Tail like the corresponding regions of the body. Feet dark brown.

Middle upper molar with five triangles, although the indentations between the two last do not quite meet.

Two specimens were collected in the Sawatch Pass, (Nos. 16 & 17.)





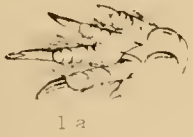


Fig 1



Fig 2



No. 2.

REPORT ON BIRDS COLLECTED ON THE SURVEY.

BY S. F. BAIRD.

BUTEO SWAINSONI, Bonaparte. (p. 19.)¹—Swainson's Buzzard.

PLATES XII AND XIII.

Buteo swainsoni, BONAP. Comp. List, p. 3, (1838.)

Buteo vulgaris, RICH. & SW. Faun. Bor. Am. Birds, p. 47.

There are few results of any of the expeditions more interesting than the discovery by Captain Beckwith's party that this hawk was abundant in the Rocky mountains. The species first figured and described by Richardson and Swainson as the common buzzard of Europe had been variously identified by American authors, but most agreed in supposing it to be the young bird of the western red-tailed hawk, now known as *Buteo montanus*. That such is not the fact, however, is clearly shown by Captain Beckwith's collection, in which are three good specimens, all differing from each other, and one of them exactly in the plumage figured in the Fauna Boreali-Americana, as quoted above.

8540. Cochetope Pass. Iris grayish brown (24.)—8539 do. same locality. Iris whitish 25.—8541. San Luis valley, 13. Iris whitish.

BUTEO CALURUS, Cassin, (p. 22.)—Red-tailed Black Hawk.

PLATE XIV.

Buteo calurus, CASSIN, Proc. Acad. Philad. VII, 1855, 281.

Similar in general form to *Buteo vulgaris* and *Buteo augur*. Bill rather strong; edges of the upper mandible with distinct rounded lobes; wings long, fourth and fifth quills longest; tail moderate, or rather short; tarsi feathered in front for nearly half their length; naked behind, naked portion in front having about ten transverse scales; claws large, strong, fully curved.

Tail bright rufous above, white at base, with about eight to ten irregular and imperfect narrow bands and one wide sub-terminal band of brownish black, and narrowly tipped with reddish white; beneath silky reddish white.

Entire plumage above and below brownish black, deeper and clearer on the back and abdomen, and paler on the throat and breast. Plumage of the upper parts with concealed transverse bands of white at the base of the feathers; and of the under parts with circular spots and transverse bands of the same also at the base of the feathers; quills brownish black, with a large portion of their inner webs white, banded and mottled with pale ashy brown; under tail coverts transversely barred with brownish black and pale rufous.

Total length, female about 21 inches; wing 16½, tail 9 inches. Male rather smaller.

Not rare in the Rocky mountains.

BUTEO OXYPTERUS, Cassin, (p. 30.)

PLATE XV.

This species is about the size of *Buteo pennsylvanicus*, but the wings and legs are much longer. The inner webs of the quills are dark cinereous, their inferior surfaces of a bronzed or silky

¹ The number in parentheses after the scientific name refers to the page of the General Report on Birds, Pacific Railroad Survey, vol. ix, where the species is described in detail.

olive lustre. Length about 16 inches; wing $13\frac{1}{2}$. The only specimen known at present was collected not far from Fort Fillmore by Dr. T. C. Henry.

BUTEO MONTANUS, Nuttall, (p. 26.)—The Western Red-tailed Hawk.

Buteo montanus, Nutt. Manual Orn. U. S. I, 112, (1840.)

Adult female.—Throat and neck before dark brown mixed with white; the brown color more extended, and, with the abdomen, tibiae, and under tail coverts, much more tinged with rufous than in *B. borealis*. Tibiæ distinctly barred transversely with rufous. Size rather larger. General appearance similar to *Buteo borealis*, but rather larger, and with the wings longer; throat and neck before brown; breast and abdomen white, with a very pale fulvous or rufous tinge; sides with numerous narrow lanceolate and oblong spots of dark brown and rufous; abdomen with a broad transverse band composed of spots of the same description. Tibial feathers pale rufous, with numerous transverse bands of a darker shade of the same color. Under wing coverts pale yellowish white, with brown spots. Tail above bright rufous narrowly tipped with white, with a subterminal band of black, and a few indications of transverse stripes near the shafts of the feathers. Upper parts of the body dark umber brown, with partially concealed ashy white and pale fulvous spots and transverse bands, especially on the scapulars and shorter quills. Upper tail coverts reddish white, with transverse bands of dark brown. Bill dark bluish; tarsi and toes yellow.

This species can only be distinguished from *B. borealis* by its larger size, the greater extent of the dark color of the throat, and the prevalence of the rufous color of the abdomen and tibiae. In some specimens, however, the abdomen is nearly pure white. Another plumage of this bird, apparently adult, of both sexes, is as follows, and is the most easily recognized of any stage:

Adult male and female.—Like the preceding, but with the under parts pale rufous, lighter on the breast, some feathers, especially on the abdomen, having longitudinal lines and spots of dark brown. Tibiæ rufous, with transverse bars of a darker shade of the same color. Tail bright rufous; tip paler, with a subterminal band of black. This second plumage, described above, we have never seen in *Buteo borealis*.

Sangre del Cristo Pass. (6.) Iris whitish.

CIRCUS HUDSONIUS, Linnæus, (p. 38.)—The Marsh Hawk.

Falco hudsonius, Linn. Syst. Nat. I, 123, (1766.)

Adult.—Form rather long and slender; tarsi long; ruff quite distinct on the neck in front. Entire upper parts, head, and breast, pale bluish cinereous; on the back of the head mixed with dark fulvous; upper tail coverts white. Under parts white, with small cordate or hastate spots of light ferruginous; quills brownish black, with their outer webs tinged with ashy, and a large portion of their inner webs white; tail light cinereous, nearly white on the inner webs of the feathers, and with obscure transverse bands of brown; under surface silky white; under wing coverts white.

Younger.—Entire upper parts dull umber brown, many feathers edged with dull rufous, especially on the neck; under parts dull reddish white, with longitudinal stripes of brown, most numerous on the throat and neck before; tibiae tinged with reddish; upper tail coverts white.

Young.—Entire upper parts dark umber brown; upper tail coverts white. Under parts rufous, with longitudinal stripes of brown on the breast and sides; tail reddish brown, with about three wide bands of dark fulvous, paler on the inner webs. Tarsi and toes yellow.

Total length, female, 19 to 21 inches; wing $15\frac{1}{2}$, tail 10 inches. Male, total length 16 to 18 inches; wing $14\frac{1}{2}$, tail $8\frac{1}{2}$ to 9 inches.

6859. Rocky mountains. (4.)—Desert between White river and San Rafael creek, Utah. (28.)

TINNUNCULUS SPARVERIUS, Vieill. (p. 13.)—Sparrow Hawk.

Falco sparverius, Linn. Syst. Nat. I, 1766, (128.)

No. 8519. Cochetope Pass.

OTUS WILSONIANUS, Lesson, (p. 53.)—The Long-eared Owl.

Otus wilsonianus, Lesson, Traité d'Orn. I, p. 110. (1831.)

SP. CH.—Ear tufts long and conspicuous; eyes rather small; wings long; tarsi and toes densely feathered. Upper parts mottled with brownish black, fulvous, and ashy white; the former predominating. Breast pale fulvous, with longitudinal stripes of brownish black; abdomen white; every feather with a wide longitudinal stripe, and with transverse stripes of brownish black;

legs and toes pale fulvous, usually unspotted, but frequently with irregular narrow transverse stripes of dark brown. Eye nearly encircled with black; other feathers of the face ashy white, with minute lines of black; ear tufts brownish black, edged with fulvous and ashy white; quills pale fulvous at their bases, with irregular transverse bands of brown; inferior coverts of the wing pale fulvous, frequently nearly white; the larger widely tipped with black; tail brown, with several irregular transverse bands of ashy fulvous, which are mottled as on the quills; bill and claws dark; irides yellow.

Total length, female, about fifteen inches; wing 11 to 11½; tail 6 inches. Male, rather smaller.

No. 9144. Cochetope Pass. (23.) No. 9145. Rio Grande valley. (23.)

ATHENE CUNICULARIA, Molina, (p. 60.)—Burrowing Owl.

Strix cunicularia, MOLINA, Sagg. Stor. Nat. Chili, (1782.)

SP. CH.—Resembling *A. hypugaea*, but larger; tarsus longer, and more fully feathered in front to the toes.

ADULT.—Upper parts light ashy brown, with large spots of dull white enclosed in edgings of brownish black. Throat white; a transverse band of brownish black and reddish white feathers across the neck in front, succeeded by a large patch of white. Breast light brown, with large spots of white like the upper parts; abdomen yellowish white, with hastate or crescent-shaped spots of reddish brown disposed to form transverse bands; under tail coverts, tibiae, and tarsus, and under wing coverts, yellowish white; quills and tail light brown, with spots of reddish white, edged (the spots) with brownish black; tail with about six transverse bands or pairs of spots of reddish white, enclosed or edged with dark brown.

No. 9168. Uncompagre river, Utah. (27.) Iris greenish yellow.

CHORDEILES HENRYI, Cassin, (p. 153.)—Western Night-Hawk.

PLATE XVII.

Chordeiles henryi, CASSIN, Illustrations, I, Jan. 1855, 233.

SP. CH.—Female similar to *C. virginianus*, but the upper parts much more mottled and more rufous. The males lighter.

6698. Rio Grande valley. (10.)

SIALIA ARCTICA, Swainson, (p. 224.)—Arctic Bluebird.

PLATE XXXV.

Erythaca arctica, RICH. & SW., F. B. A. II, 1831, 209; pl. xxxix.

SP. CH.—Entirely blue; paler beneath; the belly and under tail coverts white.

No. 7606. Cochetope Pass, (20.)

EREMOPHILA CORNUTA, Boie, (p. 403.)—Sky Lark.

PLATE XXXII.

The figure on the plate is taken from a specimen collected in Utah Territory by Captain Stansbury, (No. 3702,) and supposed at one time to be the *Otocoris occidentalis* of Colonel McCall. A subsequent examination of a large series of western specimens rendered it very doubtful whether there is really any such species, as distinguished by a white chin and throat from the *Eremophila cornuta*.

XANTHOCEPHALUS ICTEROCEPHALUS, Baird, (p. 531.)—Yellow-headed Blackbird.

Icterus icteroccephalus, BONAP. Am. Orn. I, 1825, 27; pl. iii.

SP. CH.—First quill nearly as long as the second and third, (longest,) decidedly longer than the third. Tail rounded, or slightly graduated. General color black, including the inner surface of wings and axillaries, base of lower mandible all round, feathers adjacent to nostrils, lores, upper eyelids, and remaining space around the eye. The head and neck all round, the fore part of the breast, extending some distance down on the median line, and a somewhat hidden space around the anus, yellow. A conspicuous white patch at the base of the wing formed by the spurious feathers, interrupted by the black alula.

Female smaller, browner; the yellow confined to the under parts and sides of the head, and a superciliary line. A dusky maxillary line. No white on the wing. Length of male, 10.00 inches; wing, 5.60; tail, 4.50.

No. 8554. Sawatch Pass, (15.)

CORVUS CARNIVORUS, Bartram, (p. 560.)—American Raven.

Corvus carnivorus, BARTRAM, Travels in E. Florida, 1793, 290.

SP. CH.—Fourth quill longest; third and fifth about equal; second between fifth and sixth; first nearly equal to the eighth. Length about 24 or 25 inches; extent, 50 to 51; wing, about 17; tail, 10. Tail moderately graduated; the outer about 1.60 to 1.90 of an inch less than the middle. Entirely glossy black, with violet reflections.

Hab.—Entire continent of North America. Rare east of the Mississippi.

No. 6857. Between White river and San Rafael, Utah, (29.)

PICA HUDSONICA, Bonap. (p. 576.)—Magpie.

Corvus hudsonica, JOS. SABINE, App. Narr. Franklin's Journey, 1823, 25, 671.

SP. CH.—Bill and naked skin behind the eye, black. General color black. The belly, scapulars, and inner webs of the primaries white; hind part of back grayish; exposed portion of the tail feathers glossy green, tinged with purple and violet near the end; wings glossed with green; the secondaries and tertiaries with blue; throat feathers spotted with white. Length, 19.00; wing, 8.50; tail, 11.00.

8481. Utah creek, near Fort Massachusetts, (7.)—7100. Cochetope Pass, (14.)

PERISOREUS CANADENSIS, Bonap. (p. 590.)—Canada Jay.

Corvus canadensis, LINN. Syst. Nat. I, 1766, 158.

SP. CH.—Tail graduated; lateral feathers about one inch shortest. Wings a little shorter than the tail. Head and neck, and fore part of breast white. A plumbeous brown nuchal patch, becoming darker behind, from the middle of the crown to the back, from which it is separated by an interrupted whitish collar. Rest of upper parts ashy plumbeous; the outer primaries margined, the secondaries, tertiaries, and tail feathers obscurely tipped with white. Beneath smoky gray. Crissum whitish. Bill and feet black. Length, 10.70; wing, 5.75; tail, 6.00; tarsus, 1.40.

No. 8452. Sangre del Christo Pass, Utah, (5.)

CENTROCERCUS UROPHASIANUS, Swainson, (p. 624.)—Sage Cock; Cock of the Plains.

SP. CH.—Tail feathers twenty. Above varied with black, brown, and brownish yellow; coverts having all the feathers streaked with the latter. Beneath black; the breast white; the upper feathers with spiny shafts; the lower streaked with black; tail coverts with white tips; the sides also with much white. Length, 29; wing, 11.30; tail, 11.50.

No. 10023. Cochetope Pass, (21.)—Iris grayish white.

GRUS CANADENSIS, Temm. (p. 655.)—Sand-hill Crane; Brown Crane.

Ardea canadensis, LINN. Syst. Nat. I, 1766, 234, No. 3.

SP. CH.—Bill compressed. Lower mandible not as deep towards the tip as the upper. Gonys nearly straight, in the same line with the basal portion of bill. Commissure decidedly curving from beyond the middle to the tip, where it is even, not crenated. Color bluish gray; the primaries and spurious quills dark plumbeous brown; the shafts white. Cheeks and chin whitish. Entire top of head (bounded inferiorly by a line from commissure along the lower eyelid) bare of feathers, warty and granulated, thinly beset with short scattered black hairs. Feathers of occiput advancing forward in an obtuse angle; the grey feathers along this point, and over the auricular region, tinged with plumbeous. Length, 48; wing, 22; tarsus, 10; commissure, 6.

No. 9394. Rio Grande valley, (No. 12.)

SYMPHEMIA SEMIPALMATA, Hartlaub, (p. 729.)—Willet.

Scelopax semipalmatus, Gmelin, Syst. Nat. I, 1788, 659.

SP. CH.—The largest American species of this genus. Bill longer than the head, straight, rather thick, and strong; groove in the upper mandible extending about half its length, in the lower mandible nearly obsolete; wings long; legs long, strong; toes moderate, united at base by membranes, the larger of which unites the outer and middle toe; hind toe small; tail short. *Adult*. Entire upper parts dark ash color, (without spots;) the shafts of the feathers brownish black; rump and upper tail coverts white. Under parts white, tinged with ashy on the neck and sides; axillaries and under wing coverts brownish black; primary quills white at base, and tipped with brownish black; secondaries white, spotted with brownish black; tail ashy white, the two middle feathers strongly tinged with ashy; others spotted with dark ashy brown. Bill dark bluish brown, lighter at base; legs light blue. *Younger*. Entire plumage spotted, and transversely banded with brownish black.

Total length about 15 inches; wing, $8\frac{1}{4}$; tail, $3\frac{1}{4}$; bill about $2\frac{1}{2}$; tarsus about $2\frac{1}{2}$ inches.

No. 9818. Great Basin, Utah.

NUMENIUS LONGIROSTRIS, Wilson, (p. 743.)—Long-billed Curlew.

SP. CH.—The largest American species of this genus. Bill very long, much curved; upper mandible longer than the under, somewhat knobbed at the tip; wing rather long; legs moderate; toes united at base. Entire upper parts pale rufous, tinged with ashy; every feather with transverse and confluent bands of brownish black, most numerous and predominating on the back and scapulars; secondary quills, under wing coverts, and axillaries, bright rufous; primaries with their outer webs brownish black and their inner webs rufous, with transverse bands of black. Under parts pale rufous, with longitudinal lines of black on the neck and sides; tail rufous, tinged with ashy, transversely barred with brownish black. Bill brownish black; base of under mandible reddish yellow; legs bluish brown. Specimens vary to some extent in the shade of the rufous color of the plumage, and very much in the length of the bill. The rufous color is probably more distinct in the young. Total length about 25 inches; wing, 10 to 11; tail, 4; bill, 5 to 8; tarsus, $2\frac{1}{4}$ inches.

Great Salt Lake, May 15, 1854. (No. 2.)

FULICA AMERICANA, Gmelin, (p. 751.)—Coot; Poule d'Eau; Mud Hen.

Fulica americana, Gm., Syst. Nat. I, 1788, 704.

SP. CH.—Head and neck glossy black, with a tinge of ashy; under tail coverts white. Entire other plumage dark bluish cinereous or slate color, with a tinge of olive on the back and darker on the rump. Edge of wing at shoulder and edge of first primary white; secondary quills tipped with white; rump frequently tinged with brownish. Bill very pale yellow or nearly white, with a transverse band of brownish black near the end; tip white; legs dull grayish green. Female similar, but with the tints lighter. Young like the adult, but with the under parts lighter; abdomen frequently ashy white; back and rump dark olive brown; head and neck lighter.

Total length about 14 inches; wing, 7; tail, 2 inches.

9984. Great Salt Lake City.

CYGNUS AMERICANUS, Sharpless, (p. 758.)—American Swan.

Cygnus americanus, Sharpless, Doughty's Cab. N. H. I, 1839, 185, pl. xvi.

SP. CH.—Bill as long as the head, broad, high at the base; the feathers ending on the forehead in a semicircular outline. Nostrils far forward, the anterior extremity considerably more forward than half the commissure. Tail of 20 feathers.

Adult pure white; bill and legs black; the former with an orange or yellowish spot in front of the eye. Less mature specimens with the head above tinged with reddish brown. Length, 55 inches; wing, 22.00; tarsus, 4.25; bill above, 4.20.

Hab.—Continent of North America.

9978. Salt Lake City.

ANAS BOSCHAS, L. (p. 774.)—Mallard.

Anas boschas, Linn. Syst. Nat. I, 1766, 205.

SP. CH.—*Male*. Head and neck bright grass green, with violet gloss, the top of the head duller; a white ring round the middle of the neck, below which and on the fore part and sides of the breast the color is dark brownish chestnut. Under parts

and sides, with the scapulars, pale gray, very finely undulated with dusky; the outer scapulars with a brownish tinge. Fore part of back reddish brown; posterior more olivaceous. Crissum and upper tail coverts black, the latter with a blue gloss. Tail externally white; wing coverts brownish gray, the greater coverts tipped first with white, and then more narrowly with black. Speculum purplish violet, terminated with black; a recurved tuft of feathers on the rump.

Female with the wing exactly as on the male. The under parts plain whitish ochrey, each feather obscurely blotched with dusky. Head and neck similar, spotted and streaked with dusky; the chin and throat above unspotted. Upper parts dark brown, the feathers broadly edged and banded with reddish brown parallel with the circumference.

Length of male, 23; wing, 11; tarsus, 1.70; commissure of bill, 2.50.

9699. Salt Lake City.

AYTHYA AMERICANA, B o n. (p. 793.)—Red-head.

SR. CH.—Bill as long as the head, broad, blue, the end black; the region anterior to the nostrils dusky. Head, and neck for more than half its length, brownish red, glossed above and behind with violaceous red. Rest of neck and body anterior to the shoulders, lower part of back and tail coverts black. Beneath white, sprinkled with gray and black anterior to the crissum; the sides, interseapulars, and scapulars finely lined with undulating black and white in nearly equal proportions, imparting a general gray tint. Wing coverts bluish gray, finely sprinkled with whitish. The speculum, consisting of the ends of the secondaries, hoary grayish blue, lightest externally, and the innermost narrowly edged externally with black. Basal portion of inner primaries somewhat similar to the speculum. Tail of fourteen feathers.

Female with the head, neck, and fore part of body brownish; the region round the base of the bill whitish. Length of male, 20.50; wing, 9.50; tarsus, 1.60; commissure, 2.30.

9787. Salt Lake City. 9786. Uncompagre river, Utah. (26.)

NETTION CAROLINENSIS, B a i r d, (p. 777.)—Green-winged Teal.

Anas carolinensis, GMELIN, Syst. Nat. I, 1788, 533.

SR. CH.—Head and neck all round chestnut: chin black; forehead dusky. Region round the eye, continued along the side of the head as a broad stripe, rich green, passing into a bluish black patch across the nape. Under parts white, the feathers of the jugulum with rounded black spots. Lower portion of neck all round, sides of breast and body, long feathers of flanks and scapulars beautifully and finely banded closely with black and grayish white. Outer webs of some scapulars, and of outer secondaries black, the latter tipped with white; speculum broad and rich green; wing coverts plain grayish brown, the greater coverts tipped with buff. A white crescent in front of the bend of the wing; crissum black, with a triangular patch of buffy white on each side. Lower portion of the green stripe on each side of the head blackish, with a dull edge of whitish below.

Female with the wings as in the male. The under parts white, with hidden spots on the jugulum and lower neck; above dark brown, the feathers edged with gray.

Length, 14 inches, wing, 7.40; tarsus, 1.14; commissure, 1.68.

9721. Salt Lake City.

BUCEPHALA AMERICANA, B a i r d, (p. 796.)—Golden Eye; Whistle Wing.

Clangula americana, BONAP. Comp. List, 1838.—EYTON, Mon. Anat. 1833, 167.

SR. CH.—Bill black. Head and upper part of neck glossy green; the under surface opaque velvety purplish black. An elliptical patch along the base of upper mandible anterior to the eye, lower part of neck, under parts generally, and sides, middle and greater wing coverts, the innermost secondaries (and tertials, except the innermost three or four) white. The white on the wing is in a continuous patch, although there is a concealed black bar on the base of the greater coverts. The inner scapulars are white, margined externally with black; posteriorly, however, they are black, streaked centrally with white. The inner scapulars and tertials, and the whole back, rump, and lesser wing coverts, are black; the primaries and tail black, with a hoary gloss. The under side of quills and lower greater coverts are plumbeous gray; the rest of the under wing and the axillars are sooty brown. The long white feathers of the flanks are edged superiorly with black.

Female with the head and neck above small brown, without white patch. White of wing less extended; the middle coverts only touched with white. There is a tendency to a black bar across the tips of the greater coverts. The white of the wing sometimes well defined.

Length, 18.75; wing, 8.50; tarsus, 1.50; commissure, 2.

9798. Great Salt Lake City.















No. 3.

REPORT ON REPTILES COLLECTED ON THE SURVEY.

BY S. F. BAIRD.

SCELOPORUS GRACIOSUS, B. & G.

Sceloporus graciosus, B. & G. Pr. A. N. Sc. VI, April, 1852, 69.—IB. Stansbury, Great Salt Lake, 1852, 346; pl. v, fig. I.

Sceloporus gracilis, B. & G. Pr. A. N. Sc. Oct. 1852, 175.—GIRARD, Herp. U. S. Ex. Ex. 1858.

2842. Valley of Salt Lake City.

?SCELOPORUS OCCIDENTALIS, B. & G.

Sceloporus occidentalis, B. & G. Pr. A. N. Sc. VI, Oct. 1852, 175.—GIRARD, Herp. U. S. Ex. Ex. 1858, 333; pl. xix, figs. 8—14.

2837. Salt Lake valley. The specimen is not in very good condition, and may possibly belong to the next species.

?SCELOPORUS LONGIPES, Baird.

Sceloporus longipes, BAIRD, Pr. A. N. Sc. Dec. 1858.

2863. Salt Lake valley. 2863. Salt Lake.

CROTAPHYTUS COLLARIS, Holbrook.

PLATE XXIV, FIG. 1.

Agama collaris, SAY, Long's Exped. II, 1823, 252.

Crotaphytus collaris, HOLBROOK, N. Am. Herp. II, 1842, 79; pl. x.

2729, 2697, 2721. Upper Arkansas to Rocky mountains. These specimens exhibit the usual variety of coloring of the species.

CROTAPHYTUS WISLIZENII, B. & G.

Crotaphytus wislizenii, B. & G. Pr. A. N. Sc. VI, April, 1852, 67.

Crotaphytus gambelii, B. & G. Pr. A. N. Sc. VI, Aug. 1852, 126.

Crotaphytus fasciatus, HALLOW. Pr. A. N. Sc. VI, Dec. 1852, 207.

2698. Salt Lake Basin. 2695. Head of Humboldt. This species was found to be quite abundant in Utah.

CALLISAURUS VENTRALIS, Baird.

Homonosaurus ventralis, HALLOWELL, Pr. A. N. Sc. VI, Oct., 1852, 179.

Callisaurus ventralis, BAIRD, Herp. Mex. Bound. Surv. 1859.

2803. Salt Lake Basin. This specimen is more northern in its locality than any collected by the other expeditions.

HOLBROOKIA MACULATA, Girard.

Holbrookia maculata, GIRARD, Pr. Am. Assoc. IV, for 1850, 1851, 201.—IB. Stansbury's Report, 1852, 342; pl. vi, figs. 1—3.

2657. Salt Lake Basin. This was found to be exceedingly abundant along the Arkansas.

TAPAYA BREVIROSTRIS, Girard.

Tapaya brevirostris, GIRARD, Herp. U. S. Ex. Ex. 1858, 397.

207. Rocky mountains, near 38°.

TAPAYA DOUGLASSII, Girard.

Agama douglassii, BELL, Trans. Linn. Soc. XVI, for 1828, 1833, 105.

Phrynosoma douglassii, WAGLER, Naturl. Syst. Amph. 1830, 146.—HOLBROOK, N. Am. Herp. II, 1842, 101; pl. xiv

Tapaya douglassii, GIRARD, Herp. U. S. Ex. Ex. 1858, 398; pl. xxi, figs. 1—5.

229. Utah Basin.

DOLIOSAURUS PLATYRHINOS, Girard.

Phrynosoma platyrhinus, GIRARD, Stansbury's Ex. 1852, 361; pl. vii, figs. 1—5.

Doliosaurus platyrhinus, GIRARD, Herp. U. S. Ex. Ex. 1858, 407.

190. Salt Lake valley.

CNEMIDOPHORUS TESSELATUS, Baird.

Ameiva tessellata, SAY, Long's Exped. II, 1823, 50.

3026. Salt Lake Basin. The specimen collected appears more nearly referable to this long lost species of Say than to any other, although closely related to *C. tigris*.

PLESTIODON SKILTONIANUS, B. & G.

Plestiodon skiltonianus, B. & G. Pr. A. N. Sc. VI, April, 1852, 69.—IB. Stansbury's Report, 1852, 349; pl. iv, figs. 4—6.

Eumeces quadrilineatus, HALLOWELL, Pr. A. N. Sc. VII, June, 1854, 94.

3166. Fort Humboldt, California. This locality is more than usually eastern.

PLESTIODON GUTTULATUS, Hallowell.

Lamprosaurus guttulatus, HALLOW. Pr. A. N. Sc. VI, Dec. 1852, 206.

Plestiodon guttulatus, HALLOW. Pr. A. N. Sc. VII, Dec. 1857, 215.

3115. Upper Arkansas?

PLESTIODON SEPTENTRIONALIS, Baird.

PLATE XXIV, FIG. 2.

Plestiodon septentrionalis, BAIRD, Pr. A. N. Sc. Dec. 1853.

One post-nasal plate which does not separate the inter-nasals and post-frontals. Color above olive, with four equidistant and equal dark stripes on adjacent half rows of scales. Two narrow white lines on each side, traversing the centres of single rows, and margined above and below by black. Upper lateral light stripes separated by six rows of scales. Beneath light greenish.

No. 1356. Minnesota and Nebraska.

EUTAENIA ORDINOIDES, B. & G.

Tropid notus ordinoides, B. & G., Pr. A. N. Sc. VI, 1852, 176.

Eutaenia ordinoides, B. & G., Catal. N. Am. Serp. 1853, 33.—GIRARD, Herp. U. S. Ex. Ex. 1858, 153; pl. xiv. figs. 1, 4.

SPEC. CHAR.—The largest of the genus. Body very stout. First row of dorsal scales largest, but slightly carinated; second much smaller, only slightly larger than the third. Caudal scales strongly carinated. A dorsal and two lateral stripes. Lateral stripe on the second and third rows. Two series of black spots on each side, with the interval reddish brown; these, in large specimens, are usually confluent, forming two distinct black stripes, separated by a well defined reddish one. First row of scales below the lateral stripe, greenish, slightly darker than the abdomen. Abdomen uniform greenish; dorsal rows, 19.—(KINNICOTT.)

No. 889. Between Salt Lake and California. Lt. Beckwith.

EUTAENIA VAGRANS. B. & G.

PLATE XVII.

Eutaenia vagrans, B. & G. Catal. N. Am. Serp. 1853, 35.

GIRARD, Herp. U. S. Ex. Ex. 1858, 154; pl. xiv. figs. 5—10.

SPEC. CHAR.—Head large and high, eight labials above; sixth and seventh very large, higher than wide, the sixth extending above the level of the lower edge of the eye; the seventh much larger than the fifth. Light olive brown above, with two series of black spots on each side, the upper of which encroaches upon the dorsal stripe, constricting it at regular intervals, while the lower encroaches upon the indistinct lateral stripe. Lateral stripe on second and third rows; dorsal rows, 21.—(KENNICOTT.)

No. 919. Camp of May 17, 921, 922, 923. Utah. Lt. Beckwith.

NERODIA ERYTHROGASTER, B. & G.

PLATE XVIII.

Coluber erythrogaster, SHAW, Gen. Zool. III, 1804, 458.

Tropidonotus erythrogaster, HOLBROOK, N. Am. Herp. III, 1842, 33; pl. viii.

Nerodia erythrogaster, B. & G. Catal. N. Am. Serp. 1853, 41.

SPEC. CHAR.—Head small, elongated, narrowing forwards; occipital region flattened. Vertical plate pentagonal, very large, as are also the occipitals. Three post-orbitals. An elevated loreal. Dorsal rows of scales, 23 in number, all very strongly carinated. Uniform dark bluish black above, lighter on the sides; external band of dull blue extending on the abdominal scutellæ. Body beneath uniform dull coppery yellow, sometimes with the anterior edge of each scutellæ bluish. No distinct spots on the abdomen as in *N. sipedon*. Indications of three series of dorsal blotches, as in *N. Woodhousii*, in young specimens.

No. 1320. Cedar creek, Arkansas. Lt. Beckwith.

HETERODON NASICUS, B. & G.

Heterodon nasicus, B. & G. Stansbury's Report Salt Lake, 1852, 352.—IB. Catal. N. Am. Serp. 1853, 61.

SPEC. CHAR.—Vertical broader than long. Rostral excessively broad and high. Azygos plate surrounded behind and on the sides by many small plates (12—15.) A second loreal. Labials short and excessively high. Dorsal rows of scales 23, exterior alone smooth. A dorsal series of about 50 blotches, with four or five others on each side. Body beneath black. A narrow white line across the middle of the superciliaries; a second behind the rostral. A broad dark patch from the eye to the angle of the mouth, crossing the last two labials.

No. 1263. Rocky Mountains. Lt. Beckwith.

PITYOPHIS BELLONA, B. & G.

Churchillia bellona, B. & G., Stansbury's Report, 1852, 350.

Pityophis bellona, B. & G., Catal. N. Am. Serp., 1853, 66.

Pityophis affinis, HALLOWELL, Pr. A. N. Sc. VI, 1852, 181.

SPEC. CHAR.—Head broad behind, tapering to the snout. Snout rather pointed but less so than in *P. sayi*, elevated. Crown flattened between the eyes and posteriorly. Vertical plate broad anteriorly, elongated and narrow posteriorly. Anti-orbitals 2,

sometimes 1; post-orbitals 3 or 4. Frequently a supplemental plate before the vortical. Dorsal rows of scales 29 to 35, the seven outer rows smooth. Head spotted with black; transverse frontal bar from one orbit to the other, well marked; the oblique post-orbital stripe rather narrow. Color of the body whitish yellow; a dorsal series of 45—65 subquadrate blotches from head to anus, transversely elongated posteriorly; 3 or 4 smaller series on each side. The lateral blotches longitudinally elongated near the head; vertically elongated posteriorly, where they form a series of jet black vertical bars. Ten or fifteen transverse black bands on the tail. Abdomen yellow with an external series of black spots on each side.—(KENNICOTT.)

Nos. 1547—1522. Lt. Beckwith.

MASTICOPHIS TAENIATUS, B. & G.

PLATE XXIII.

Leptophis taeniata, HALLOWELL, Pr. A. N. Sc. VI, 1852, 181.

Masticophis taeniatus, B. & G., Catal. Serp., 1853, 103.

A broad brown dorsal stripe margined by a darker line. The four outer rows of scales on each side yellow, with a dark line through the centre of each. A dark line along the edge of the abdomen, making six dark lines on each side. Beneath yellowish. Dorsal rows 15, tail about one-third the total length.

1984, 1980. Utah. Lt. Beckwith.

BUFO WOODHOUSII, Girard.

Bufo dorsalis, HALLOW, Pr. A. N. Sc., VI, 1852, 181.—Ia. Sitgreaves Rep., 1853, 142; pl. xix.

Bufo woodhousii, GIRARD, Pr. A. N. Sc., VII, May, 1854, 86.

SP. CH.—Head short and thick; upper central surface but little depressed, not to say grooved; the suborbital ridge being slightly elevated. The occipito-temporal ridge is thicker, and hence a little more conspicuous. Snout rounded, nostrils terminal. Mouth wide, upper jaw emarginated. Tympanum and parotids of moderate size. Limbs rather short and stout. First finger touch longer than the second. A large metacarpal disk. Toes semipalmated. Two metatarsal tubercles, a very large and a very small one. No membranous fold at the inner lower edge of the tarsus. Papillæ of medium size upon the back. Inferior surface, with rather small and crowded granular warts. Above dark brown, with numerous lines of yellow. A dorsal yellowish vitta running the whole length of the body. Transverse blotches of black upon the thighs and fore arms. Beneath ochraceous.—(GIBARD.)

2641. Upper Arkansas. Captain Beckwith.

AMBLYSTOMA MAVORTIUM, Baird.

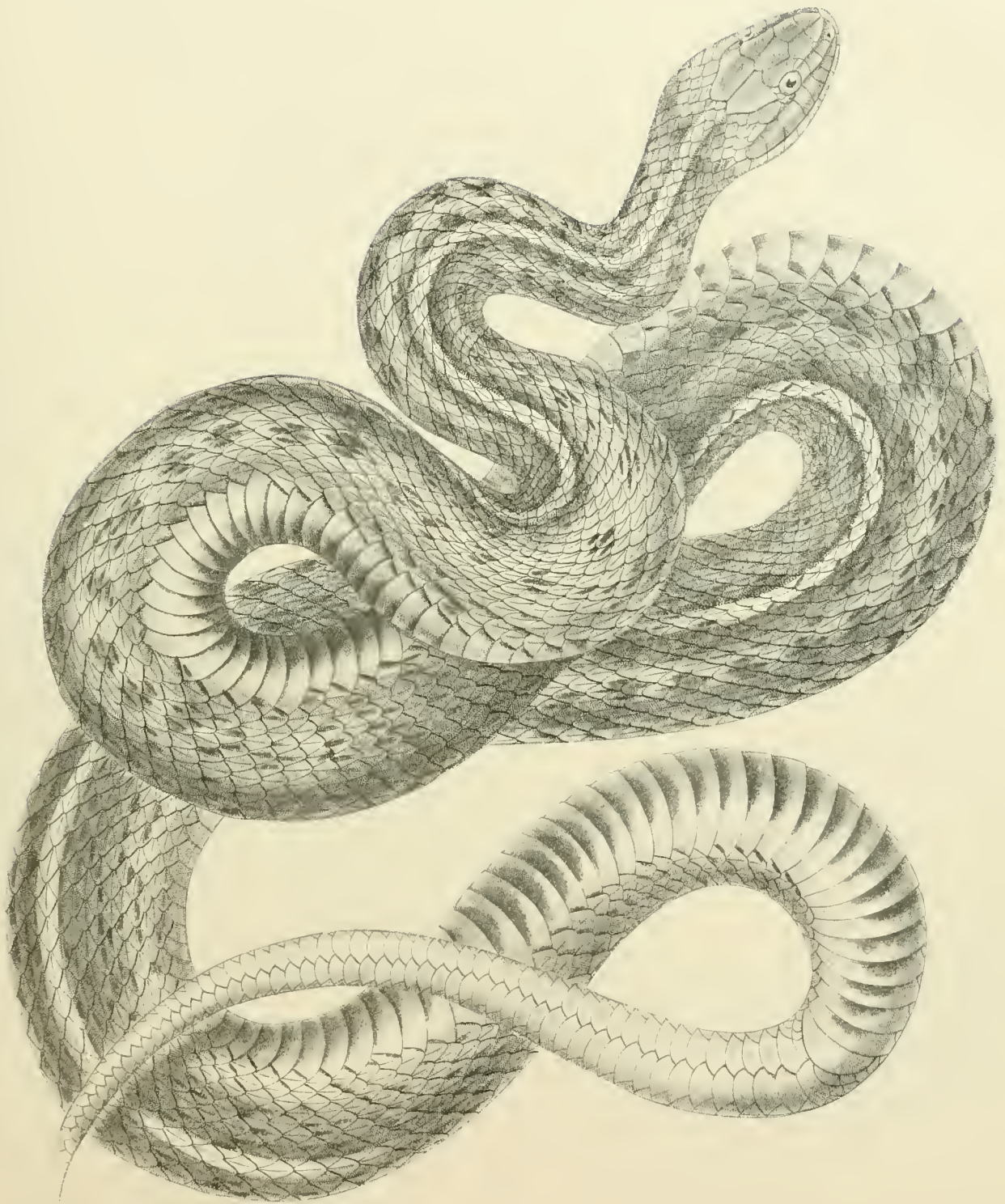
Ambystoma mavortium, BAIRD, J. A. N. Sc., 2d series, I, October, 1849, 28.

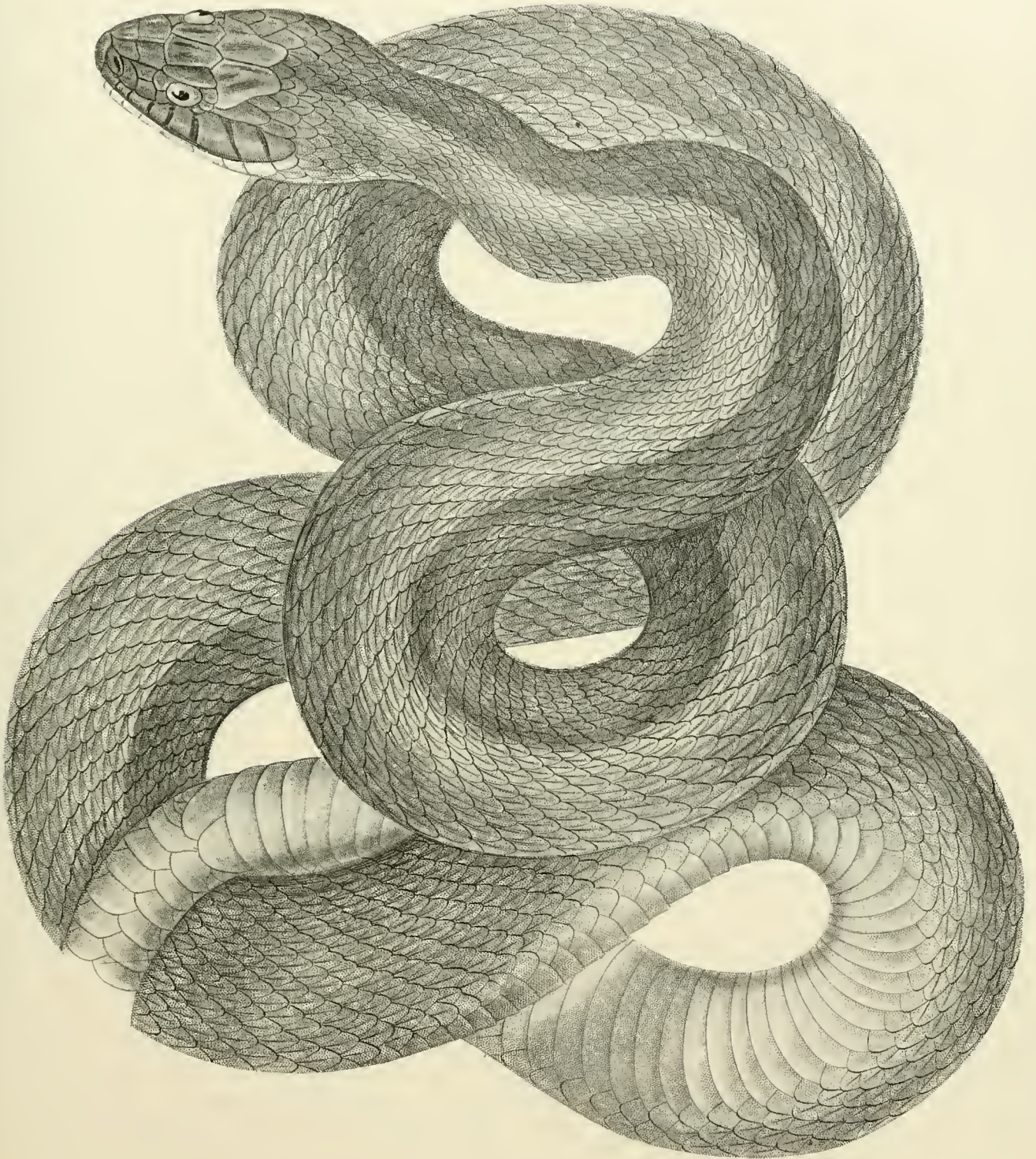
4062. Rocky mountains. Captain Beckwith.

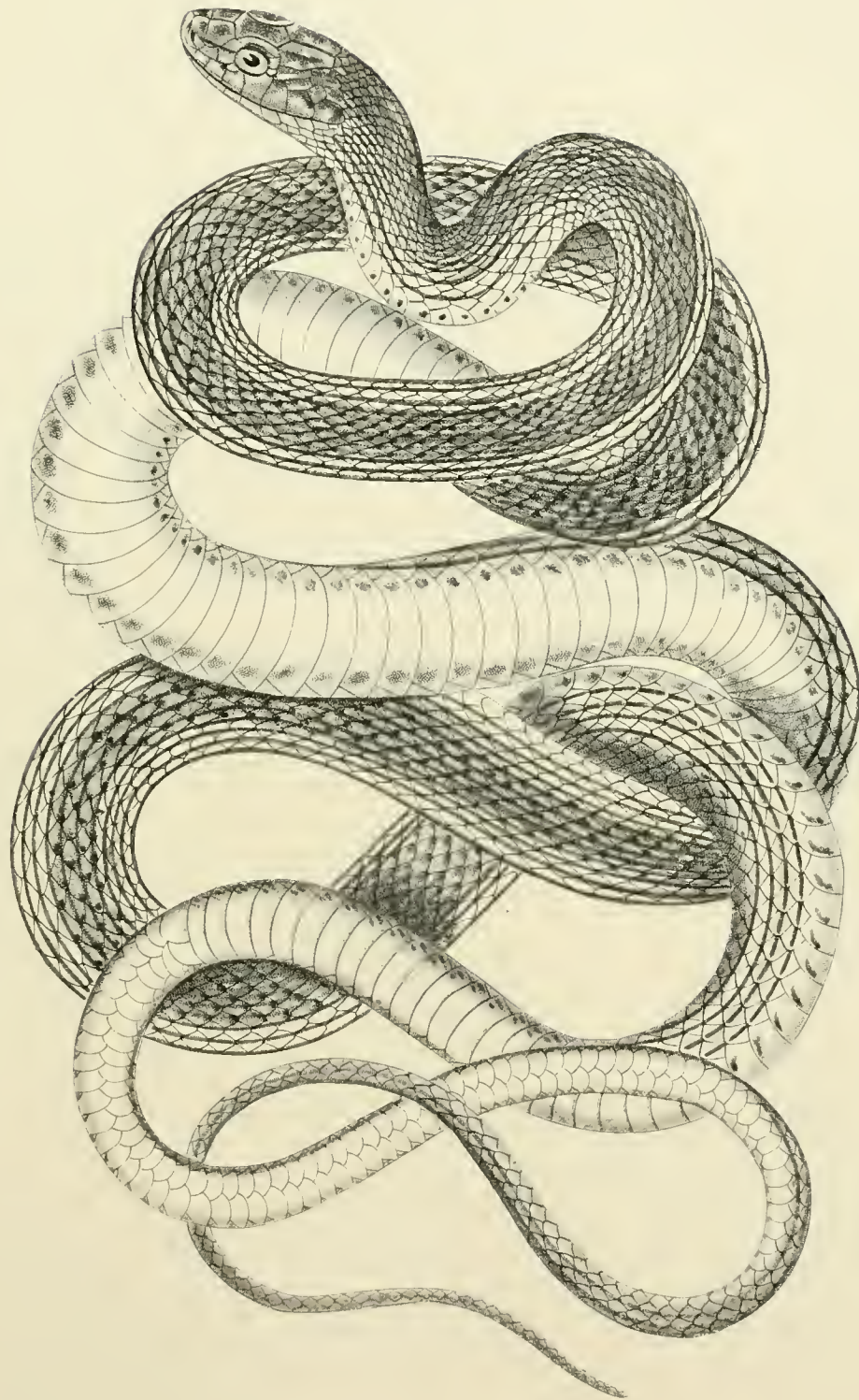
SIREDON LICHENOIDES, Baird.

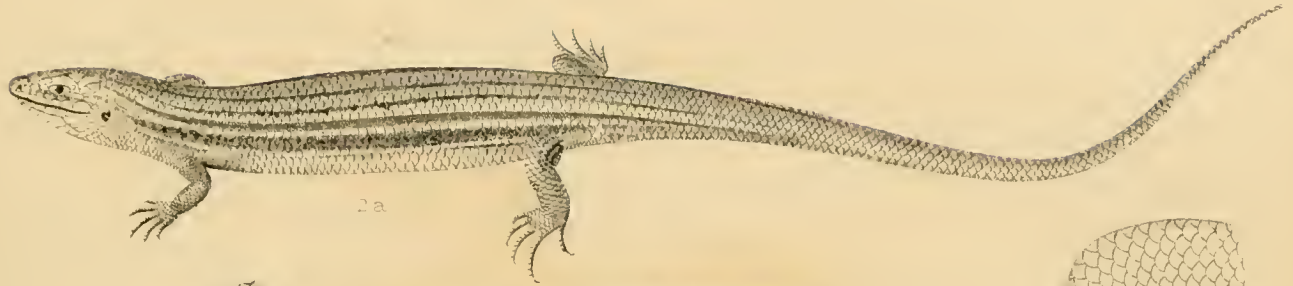
Siredon lichenoides, BAIRD, Pr. A. N. Sc., pl. vi, April, 1852, 68.—Ib. Stansbury's Report, 1852, 336; pl. i.

4076. Rocky mountains. Captain Beckwith.

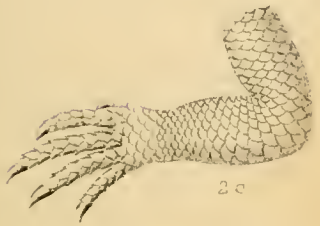




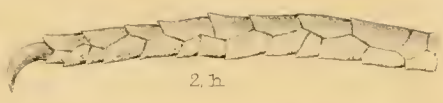




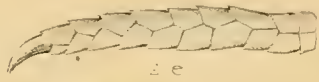
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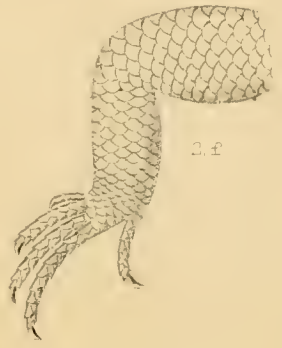
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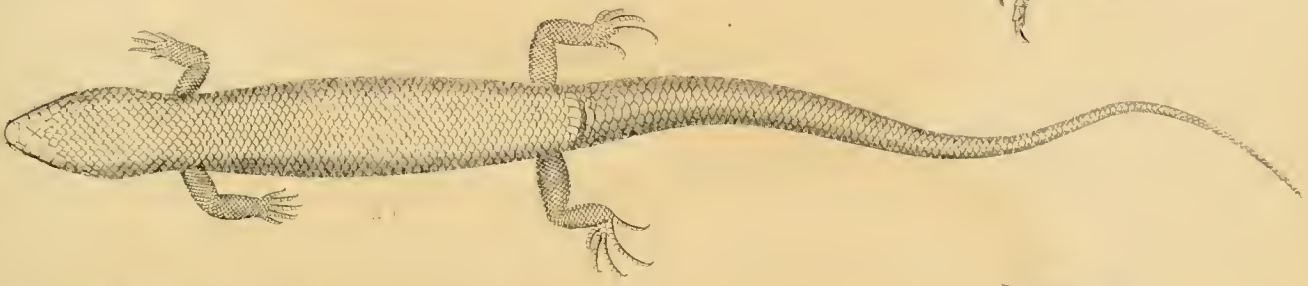
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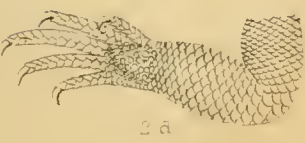
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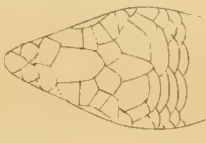
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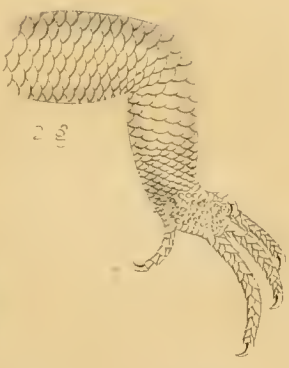
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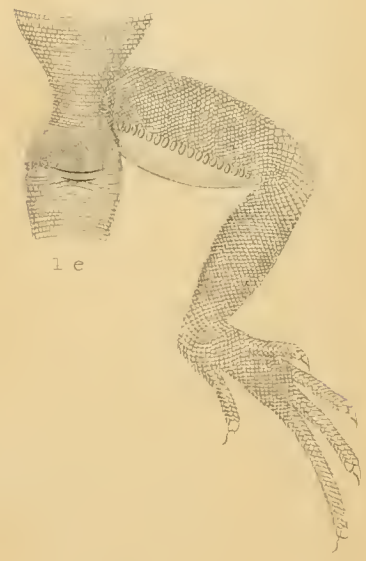
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1g



1d



1a

No. 4.

REPORT ON FISHES COLLECTED ON THE SURVEY.

BY CHARLES GIRARD, M. D.

1. BRYTTUS HUMILIS, Grd.

GEN. REP. 21. PLATE VII, FIGS. 9—24.

SPEC. CHAR.—Body sub-elliptical. Nape convex, and snout sub-conical. Posterior extremity of maxillary extending beyond the anterior rim of the orbit. Insertion of the ventral situated posteriorly to the base of pectorals, and a little in advance of the origin of the dorsal, their tips overlapping the vent. Scales large. Reddish brown or dusky, maculated. Fins unicolor; dorsals sometimes blotched.

429. Cottonwood creek, Utah. Mr. Kreuzfeld.

2. AMBLODON GRUNNIENS, Rafin.—Buffalo Perch, Grunting Perch, &c.

GEN. REP. 96. PLATE XXIII.

SPEC. CHAR.—Profile of head depressed on the nape. Snout thick, blunt, and short. Posterior extremity of maxillary extending to a vertical line intersecting the anterior rim of the pupil. Extremities of pectorals almost even with the tips of ventrals, or else projecting slightly beyond them. First anal spine diminutive; second one stout and well developed. Caudal fin posteriorly convex. Color bluish-grey, lighter beneath than above. Fins greyish-olive; anal maculated.

483. St. Louis, Missouri. Dr. Geo. Engelmann.

3. PTYCHOSTOMUS HAYDENI, Grd.

GEN. REP. 220. PLATE XLIX, FIGS. 1—4.

SPEC. CHAR.—Body sub-fusiform. Head contained five times and a half in the total length. Eye sub-circular, moderate sized; its diameter entering five times in the length of the side of the head. Dorsal fin higher than long; its anterior margin being much nearer the tip of the snout than the insertion of the caudal. The latter is furcated. Insertion of ventral fins situated opposite the middle of the dorsal. Anal much deeper than broad. Pectorals moderate sized. Scales longer than deep, furrowed upon their anterior and posterior sections.

172. Yellowstone river. Dr. F. V. Hayden.

4. ACOMUS GENEROSUS, Grd.

GEN. REP. 222.

SPEC. CHAR.—Head constituting the fifth of the total length; mouth moderate sized; lips rather small, covered with uniform granules. Eye small, sub-circular; its diameter entering five times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the extremity of the snout and the insertion of the caudal. Extremities of ventrals not reaching the vent; their origin taking place under the posterior third of the dorsal. Olivaceous above, blotched with blackish; yellowish olive beneath. Fins unicolor.

256. Cottonwood creek, Utah. Mr. Kreuzfeld.

5. ACOMUS GRISEUS, Gr d.

GEN. REP. 222.—PLATE XLIX, FIGS. 5—9.

SPEC. CHAR.—Head constituting the fifth of the entire length. Mouth moderate sized. Granules of lower lip largest close to the mouth. Eye small, sub-elliptical; its longitudinal diameter entering about seven times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the extremity of the snout and the insertion of the caudal. Extremities of ventrals not reaching the vent; their origin taking place under the posterior third of the dorsal. Greyish brown above; whitish or yellowish beneath.

259. Sweet water, tributary of Platte river, Nebraska. J. S. Bowman.

6. PIMEPHALES MACULOSUS, Gr d.

GEN. REP. 234.

SPEC. CHAR.—Body rather short, deep, and compressed; greatest depth equal to one-fourth of the total length, whilst the head constitutes the fifth part of it. Eye moderate and circular; its diameter entering four times in the length of the side of the head. Angle of the mouth not extending as far as a vertical line drawn in advance of the orbit. Extremities of ventrals overlapping the vent, and reaching the anterior margin of the anal. Scales much deeper than long, and larger on the peduncle of the tail than anteriorly. Yellowish brown with black blotches.

153. Sluice of Arkansas river. Mr. Kreuzfeld.

7. HYBOGNATHUS PLACITUS, Gr d.

GEN. REP. 236.

SPEC. CHAR.—Body sub-fusiform in profile. Head sub-conical, contained about five times and a half in the total length. Eye moderate sized, sub-circular. Anterior margin of dorsal fin nearer the extremity of the snout than the base of the caudal, whilst the insertion of the ventrals is nearly equidistant between the same points. Scales anteriorly rounded. Greyish brown above, silvery on the flanks, and dull metallic white beneath.

89. Sluice of Arkansas river near Fort Makee. Mr. Kreuzfeld.

8. HYBOGNATHUS EVANSI, Gr d.

GEN. REP. 236.

SPEC. CHAR.—Body sub-fusiform in profile. Head sub-conical, thickish, contained about five times in the total length. Eye moderate sized, sub-circular. Anterior margin of dorsal fin equidistant between the extremity of the snout and the base of the caudal. Insertion of ventrals being situated posteriorly to the anterior margin of the dorsal, is therefore nearer the base of the caudal than the extremity of the snout. Caudal fin constituting the fifth of the total length. Scales anteriorly truncated. Reddish brown above; silvery on the flanks and beneath.

90. Sweetwater, tributary of Platte river. J. S. Bowman.

9. ALGANSEA OBESA, Gr d.

GEN. REP. 239.

SPEC. CHAR.—Head contained four times and a half in the total length. Eye rather small; its diameter entering nearly six times in the length of the side of the head. Posterior extremity of the maxillar bone corresponding to a vertical line drawn behind the nostrils. Anterior margin of the dorsal fin nearer the insertion of the caudal than the extremity of the snout. Insertion of ventrals nearer the base of the caudal than the extremity of the snout. Scales moderate. Bluish grey above; yellowish beneath; sides greyish. Fins greyish olive.

193. Humboldt river. J. S. Bowman.—194. ?. Mr. Kreuzfeld.

10. LAVINIA EXILICAUDA, B. & G.

GEN. REP. 241.—PLATE LIV, FIGS. 1—4.

SPEC. CHAR.—Body very compressed, quite deep upon its middle; peduncle of tail rather slender. Head small; eye moderate; posterior extremity of maxillary not reaching the anterior rim of the orbit. Isthmus small. Insertion of ventral fins situated in advance of the anterior margin of the dorsal. Pectorals rather small. Caudal deeply furcated. Reddish brown above, silvery grey on the sides, the scales being minutely dotted upon their margin. Beneath yellowish.

207. Sacramento river, California. Dr. A. L. Heermann.

11. ARGYREUS DULCIS, Gr d.

GEN. REP. 243.—PLATE LIV, FIGS. 5—8.

SPEC. CHAR.—Head well developed, constituting the fourth of the length, caudal fin excluded. Mouth large, and barbel conspicuous; lips fleshy. Eye small, sub-circular, its diameter entering six times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the extremity of the snout and the tip of the middle rays of the caudal. Insertion of ventral fins somewhat nearer the angle of the mouth than the base of the caudal. Color greyish yellow above; yellowish white beneath; sides sprinkled with an indistinct silvery band.

53. Cottonwood creek, Utah. Mr. Kreuzfeld.

12. POGONICHTHYS INAEQUILOBUS, B. & G.

GEN. REP. 245.—PLATE LVI, FIGS. 1—4.

SPEC. CHAR.—Head forming a little less than the fifth of the total length; snout rounded, sub-conical, thickish; gape of mouth nearly horizontal; lower jaw shorter than the upper. Posterior extremity of maxillar bone scarcely even with a vertical line drawn in front of the orbit. Anterior margin of dorsal fin somewhat nearer the extremity of the snout than the insertion of the caudal. Insertion of ventrals placed posteriorly to the anterior margin of the dorsal; their origin being nearly equidistant between the extremity of the snout and the base of the caudal. Lobes of the caudal fin unequally developed; upper one the longest. Greyish brown above; yellowish beneath.

182. Sacramento river, California. Dr. A. L. Heermann.

13. NOCOMIS NEBRASCENSIS, Gr d.

GEN. REP. 254.

SPEC. CHAR.—Head contained four times and a half in the total length. Posterior extremity of maxillary even with a vertical line drawn behind the nostrils. Eye sub-circular; its diameter entering five times in the length of the side of the head. Body stoutish and compressed, covered with large scales. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Dorsal and anal fins deeper than long. Caudal fin constituting the fifth of the length. Tip of ventrals overlapping the vent, although not reaching the anal fin. Reddish brown above, golden yellow beneath.

48. Sweetwater, tributary of Platte river. J. S. Bowman.

14. EXOGLOSSUM MIRABILE, Gr d.

GEN. REP. 256.—PLATE LVI, FIGS. 5—8.

SPEC. CHAR.—Head sub-conical, blunt, and constituting the sixth of the total length. Mouth small; posterior extremity of maxillar bone even with a vertical line drawn across the nostrils. Eye sub-circular; its diameter entering four times in the length of the side of the head. Anterior margin of dorsal much nearer the extremity of the snout than the base of the caudal. Insertion of ventrals placed somewhat posteriorly to the anterior margin of the dorsal, their tip nearly reaching the vent. Reddish brown above; middle of flank with a silvery band; beneath light reddish.

47. Arkansas river, near Fort Smith. Dr. Geo. G. Shumard.

15. *CYPRINELLA GUNNISONI*, G r d.

GEN. REP. 267.

SPEC. CHAR.—Body short, rather deep; back somewhat arched. Peduncle of tail of moderate development. Head constituting less than the fifth of the total length. Eye moderate sized; its diameter entering three times and a half in the length of the side of the head. Posterior extremity of maxillar bone reaching a vertical line drawn near the anterior rim of the orbit. Anterior margin of dorsal fin equidistant between the tip of the snout and the fork of the caudal. Origin of ventrals situated in advance of the dorsal. Pectorals and ventrals rather small. Reddish brown, lighter beneath than above. Fins unicolor.

139 Cottonwood creek, Utah. Mr. Kreuzfeld.

16. *CYPRINELLA BECKWITHI*, G r d.

GEN. REP. 267.

SPEC. CHAR.—Body short, rather deep; back somewhat arched. Peduncle of tail slender. Head contained four times and a half in the total length. Eye moderate sized; its diameter entering four times in the length of the side of the head. Gape of the mouth somewhat oblique. Posterior extremity of the maxillary extending to a vertical line drawn in front of the orbit. Anterior margin of dorsal fin somewhat nearer the insertion of the caudal than the tip of the snout. Origin of ventrals situated somewhat in advance of the dorsal. Pectorals slender, larger than the ventrals. Greyish brown above, orange red beneath. Fins unicolor.

135. Sluice of Arkansas river, near Fort Makee. Mr. Kreuzfeld.

17. *CYPRINELLA LUGUBRIS*, G r d.

GEN. REP. 271.

SPEC. CHAR.—Body elongated, sub-fusiform. Peduncle of the tail rather slender. Head contained four times and a half in the total length. Eye large; its diameter entering three times and a half in the length of the side of the head. Snout sub-conical; gape of the mouth oblique; posterior extremity of the maxillary corresponding to a vertical line drawn at the anterior rim of the orbit. Anterior margin of dorsal fin nearer the tip of the snout than the insertion of the caudal. Origin of the ventrals situated opposite the anterior edge of the dorsal. Pectorals and ventrals rather small. Dark brown above; sides and abdomen silvery white. Fins unicolor.

141. Cottonwood creek, Utah. Mr. Kreuzfeld.

18. *CYPRINELLA LUDIBUNDA*, G r d.

GEN. REP. 271.

SPEC. CHAR.—Body elongated, sub-fusiform. Peduncle of the tail rather slender. Head constituting the fifth of the total length. Eye large; its diameter entering about three times in the length of the side of the head. Snout sub-conical; gape of the mouth nearly horizontal; posterior extremity of maxillar bone corresponding to a vertical line drawn behind the nostrils. Anterior margin of dorsal fin equidistant between the insertion of the caudal and the tip of the snout. Origin of ventrals situated somewhat in advance of the anterior edge of the dorsal. Pectorals and ventrals of moderate development. Reddish brown; middle of the flanks silvery; lateral line marked with black dots.

132. Cottonwood creek, Utah. Mr. Kreuzfeld.

19. *MONIANA TRISTIS*, G r d.

GEN. REP. 277.

SPEC. CHAR.—Body elongated, sub-fusiform. Peduncle of tail long and slender. Head constituting the fifth of the length. Snout rounded and rather abbreviated; jaws equal. Posterior extremity of maxillar bone extending to a vertical line drawn behind the nostrils. Eye large and circular; its diameter entering about three times and a half in the length of the side of the head. Anterior margin of dorsal fin somewhat nearer the extremity of the snout than the insertion of the caudal. Vertical fins well developed. Reddish brown, lighter beneath than above, with a lateral dark streak.

93. Mr. Kreuzfeld.

20. SEMOTILUS SPECIOSUS, Gr d.

GEN. REP. 283.—PLATE LXI, FIGS. 11—15.

SPEC. CHAR.—Body elongated, sub-fusiform in its outlines. Head constituting the fourth of the total length, the finned portion of the caudal excluded. Snout sub-conical; gape of the mouth oblique; posterior extremity of maxillar bone extending to a vertical line drawn at the anterior rim of the pupil. Eye moderate size, sub-circular; its diameter entering five times in the length of the side of the head. Anterior margin of dorsal fin nearer the extremity of the snout than the tip of the caudal. Insertion of ventrals nearer the isthmus than the base of the caudal. Anal fin much deeper than long. Reddish brown above; yellowish or whitish beneath. Dorsal and caudal fin provided with a black spot at their base.

176. Tributaries of Platte river, Nebraska. J. S. Bowman.

21. GILA ELEGANS, B. & G.

GEN. REP. 286.

SPEC. CHAR.—Body very slender; tail very much attenuated. Head constituting the fifth of the total length. Eye small sub-elliptical; its diameter entering seven times in the length. Posterior extremity of maxillar bone extending to a vertical line drawn in advance of the orbit. Anterior margin of dorsal fin nearer the extremity of the snout than the base of the caudal. Base of anal fin entering about nine times in the total length. Origin of ventrals much nearer the extremity of the snout than the base of the caudal. Reddish brown above; metallic yellow beneath.

249. Grand river, Utah. Mr. Kreuzfeld.

22. TIGOMA OBESA, Gr d.

GEN. REP. 290.

SPEC. CHAR.—Body short and compact; peduncle of the tail rather attenuated. Head small, constituting the fifth of the total length. Snout abbreviated and rounded; posterior extremity of maxillar bone extending to a vertical line drawn in front of the orbit. Eye moderate sized, sub-circular; its diameter entering a little over four times in the length of the side of the head. Anterior margin of dorsal fin nearly equidistant between the extremity of the snout and the fork of the caudal fin. Origin of ventrals somewhat nearer the insertion of the caudal than the extremity of the snout. Bluish grey above; yellowish white beneath, with a lateral reddish streak.

215. Salt Lake Valley, Utah. J. S. Bowman.

23. TIGOMA HUMBOLDTI, Gr d.

GEN. REP. 291.

SPEC. CHAR.—Body rather short and deep, tapering gradually towards the peduncle of the tail. Head contained a little over four times and a half in the total length. Snout thickish and rounded; gape of mouth slightly oblique; posterior extremity of maxillar bone extending to a vertical line drawn within the anterior rim of the orbit. Eye well developed, sub-circular; its diameter entering four times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the extremity of the snout and the fork of the caudal. Origin of ventrals equidistant between the extremity of the snout and the insertion of the caudal. Bluish or greyish black above; yellowish beneath.

225. Humboldt river. J. S. Bowman.

24. TIGOMA EGREGIA, Gr d.

GEN. REP. 291.

SPEC. CHAR.—Body rather elongated, sub-fusiform in profile. Head contained four times in the length, the caudal fin excluded. Snout sub-conical and thickish; gape of the mouth slightly oblique; jaws equal; posterior extremity of the maxillary extending to a vertical line drawn within the anterior rim of the orbit. Eye moderate sized, sub-circular; its diameter entering four times and a half in the length of the side of the head. Anterior margin of dorsal fin nearer the extremity of the snout than the fork of the caudal. Origin of ventrals equidistant between the insertion of the caudal fin and the extremity of the snout. Bluish black above; yellowish orange beneath.

226. Mr. Kreuzfeld.

25. TIGOMA LINEATA, G r d .

GEN. REP. 292.

SPEC. CHAR.—Body elongated, sub-fusiform. Head forming a little less than the fourth of the total length. Snout sub-conical; gape of the mouth somewhat oblique; lower jaw slightly overlapped by the snout. Posterior extremity of maxillary bone extending to a vertical line drawn at the anterior rim of the orbit. Eye moderate, sub-circular; its diameter entering nearly five times in the length of the side of the head. Anterior margin of dorsal fin somewhat nearer the extremity of the snout than the tip of the upper lobe of the caudal. Origin of ventrals nearer the extremity of the snout than the fork of the caudal. Scales small. Bluish brown streaks above; uniform yellowish beneath.

229. Mr. Kreuzfeld.

26. TIGOMA GRACILIS, G r d .

GEN. REP. 293.

SPEC. CHAR.—Body elongated, sub-fusiform in profile. Head contained about four times and a half in the total length. Snout sub-conical, rather abbreviated; gape of mouth somewhat oblique; posterior extremity of the maxillary extending to a vertical line drawn immediately in front of the orbit. Eye moderate, sub-circular; its diameter entering five times in the length of the side of the head. Anterior margin of dorsal fin nearer the extremity of the snout than the tip of the upper lobe of the caudal. Origin of ventrals nearer the fork of the caudal than the extremity of the snout. Scales small. Bluish grey above; yellowish beneath.

230. Mr. Kreuzfeld.

27. SIBOMA ATRARIA, G r d .

GEN. REP. 297.

SPEC. CHAR.—Body somewhat elongated, sub-fusiform in profile. Peduncle of the tail rather stout; head constituting a little less than the fourth of the total length: its profile gently sloping forwards, the snout being sub-conical. Mouth small; posterior extremity of the maxillary extending to a vertical line drawn immediately behind the nostrils. Eye small and sub-circular; its diameter entering five times and a half in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Blackish or brownish black above; greyish white beneath.

236. Utah district, near the Desert. Mr. Kreuzfeld.

28. PTYCHOCHEILUS VORAX, G r d .

GEN. REP. 301.

SPEC. CHAR.—Body of moderate length, rather deep upon its middle, and very much tapering posteriorly. Peduncle of the tail very slender. Head small, contained nearly five times in the total length. Posterior extremity of maxillary bone extending to a vertical line drawn across the anterior rim of the orbit. Eye moderate; its diameter entering about six times and a half in the length of the side of the head. Anterior margin of dorsal fin somewhat nearer the insertion of the caudal than the extremity of the snout. Bluish grey above; whitish beneath.

202. Mr. Kreuzfeld.

29. SALAR VIRGINALIS, G r d .

GEN. REP. 320.—PLATE LXXIII, FIGS. 1—4.

SPEC. CHAR.—Body sub-fusiform in profile, otherwise compressed; head comprised about four times in the total length, the caudal fin excluded; jaws sub-equal; posterior extremity of maxillary extending to a vertical line intersecting the posterior rim of the orbit. Anterior margin of dorsal nearer the extremity of the snout than the insertion of the caudal fin. Greyish brown above, with a purplish reflection and sub-circular black spots; beneath olivaceous, unicolor.

593. Utah Creek. Mr. Kreuzfeld.

30. SALAR IRIDEA, G r d .

GEN. REP. 321.—PLATE LXXIII, FIG. 5 ; AND PLATE LXXIV.

SPEC. CHAR.—Body sub-fusiform in profile, otherwise compressed; head well developed, constituting a little less than the fourth of the total length. Jaws sub-equal; posterior extremity of maxillary extending to a vertical line drawn somewhat beyond the orbit. Anterior margin of dorsal fin equidistant between the extremity of the snout and the insertion of the caudal. Reddish brown above, with numerous and small black spots; yellowish white beneath.

596. Humboldt bay, California. Lt. W. P. Trowbridge.

31. MELETTA COERULEA, G r d .

GEN. REP. 330. PLATE LXXV, FIGS. 5—7.

SPEC. CHAR.—Body slender, elongated, sub-fusiform in profile. Head constituting more than the fifth of the total length. Posterior extremity of maxillar bone extending to a vertical line drawn through the middle of the orbit. Eye large and sub-circular; its diameter entering four times and a half in the length of the side of the head. Anterior margin of dorsal fin nearer the extremity of the snout than the insertion of the caudal. Base of anal fin entering about ten times in the total length. Insertion of ventrals opposite the posterior third of the base of the dorsal fin. Bluish black above; yellowish or whitish beneath, with metallic reflects. Fins unicolor.

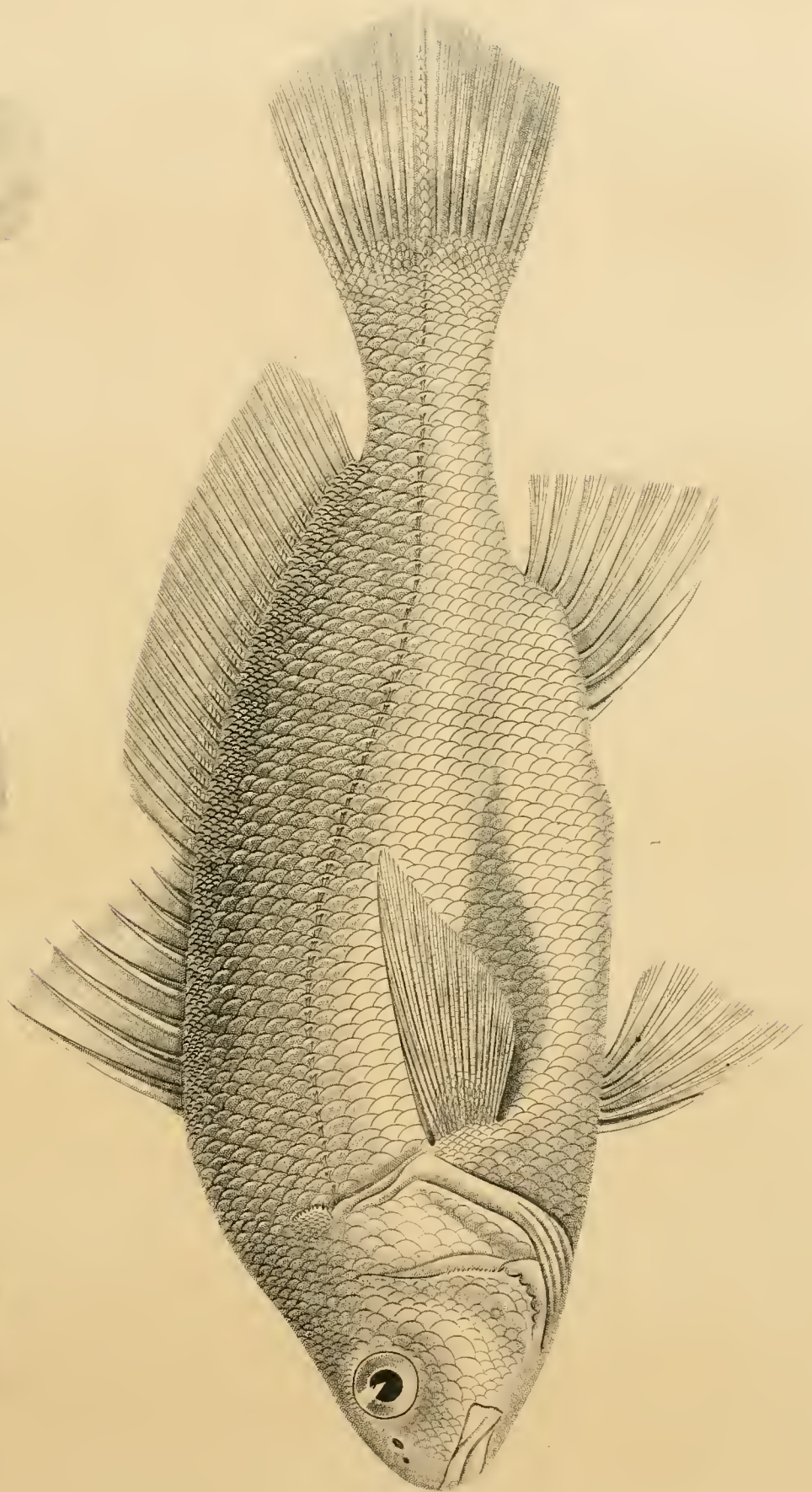
958. Humboldt bay, California. Lt. W. P. Trowbridge.

32. HYODON TERGISUS, L e s u .—Moon-eye.

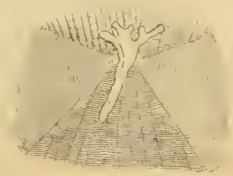
GEN. REP. 330. PLATE LXXV, FIGS. 1—4.

SPEC. CHAR.—Head contained five times and a half in the total length; snout rounded, sub-conical. Posterior extremity of maxillar bone extending to a vertical line drawn posteriorly to the pupil. Eye very large, sub-circular; its diameter entering about four times in the length of the side of the head. Anterior margin of dorsal fin somewhat nearer the tip of the caudal than the occiput. Base of anal fin entering about four times in the total length. Insertion of ventrals nearer the extremity of the snout than the terminus of the anal.

962. St. Louis, Missouri. Dr. Geo. Engelmann.



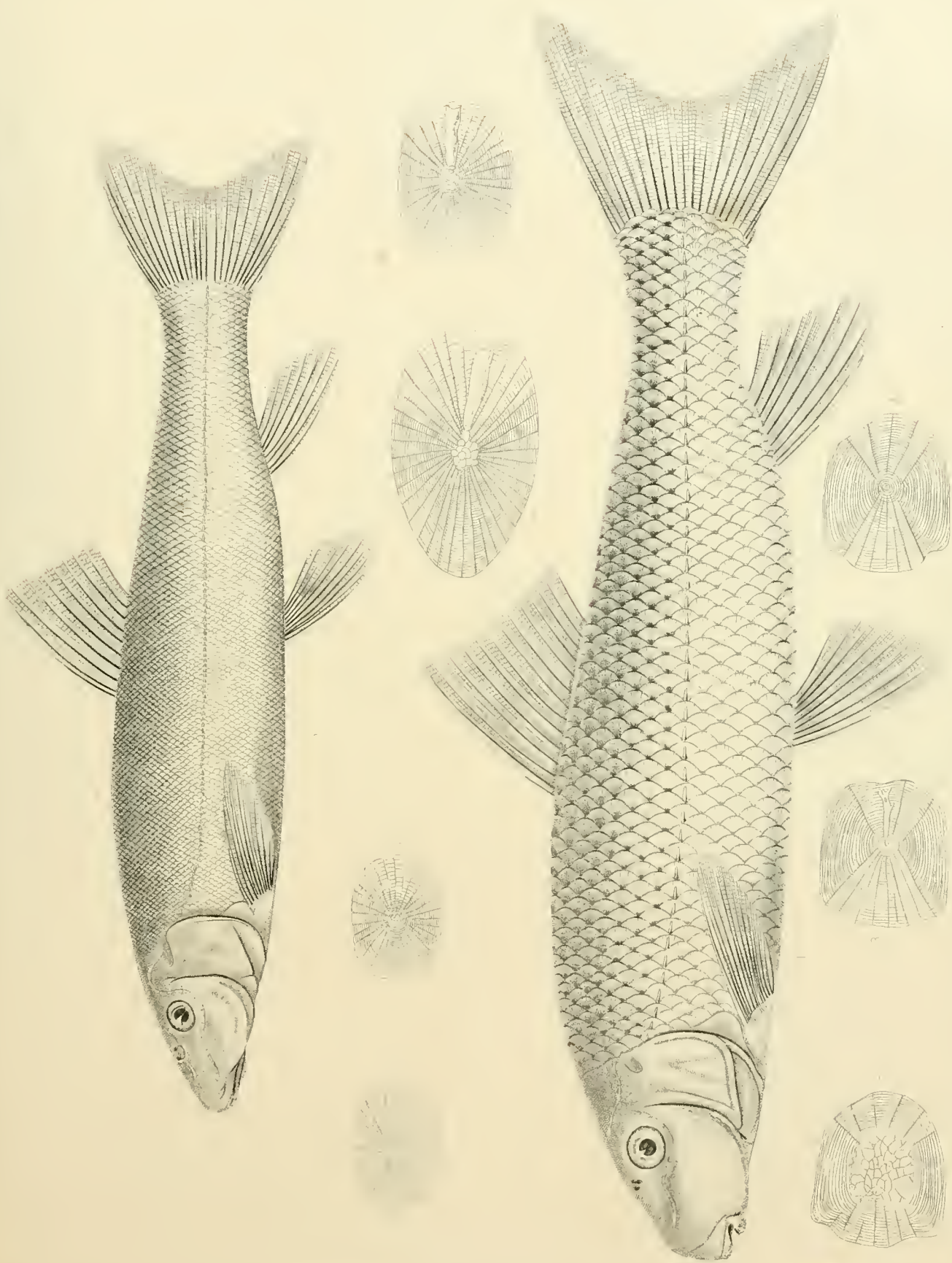
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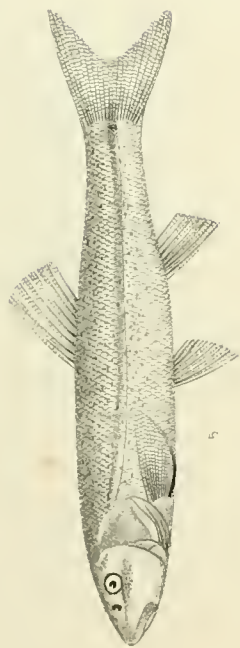
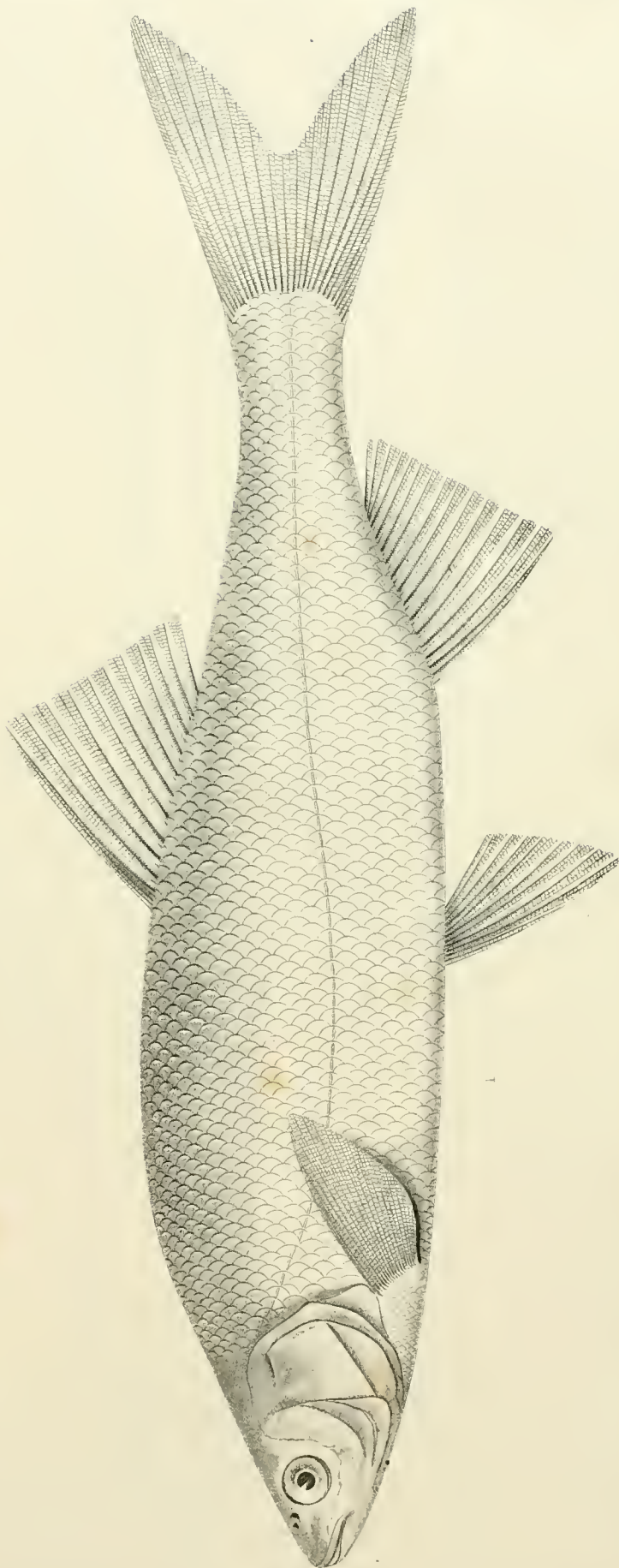


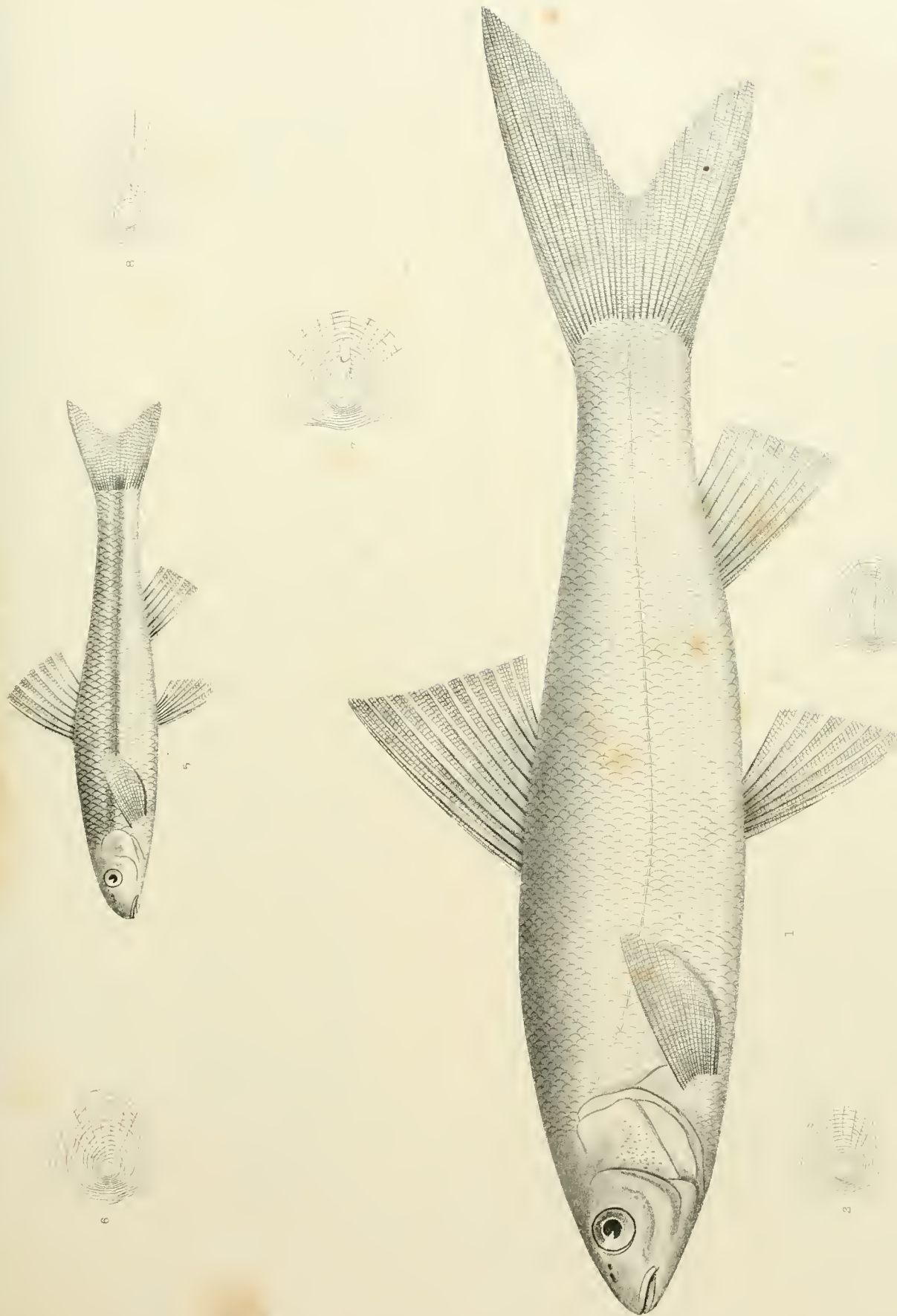
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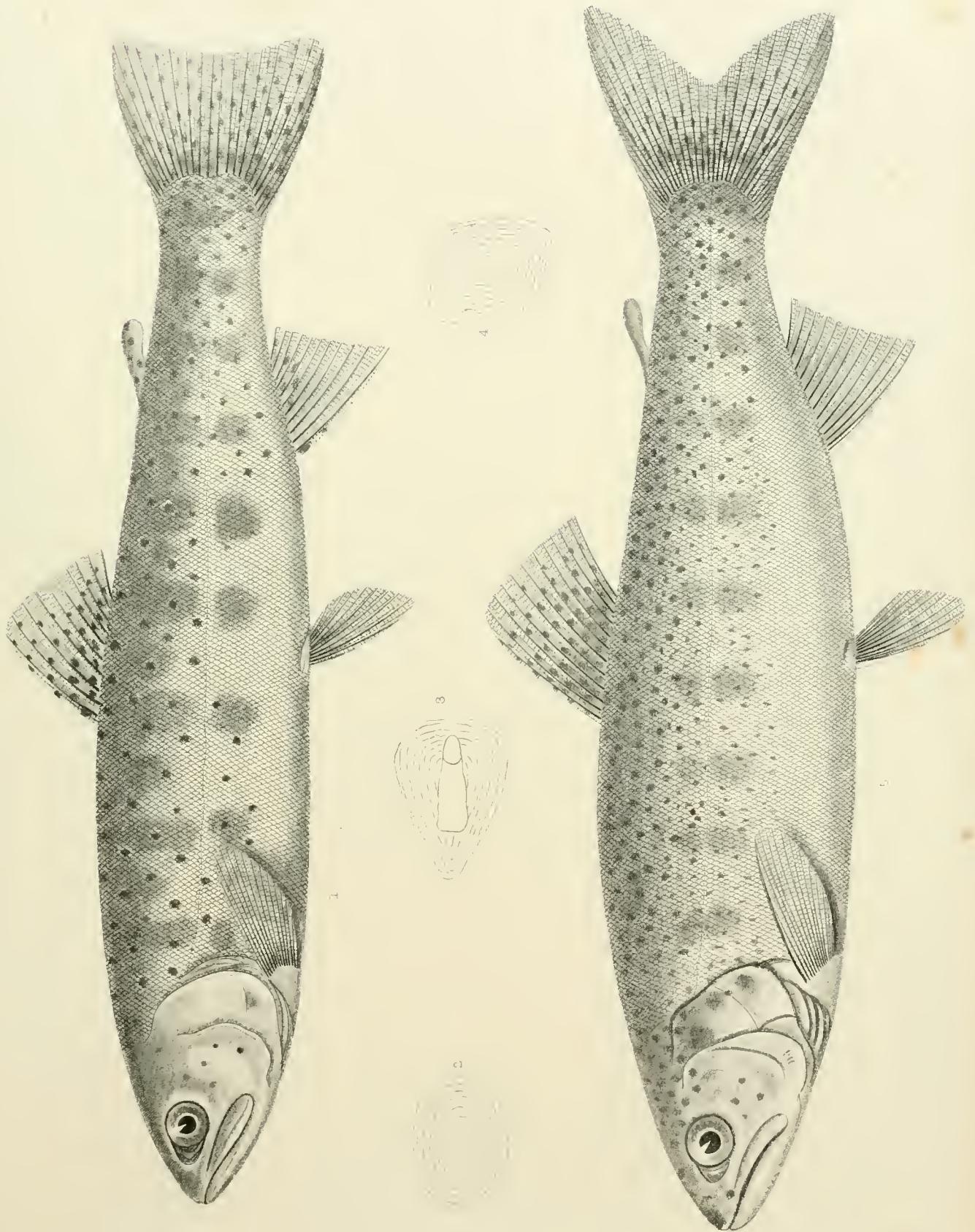


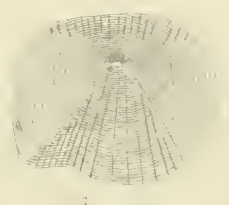
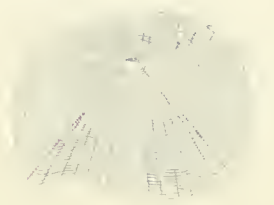
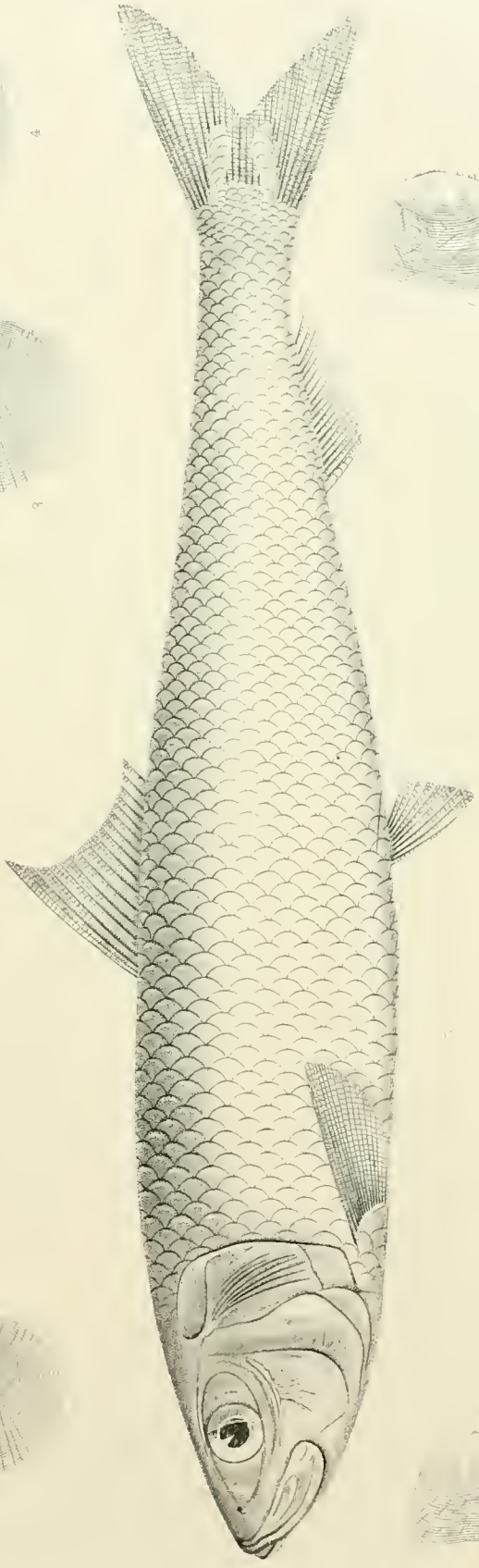
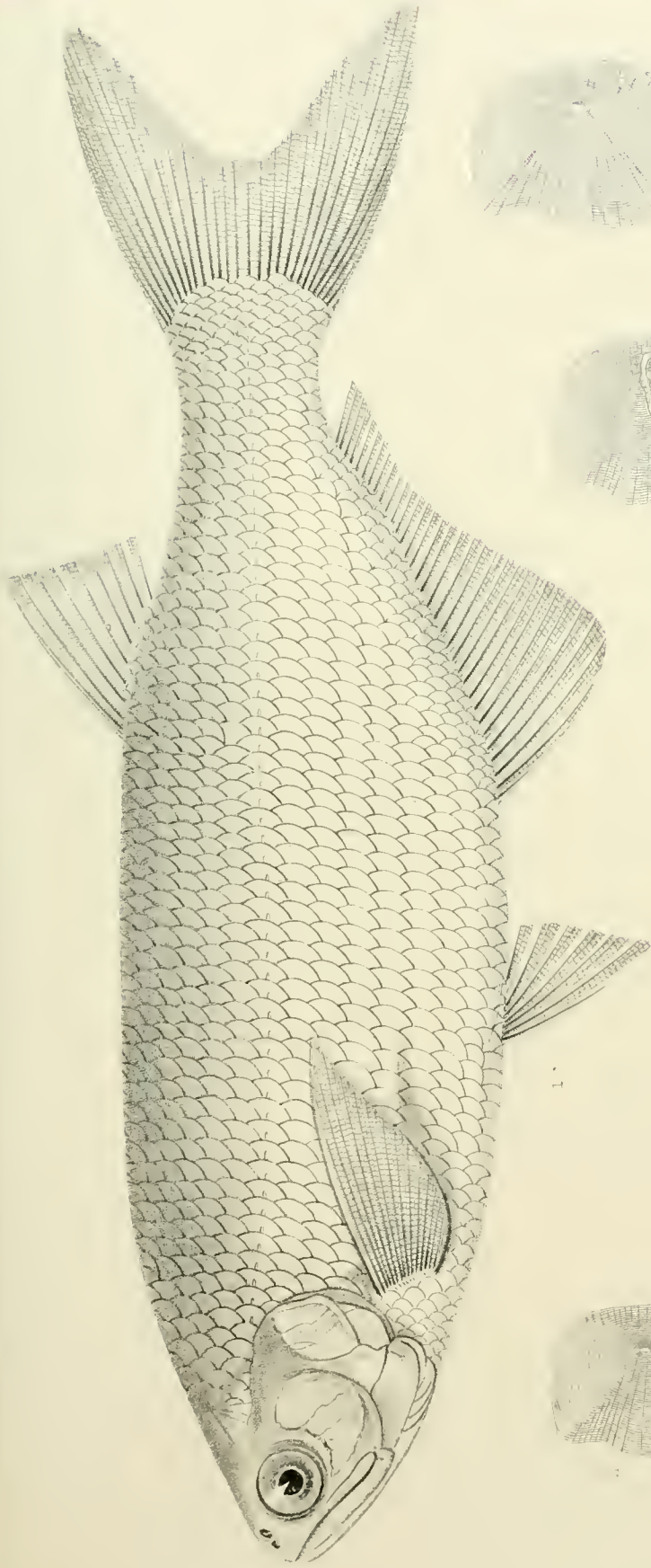
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EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.
WAR DEPARTMENT.

R E P O R T

OF

EXPLORATIONS FOR A RAILWAY ROUTE

(NEAR THE THIRTY-FIFTH PARALLEL OF NORTH LATITUDE,)

FROM

THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.

BY

LIEUTENANT A. W. WHIPPLE,

CORPS OF TOPOGRAPHICAL ENGINEERS;

ASSISTED BY

LIEUTENANT J. C. IVES,

CORPS OF TOPOGRAPHICAL ENGINEERS.

1853-'54.

PART VI.

EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.
WAR DEPARTMENT.

ROUTE NEAR THE THIRTY-FIFTH PARALLEL, EXPLORED BY LIEUTENANT A. W. WHIPPLE, TOPOGRAPHICAL
ENGINEERS, IN 1853 AND 1854.

ZOOLOGICAL REPORT.

WASHINGTON, D. C.
1859.

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No. 2.

REPORT ON MAMMALS COLLECTED ON THE SURVEY.

BY C. B. R. KENNERLY, M. D.

CANIS LATRANS, Say.—Prairie Wolf; Coyote.

Canis latrans, SAY, in Long's Exped. R. Mts. I, 1823, 168.

AUD. & BACH N. A. Quad. II, 1851, 150; pl. lxxi.

BAIRD, Gen. Rep. Mammals, 1857, 113.

? *Canis ochropus*, ESCHSCHOLTZ, Zool. Atlas, iii, 1829, 1; pl. xi. (California.)

Canis frustror, WOODHOUSE, Pr. A. N. Sc. Ph. V, Oct. 1850, 147.—*Ib.* V. Feb. 1851, 157.—*Ib.* Sitgreaves' Exped. Zuñi & Colorado R. 1853, 46.

Specimens of this wolf were collected in the San Francisco mountains. Their fur was softer, and the skull broader than those of the Missouri.

MEPHITIS —Skunk.

A skunk (No. 158) was obtained at camp 104, Pueblo creek, New Mexico, intermediate in size between the common *Mephitis americana* and *M. bicolor*. Its general color was black, with a white line on each side, white forehead and white tip to the tail. It was lost with the other alcoholic specimens on the Isthmus.

SCIURUS ABERTI, Woodhouse.—Tuft Eared Squirrel.

Sciurus dorsalis, WOODHOUSE, Pr. A. N. Sc. Phil. VI, June, 1852, 110. (San Francisco Mountains, Cal.)

Sciurus aberti, WOODHOUSE, Pr. A. N. Sc. Phil. VI, Dec. 1852, 220.—*Ib.* Sitgreaves' Zuñi Exped. 1853, 53;

Mammals, pl. vi

AUD. and BACH N. Am. Quad. III, 1854, 262; pl. cliii, fig. 1.

BAIRD, Gen. Rep. Mammals, 1857, 267.

SE. CH.—Above finely grizzled bluish gray and black; a broad dorsal stripe of pure chestnut from shoulders to tail; under parts and feet white; a distinct dark line on each side of the belly. Tail very full and bushy, as long as the body; pure white beneath, above mixed black and white. Ears with long tufts springing from the superior border of the ear, as in *Sciurus vulgaris*. Head and body about 11 inches long.

This beautiful squirrel was very common in the San Francisco range of mountains, living among the tall pines that here abound, and finding its chief subsistence in the *piñones*, the fruit of *Pinus edulis*. We did not observe it west of Mt. Sitgreaves.

Three specimens were collected, (156;) all lost on the Isthmus.

SPERMOPHILUS BEECHEYI, Rich.—California Ground Squirrel.

Arctomys (Spermophilus) beecheyi, RICHARDSON, Fauna Boreali-Americana, I, 1829, 170, pl. xii, B.

Spermophilus beecheyi, F. CUVIER, Suppl. Buffon, I, Mamm. 1831, 331.

BAIRD, Pr. A. N. Sc. Phil. VII, 1855, 334.—*Ib.* Gen. Rep. Mammals, 1857, 307.

♂ CH.—Size of the cat squirrel, *S. cinereus*. Ears large, prominent. Tail more than two-thirds as long as the body. Above, mixed black, yellowish brown, and brown in indistinct mottlings; beneath, pale yellowish brown. Sides of head and neck, hoary yellowish, more or less lined with black, a more distinct stripe of the same, from behind the ears on each side, extending above the shoulders to the middle of the body. Ears black on their inner face. Dorsal space between the stripes scarcely darker than the rest of the back. Length, 9 to 11 inches; tail, with hairs, 7 to 9. Hind feet, 2 to 2.30 inches.

These animals are very abundant near the Comomongo Rancho, and indeed throughout the valley of the San Gabriel river. They were always found living in communities, and in general habits resembled the prairie dog, *Spermophilus ludovicianus*. Their size is about that of the common gray squirrel, or a little larger. Their color is usually a rusty gray; I have, however, seen some almost entirely black. The burrowing owl, *Athene hypugaea*, which is the constant companion of the prairie dog, is also found among these animals in considerable numbers. (No. 157. Lost on the Isthmus.)

? SPERMOPHILUS HARRISII, Aud. & Bach.—Harris' Squirrel.

Spermophilus harrisi, AUD. & BACH. N. Am. Quad. III, 1854, 267; pl. cliv, fig. 1.

BAIRD, Gen. Rep. Mammals, 1857, 313.

Size rather less than that of *Tamias striatus*. Tail vertebrae about half the length of the body. Ears short, pointed. Soles hairy. Above, finely grizzled grayish, or whitish brown and black; under parts, and a stripe on each side, (without any black or dusky border,) whitish. Tail with one black and one light line, within the marginal whitish, black in the centre; uniform whitish beneath. Length, 5 inches; tail, with hairs, about 3. Hind foot, 1.45.

This beautiful and rare spermophile is found in considerable numbers at Cold Spring, near the summit of the Sierra Madre. In this vicinity there were huge piles of scoriaceous rock in which it lived. It was not very shy, but a specimen was procured with difficulty, owing to the fact that it was almost impossible to kill the animal before it could escape into the rocks, and avoid blowing it to pieces. Its food, in this locality, consisted of *piñones* and acorns. We again observed this animal near Camp 139, between the Colorado and Mohave rivers. Here we found it on the hill-sides in the most rocky and inaccessible spots, and exceedingly shy. (No. 6. Lost on the Isthmus.)

SPERMOPHILUS, ?

This animal was found among the rocks on the hill-sides in the immediate vicinity of Bill Williams' Fork, Camp 117. It was very active, and ran with great rapidity. It was somewhat larger than the *S. tridecem lineatus*; its color a uniform rusty gray, its belly somewhat lighter. Its hair was rather coarse; its tail short and bushy. Two specimens were obtained, (119,) but lost on the Isthmus, which prevents its identification. It seemed to resemble somewhat the *S. townsendii*.

CYNOMYS LUDOVICIANUS, Rich.—Missouri Prairie Dog.

Arctomys ludovicianus, ORD, Guthrie's Geog. 2d Am. ed. II, 1815, 292, 302.

Spermophilus ludovicianus, "LESSON, Manual, 214, 658."

F. CAVIER, Suppl. Buffon, I, Mam. 1831, 316.

AUD. & BACH. N. Am. Quad. II, 1851, 319; pl. xcix.

Cynomys ludovicianus, BAIRD, Gen. Rep. Mammals, 1857, 331.

Size of fox squirrel, *S. vulpinus*, but heavier; ears very short, not projecting above fur. Tail short, with the hairs, about one-third the length of body. Claws long, very stout; the thumb of the fore feet armed with a long claw instead of a flat nail. Soles with a patch of hair. Color above reddish brown or cinnamon, with the tips of the hairs lighter and with scattered black hairs interspersed; beneath brownish white or yellow. In winter of a more grayish cast above. Hairs on the upper part lead

color at base, then pale cinnamon white to cinnamon. Tail like the back, its tip black, with the hairs light colored at base. Length about 12 inches; tail, with hairs, 4; hind foot about 2.25 inches.

This well known marmot we found very abundant throughout Texas, and on the Jornada del Muerto, of New Mexico. We did not observe it north of this district, nor did we find it west of the Rio Grande at all. However, it was found by Mr. Clark, near the copper mines of Santa Rita, and in other places west of the Rio Grande; but the nature of the country over which we passed was of a nature unsuited to their habits, being too barren, and generally not affording vegetation of the kind upon which they feed.

GEOMYS CLARKII, Baird.—Pecos Gopher.

Geomys clarkii, BAIRD, PR. A. N. Sc. Ph. VII, April, 1855, 332.—IB. Gen. Rep. Mammals, 1857, 383.

SP. CH.—Upper incisors with a single deep groove bisecting the surface, the portions on either side equal. Fore feet nearly equal to or rather shorter than the hinder ones. Second claw of the hand reaching as far as the fourth. Pouches small. Fur soft and full.

Color above, uniform yellowish brown, the hairs with dusky tips. Beneath, paler and grayer. Cheek pouches much like the surrounding region.

A fine specimen of this species was obtained on the Pecos river, Texas.

THOMOMYS BULBIVORUS, Baird.—California Gopher.

PLATE XI.

? *Diplostoma bulbicorum*, RICH. F. B. Am. I, 1829, 266; pl. xviii, B, (marked *Diplostoma douglasi*).—IB. Zool. of Blossom, 1839, 13.

Thomomys bottae, LESSON, NOUV. MAM. R. AN. 1812, 119.

BAIRD, PR. A. N. Sc. Phila. VII, April, 1855, 335.

Thomomys bulbivorus, BAIRD, Gen. Rep. Mammals, 1857, 389.

SP. CH.—Cheek pouches large, completely furred inside, white to their very margin, which is dark brown, forming a very strong contrast. Tail from one-third to less than one-half the length of body; slender at base. Upper incisors quite convex transversely; groove obsolete. Hands small; claws very slender and delicate, nearly straight; middle claw $4\frac{1}{2}$ lines, its under surface occupying about two-sixths the whole hand, its finger barely shorter than this; claw of thumb extending over two-fifths of whole hand.

Color.—Reddish chestnut brown above and on sides, finely lined everywhere by dusky tips to the hairs, without any uniform dark wash on the back. Beneath paler. Tail grayish white, except a short line of dusky along the base above. Chin dusky; its extremity white.

This species was observed in various parts of California, especially near San Francisco.

THOMOMYS LATICEPS, Baird.—Broad-headed Gopher.

PLATE XII, FIG. 2.

Thomomys laticeps, BAIRD, PR. A. N. Sc. Phil. VII, April, 1855, 335.

IB. Gen. Rep. Mammals, 1857, 392.

SP. CH.—Cheek pouches moderate, well haired. Tail nearly one-half the body, thick at base. Skull very broad and muzzle short; the upper incisors convex, the groove quite distinct. Feet very large and broad. Claws of fore foot or hand small, slender, 4 lines long above; below, about two-sevenths the length of the whole hand, its digit about two-eighths. Claw of thumb extending over nearly three-sixths the hand.

Color.—Above, yellow reddish brown; the dorsal region with the hairs largely and sharply tipped with blackish; sides nearly uniform; beneath, tinged with reddish. Pouches dull white, the dusky of the surrounding region dipping into them. Tail grayish white, dusky above.

One specimen was obtained by Lieutenant Trowbridge at Humboldt Bay.

THOMOMYS FULVUS.

PLATE XII, FIG. 2.

Geomys fulvus, WOODHOUSE, Pr. A. N. Sc. Phil. VI, Dec., 1852, 201.—In. Sitgreaves' Exp. Zuñi and Colorado, 1853
51; pl. v, Mammals.

Pseudostoma (Geomys) fulvus, AUD. & BACH. N. Am. Quad. III, 1851, 300.

Thomomys fulvus, BAIRD, Gen. Rep. Mammals, 1857, 402.

SP. CH.—Cheek pouches moderately large, well clothed with hair. Tail nearly half as long as the body, thick at base. Extremities large. Claws large, not much curved. Third claw of hand $4\frac{1}{2}$ lines long above; beneath, extending over two-sixths the whole hand; its digits about two-ninths the same length. Claw of the third reaching to two-fifths of the hand.

COLOR.—Above and on the sides, bright uniform reddish brown; beneath, yellowish white, with a tinge of chestnut on the belly. Pouches white at the bottom, chestnut around and in the margins, chin dusky. Tail white; dusky above at the base.

A specimen, (No. 155,) was collected at camp 99, Picacho mountains, New Mexico, and others were seen on Bill Williams' Fork, San Francisco mountains, &c.

? DIPODOMYS ORDII, WOODHOUSE.—Kangaroo Rat.

BAIRD, Gen. Rep. Mammals, 1857, 410.

In removing the cloth which was used in our tent as a carpet, at Camp 111, this animal was found under it. No hole was observed in the ground within the tent, whence it could have come. When pursued it leaped wildly about, making at each bound an astonishing distance. The specimen was lost on the Isthmus.

? PEROGNATHUS PENECELLATUS, WOODHOUSE.

BAIRD, Gen. Rep. Mammals, 1857, 418.

A specimen, probably of this species, was collected at Camp 125, on Bill Williams' Fork. It was lost on the Isthmus.

HESPEROMYS TEXANUS, WOODHOUSE.—Texas Mouse.

PLATE VIII, FIG. 1.

Hesperomys texana, WOODHOUSE, Pr. A. N. Sc. Phila. VI, February 1853, 212.—In. Sitgreaves' Rep. Exp. Zuñi, &c.
1853, 48; pl. ii, Mammals

Hesperomys texanus, BAIRD, Gen. Rep. Mammals, 1857, 464.

Arvicola (Hesperomys) texana, AUD. & BACH. N. Am. Quad. III, 1851, 319.

SP. CH.—Size and proportions about as in *H. leucopus*. Ears small; tail rather shorter than head and body. Color above, reddish brown; brighter than in *H. leucopus*, and more like *H. auricolus*, but darker. No conspicuous wash of dusky on the back. Feet, belly, and under surface of tail pure white. Outside of fore leg like the back?

A specimen of this species was obtained on the Pecos river, Texas. Many other long-tailed mice, of several species, were collected at different parts of our route, but as all were lost on the Isthmus, it is impossible to identify them. One of these (No. 107, *a*, collected at Camp 96,) resembled the common white footed mouse, but was larger, the ears also larger in proportion. Its abdomen was white, the same color extending slightly on each side; the feet were perfectly white; the tail very long and hairy. It lived in the hollows of the cedar trees, like the *Neotoma*, and also built up around the root of the tree a pile of small dry twigs. Sometimes as many as three were found living together in the same tree.

From the characters of size, long tail, and general habits, it is probable that this is the *Hesperomys californicus*, BAIRD, Gen. Rep. Mammals, 478, or a closely allied species.

NEOTOMA FLORIDANA, S a y & O r d .—Wood Rat.

"*Mus floridana*, ORD, Bull. Soc. Philom. 1818."

Neotoma floridana, AUD. & BACH. N. Am. Quad. I, 1849, 32; pl. iv.

BAIRD, Gen. Rep. Mammals, 1857, 487.

SP. CH.—Tail with short stiff hairs, not concealing the scaly annuli; about three-fourths the length of the head and body. Ears very large. Feet large.

Color.—Above, mixed lead color, dark brown, and yellowish brown; lighter on the sides. Under parts and feet, white. Tail dusky above, white beneath. Skull elongated and narrow.

A specimen, supposed to be of this species, was collected by Mr. Möllhausen in the Antelope Hills, on the Arkansas river.

? NEOTOMA MEXICANA, B a i r d .—Bush Rat.

BAIRD, Gen. Rep. Mammals, 1857, 490.

Many specimens of *Neotoma* were collected west of the Rocky mountains, where they appear to abound; all, however, were lost on the Isthmus. About Camp 96 we found them in a country covered by a growth of the rough-barked cedar, (*Juniperus pachyderma*.) They seem to select a hollow tree with a hole near the root; then around it they pile vast heaps of dry twigs and fragments of the several species of cactaceæ (*Opuntia*) which grow there. The latter is probably a protection against the depredations of wolves. Numerous lodges of this kind were found throughout the forest, into one of which we dug until we reached the hole at the root of the tree, when, applying a match, we soon compelled the animal to leave it, which it did by finding its way out several feet above, and fell to the ground apparently dead. Its food seemed to consist mainly of the fruit of the cactus.

Another specimen (115 *b*. White Cliff creek, N. M.) was much the largest we saw. We found, around a pile of rotten drift wood near the creek, tracks and other evidences of the presence of some animal, and applying a lighted match to the bushes awaited the result; when nearly the entire pile was consumed, the rat emerged, having four young ones adhering to it. The little ones were very young, and after the mother was killed they were placed on an open spot on the sand, where they crawled awkwardly about for a while, uttering all the time a plaintive whining cry, not unlike that of a very young kitten. They were caught early in February.

SIGMODON BERLANDIERI?

BAIRD, Gen. Rep. Mammals, 1857, 504.

Among our lost specimens was one probably of this species, certainly, I think, of this genus, obtained on the Little Colorado river, (No. 105.) We found them very abundant in many places in the valley of this river. They lived in the sand in very tortuous holes, and extending for many yards, though rarely more than fifteen inches below the surface. The entrance to their abode was generally in a pile of earth heaped around the base of a mezquite bush, (*Algarobia*,) upon the roots of which it seemed to feed. So far as we noticed, they were entirely nocturnal in their habits. On several occasions we attempted to dig them out with spades, but were always forced, after hours of labor, to relinquish the task without having accomplished our purpose. The specimen procured had, during the night, gotten into an empty bucket, where it was found alive in the morning. The body measured about three and a half inches, and the tail the same; the hair was coarser and darker than in the neotomas.

ARVICOLA.

Three specimens of arvicola were caught at Camp 94, New Year Spring. Here was a luxuriant growth of gramma grass (*Boutelorea*) both in the valley and on the hill sides. On the latter places were many loose fragments of volcanic rocks, of various sizes, scattered about, but not in such quantities as to interfere materially with the growth of the grass. Here they built their nests under the stones, and constructed them of dry grass in a manner similar to those of the eastern meadow mouse, (*Arvicola riparius*), and like this animal had paths under the grass diverging in every direction from the hole. In general appearance they resembled the above mentioned species, but were decidedly smaller. The specimens were all lost on the Isthmus.

ERETHIZON EPIXANTHUS, Brandt.—Yellow-haired Porcupine.

Erethizon epixanthus, BRANDT, Mém. Acad. St. Petersburg, 1835, 389, 416; tab. i, Animal; tab. ix, fig. 1—4, skull.—IB. Mamm. exot. 55, (same as preceding.)

WATERHOUSE, N. H. Mamm. II, 1848, 442.

BAIRD, Gen. Rep. Mammals, 1857, 569.

SE. CH.—General color dark brown, nearly black; the long hairs of the body tipped with greenish yellow. Nasal bones nearly one-half or two-fifths the length of upper surface of the skull.

We found this singular animal only on the Little Colorado river. Our marches along that stream were made during the month of December. At that season we found it frequently feeding upon the tender branches of the cottonwood trees. We observed it in no other position. When approached it drew itself into a bunch and remained quietly and without moving as long as we remained near. The hollows in the large cottonwood trees along the stream afforded them good breeding places.

LEPUS CALLOTIS, Wagler.—Jackass Rabbit; Texas Hare.

Lepus callotis, WAGLER, Nat. Syst. Amph. 1830, 25.—IB. Isis, 1831, 511.

AUD. & BACH. N. Am. Quad. II, 1851, 95; pl. lxiii.

BAIRD, Gen. Rep. Mammals, 1857, 590.

SE. CH.—Rather smaller than the European hare. Ears very long and broad; nearly one-third longer than the head and one-fifth longer than the hind foot. Hair on the buttocks short and close. Color above, yellowish gray, blotched and lined with black. Upper surface of tail and central line of rump, black; tail beneath, grayish white. Sides of rump, clear ash gray. Legs, ashy. Nape, black, (sometimes whitish?) Beneath, dull whitish, with a yellowish brown color on the throat. A light ring round the eye. Tip of the posterior surface of the ear black.

A specimen of this species was obtained at Fort Clark, New Mexico. Its ears are longer than those of any other *L. callotis* I have seen, and it may belong to *L. texianus*, although the condition of the skin is not sufficiently perfect to decide the question.

LEPUS ARTEMISIA, Bach.—Sage Rabbit.

BAIRD, Gen. Rep. Mammals, 1857, 602.

Several specimens of this species were obtained on the plains of Texas; one (No. 6) in the Sierra Madre, New Mexico, and another (108) at Camp 99, Picacho mountains, New Mexico.

LEPUS AUDUBONII, Baird.—Audubon's Hare.

PLATE VIII.

BAIRD, Gen. Rep. Mammals, 1857, 608.

SP. CH.—Size a little less than that of *L. sylvaticus*; ears longer than the head; hind feet rather short, but longer than the ears, fully furred beneath. Tail rather long.

Above, mixed yellowish brown and black, paler on the sides and throat; beneath, pure white. Thighs and rump grayish. Back of neck rusty; fore legs somewhat similar. Hairs lead color at the base, on the middle of the back (over the loins) passing directly through dark brown to black, then yellowish brown; on the sides, rump, and fore part of back, the passage into the first brown or black ring is through grayish, yellowish, or reddish brown.

This species we found somewhat abundant in the markets of San Francisco.

LEPUS TROWBRIDGII, Baird.

PLATE XIV.

Lepus trowbridgii, BAIRD, Pr. A. N. Sc. Phila. VII, April, 1855, 333.—IB. Gen. Rep. Mammals, 1857, 610.

SP. CH.—Size small, less than that of *L. auduboni*. Head small. Ears about equal to it in length. Tail very short, almost rudimentary; hind feet very short, well furred, considerably shorter than the head. Color above, yellowish brown and dark brown; beneath, plumbeous gray. Sides not conspicuously different from the back, but paler. Back of neck pale rusty. Ears grayish and black on the external band; ashy gray elsewhere, with little indication of darker margin or tip.

This species was found associated with the preceding in the San Francisco market. Both appear to be quite common near the coast, as far south as San Diego.

ANTILOCAPRA AMERICANA, Ord.—Prong Horn Antelope; Cabree.

PLATE XVI.

Antelope americana, ORD, Guthrie's Geog. (2d Amer. edition) II, 1815, 292, 308

Antilocopra americana, ORD, Bull. Soc. Philom. 1818, 146.—IB. Journal de Physique, LXXXVII, 1818, 149.

AUD. & BACH. N. Am. Quad. II, 1851, 198; pl. lxxvii.

BAIRD, Gen. Rep. Mammals, 1857, 666.

SP. CH.—Color above yellowish brown, or pale dun color; a narrow transverse band between the eyes, the top and sides of the muzzle, and a patch beneath the ear, (wanting in the female,) liver brown; edges of upper lip, chin and sides of face, spot behind the ear, a narrow crescent on the upper part of the throat, a triangular patch below this, the entire under parts and a square patch on the rump, white. Horns, hoofs, and naked parts of the nose, black.

Horns rudimentary or wanting in the female.

Many individuals of this species were observed in Texas and New Mexico. One specimen was collected in the San Francisco mountains, New Mexico.

OVIS MONTANA, Cuv.—Mountain Sheep; Bighorn.

Ovis montana, CUVIER, R. An. I, 1817, 267.

AUD. & BACH. N. Am. Quad. II, 1851, 163; pl. lxxiii.

BAIRD, Rep. U. S. Pat. Off. Agricultural for 1851, (1852,) 123, fig. plate.—IB. Stansbury's Exped. Great Salt Lake, 1852, 312.

Tayè, a species of sheep, BARTON's Med. and Physical Journal, II, 1806, 106. (Refers to *Bighorn*, I, 1805, 75.)

SP. CH.—Much larger than the domestic sheep. Horns, in the male very large, curving round, but not completing a full circle, and with but little of a spiral twist, compared with other species. The tips of the horns not more than twenty inches apart. General color grayish brown, paler about the head; a light patch under the lower jaw. Legs like the body, with a

narrow line of white on their posterior edges. Buttocks, for some inches anterior to the tail, and belly white. Tail like the back.

Female with smaller horns, more like those of the goat.

Specimens of this species were observed at various points on our route. A skull and several horns were collected in the San Francisco mountains, New Mexico.

OVIS ARIES, L.—Common Sheep.

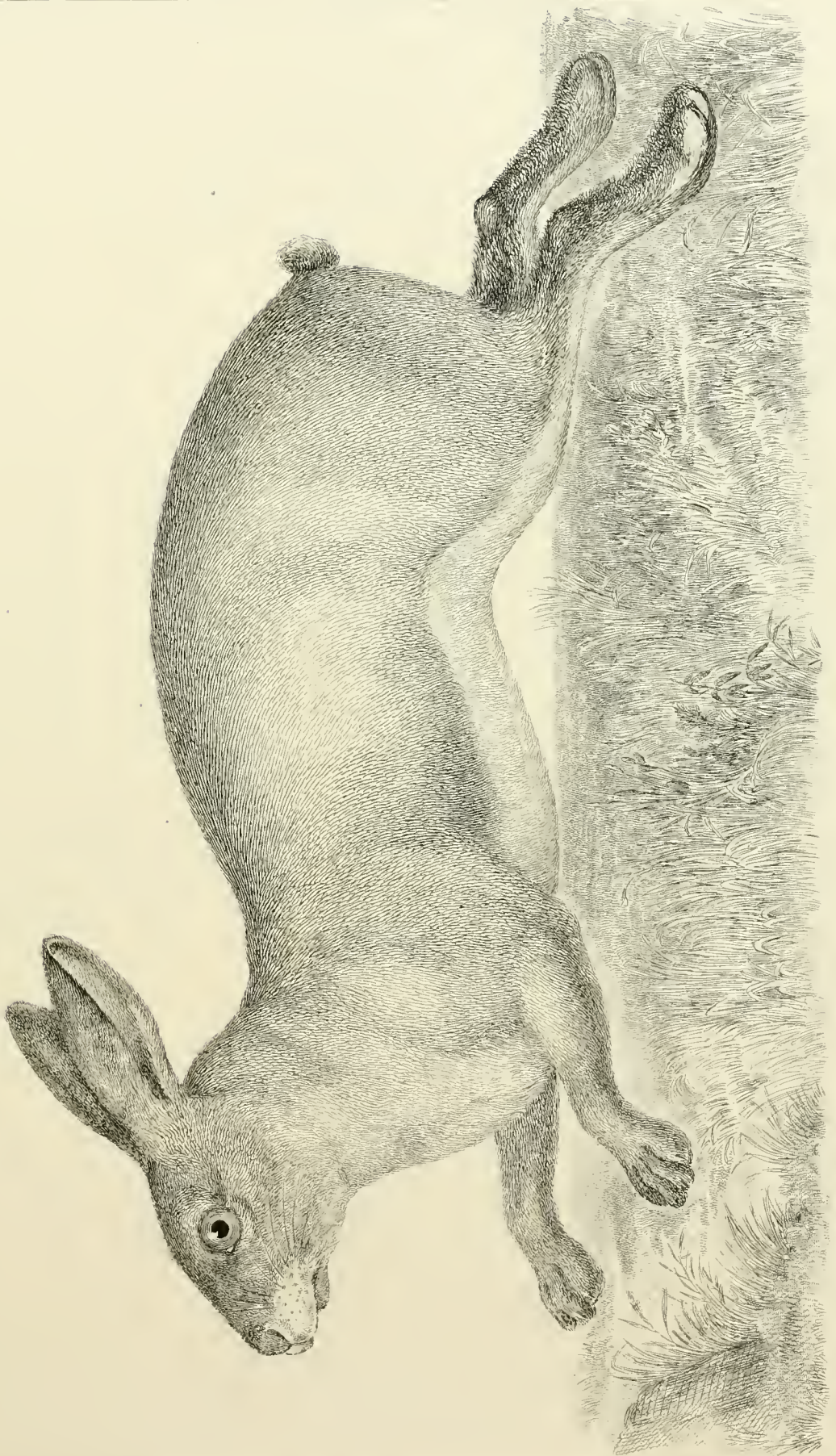
A specimen, No. 164, was procured on account of its peculiarity in having four horns that are well developed, being about eight inches long; one on each side erect and one turned down. It is said that many years ago the proprietor of an extensive hacienda on the Rio Grande owned a large number of sheep possessing this peculiarity, and that the number of horns to each individual was never less than three, and often as many as seven. His flock was driven off by the Navajoe Indians, who still graze large numbers of these animals in the mountains of New Mexico, among them many anomalies of this kind.













No 3.

REPORT ON BIRDS COLLECTED ON THE ROUTE.

BY C. B. R. KENNERLY, M. D.

1. *FALCO POLYAGRUS*, Cassin, (p. 12.)¹—Great-footed Hawk.

8503. Camp on Little Colorado, 1853-4. (38.) Kennerly & Möllhausen.

This beautiful hawk we observed while encamped on the Little Colorado river. When seen he was busily engaged in seeking his prey among the bushes that grew along the river. With difficulty the specimen was procured, and very fortunately also, as we did not see it again.

2. *TINNUNCULUS SPARVERIUS*, Vieill, (p. 14.)—Sparrow Hawk.

8507. Camp 105, New Mexico, January 23, 1854. Kennerly & Möllhausen.

This beautiful little hawk we saw first in the vicinity of the Aztec mountains. It confined itself to the open valleys or among the scattering cedars on the hill sides. We found it somewhat difficult to procure a specimen on account of its shyness, although we saw it frequently from thence to the Pacific.

3. *BUTEO MONTANUS*, Nuttall, (p. 26.)—Western Red-tail.

8533. Camp 149, New Mexico, March 16, 1854. (185.)—8549. Camp 114, New Mexico, February 6, 1854. (71.) Kennerly & Möllhausen.

This species of hawk was by far the most abundant that we observed from the Rocky mountains to the Pacific ocean. Wherever we found smaller birds we were sure to find this, their untiring and watchful enemy. One specimen that I obtained had the proventriculus filled with mice, small birds, and lizards.

4. *BUTEO ELEGANS*, Cassin, (p. 28.)—Western Red-shoulder.

8524. Camp on Little Colorado, New Mexico, November 17, 1853. (32.) Kennerly and Möllhausen.

5. *ARCHIBUTEO LAGOPUS*, Gray, (p. 32.)—Rough-legged Hawk.

8546. Near Zuñi, New Mexico, November 9, 1853. Kennerly & Möllhausen.

We found this large and beautiful hawk quite abundant in the vicinity of the Pueblo of Zuñi. Here it confined itself to the neighborhood of the stream, watching eagerly for ducks, which seemed to be its favorite prey. We did not observe it often after leaving this village.

6. *CIRCUS HUDSONIUS*, Vieill, (p. 38.)—Marsh Hawk.

6860. Fort Conrad, New Mexico, October, 1853. Dr. Kennerly.

We found this bird throughout Texas and New Mexico, wherever we found a marsh. When

¹ The page references are to volume IX of this series.

seen they were always hunting the marshes closely for their prey; flying low around and around, from point to point, and occasionally suddenly turning as if to examine more closely some place just passed. When encamped near such places we seldom failed to see three or four, particularly towards the close of the day, engaged in searching food.

7. CRAXIREX UNICINCTUS, Cassin, (p. 46.)—Harris' Buzzard.

9134. New Mexico, February 27, 1854. (179.) Kennerly & Möllhausen.

The only specimen of this bird that we saw we procured from the Mohave Indians, on the Great Colorado river, who had captured it alive by some means.

8. BUBO VIRGINIANUS, Bon. (p. 49.)—Great Horned Owl.

Little Colorado, New Mexico.—9154. Camp No. 98, New Mexico. (46.)—9158. Sixth Camp, Little Colorado, December 15, 1853. (37.) Kennerly & Möllhausen.

When encamped in the dark forest, or near a cañon with rough and rugged sides, the stillness of the night was generally broken by the dismal cry of this owl, "hooting hoarse courtship to his ill-omened paramour." Occasionally allured by our camp fires he would sweep around our heads for a while, then disappear again in the darkness to render his dismal notes or hunt his prey. The specimens that we procured were caught or shot in the deep and dark cañons that we passed, where they made their homes among the cliffs along the sides. Sometimes frightened by the loud and reverberating report of a gun in these places, they would creep among the rocks, attempting to conceal themselves, and were thus captured alive.

9. SCOPS M'CALLI, Cassin, (p. 52.)—Western Screech Owl.

9147. Camp 118, New Mexico, February 10, 1854. Kennerly & Möllhausen.

This singular little owl we observed only on Bill Williams' Fork. There he lives in the large cactus of that region, (*Cereus giganteus*), occupying the deserted holes of various species of woodpeckers. He seldom makes his appearance during the day, and when he does, it is only to show his head from his hole, ready at any time to disappear in a moment upon the approach of danger. On one occasion we observed him among some very thick bushes near the water.

10. OTUS WILSONIANUS, Lesson, (p. 53.)—Long-eared Owl.

9146. Camp 107, New Mexico, January 28, 1854. (57.) Kennerly & Möllhausen.

The only specimen of this bird that we saw was killed in a cañon, a short distance west of the Aztec mountains. The cañons of that country afford good places for the nests of these birds, which they build in common with the crow, and some of the hawks, along the precipitous cliffs that compose the sides of these cañons. The place generally selected is one unapproachable by the wolf and lynx, the unceasing enemies of their young.

11. ATHENE CUNICULARIA, Bonap. (p. 60.)—Burrowing Owl.

9168. Los Angeles, California, March 4, 1854. (191.) Kennerly & Möllhausen.

Wherever we found the prairie dog, (*Cynomys*,) there we were sure to find this singular little owl. Indisposed, as it would seem, to burrow a hole in the earth for itself, it occupies those that have been deserted by the marmot, and occasionally, I believe, I have seen it enter the same hole with that animal. At any hour of the day they may be seen seated upon the mounds erected around the holes of the marmot, or else with its head protruding from the orifice, disappearing immediately when approached. Sometimes when molested they commence bowing and chattering in a somewhat ludicrous manner at the intruder, or fly swiftly away, keeping near the earth, and alighting suddenly in the vicinity of a burrow to renew these amusing motions.

We found it also very abundant in the valley of the San Gabriel river, California, associated with the large ground squirrel of that region. Here its habits were the same as we have observed them elsewhere.

I am not disposed to believe with some that this bird feeds on the young of the animals with which it is always associated. In this event a degree of animosity would certainly exist between them which the closest observation has failed to detect. On the contrary, they seem to live together in the utmost harmony. I think there is but little doubt that the owl feeds upon these animals when they die from natural causes; thus he becomes a scavenger to the burrows, and on that account is respected rather than hated by his companions.

12. *CONURUS CAROLINENSIS*, Kuhl, (p. 67.)—Parakeet.

3896. Fort Smith, Arkansas. H. B. Möllhausen.

13. *GEOCOCCYX CALIFORNIANUS*, Baird, (p. 73.)—Paisano.

6178. El Paso, Texas. Dr. Kennerly.—6182. Fort Conrad, New Mexico. Dr. Kennerly.—

6183. Little Colorado river, November 2, 1853. (33.) K. & M.

We found this bird quite abundant near San Antonio, Texas, living among the thick mezquite (*Algarobia*) bushes. Frequently, as we marched up the Rio Grande, did it cross the road in front of us, running very rapidly and disappearing among the weeds. It was also seen occasionally during the winter along the Little Colorado river. After leaving this river, although we did not see the bird itself, yet we frequently saw the tracks of this, or some other species of the same genus in the sands along the valley of Bill Williams' Fork. We found it somewhat difficult to procure a specimen, owing to its shyness and rapidity on foot. It is said that sometimes it is captured alive by being pursued on horseback, and when thus taken very soon becomes quite tame, willingly remaining about the house and soon destroying all the mice in its vicinity. Besides mice, which they catch with as much dexterity as a cat, they also eat lizards, which are generally numerous in the vicinities in which this bird is found.

I embraced the opportunity of dissecting the specimen that I procured and found that the viscera consisted simply of the stomach or digesting cavity and a very short intestinal canal, very little if at all longer than the rectum of other birds.

14. *PICUS HARRISII*, Aud. (p. 87.)—Harris' Woodpecker.

6079. Little Colorado river, December 8, 1853. (35.) K. & M.

This bird was found along the Little Colorado river, in the month of December, wherever the cottonwood trees grew. When seen there were generally several in company. After leaving this river, however, we did not see them again.

15. PICUS SCALARIS, Wagler, (p. 94.)

6115. ♀. Colorado river, California, February 15, 1854. (165.) K. & M.

Near San Antonio, Texas, we saw this bird very often, as well as during our march several hundred miles west of that place. But after leaving the Rio Grande we did not meet with it until we reached the head waters of Bill Williams' Fork. From thence to the Great Colorado river we saw it frequently wherever we found timber, but it was very shy, alighting in the tops of the leafless cottonwood trees, and keeping a vigilant lookout.

16. CENTURUS UROPYGIALIS, Baird, (p. 111.)—Gila Woodpecker.

PLATE XXXVI.

♂, ♀. Bill Williams' Fork, New Mexico, February 13 and 16. (99, 171.) Kennerly and Möllhausen.

First described from specimens collected by the expedition.

We saw this bird continually almost during our march along the Big Sandy, Bill Williams' Fork, and the Great Colorado, but it was with great difficulty that we procured several specimens, on account of its shyness. Seated in the top of a tree, it was ever on guard, and upon the approach of danger flew away, accompanying its flight with its peculiar notes. Its flight was in an undulating line, like that of other birds of this class.

17. COLAPTES MEXICANUS, Swainson, (p. 120.)—Red-shafted Woodpecker.

6160. Camp 134, New Mexico. (180.) Kennerly and Möllhausen.

Our attention was called particularly to this bird upon reaching the Big Sandy. From thence to the Great Colorado we pursued it almost daily without being able to procure a specimen. We saw it on the barren hills among the large cacti, (*Cereus giganteus*), in which it builds its nest, as well as among the bushes and trees of the valley. Its shyness was inexplicable to us until we reached the Great Colorado, where we found it closely hunted and much prized by the Indians on account of the beauty of its feathers, with which they make head dresses. We procured from the Indians a beautiful live specimen, which had been caught in a trap. We met with it again occasionally during our march up the Mohave river.

18. ATTHIS COSTAE, Reich. (p. 138.)—Coste's Humming Bird.

PLATE XIX.

6073, ♂; 6074, ♀. Bill Williams' Fork, New Mexico, February 9, 1854. (79, 80.) Kennerly and Möllhausen.

First recognized as belonging to the fauna of the United States from specimens collected by the expedition.

In the month of February, while travelling along Bill Williams' Fork, we found a few flowers that had already expanded beneath the genial rays of the sun, and around these we never failed to find this beautiful bird. At this season they were generally paired, and they were ever flitting around the flowers enjoying their sweets "with hearts of controversy." Their notes consisted of a rapid chirping sound. Approaching near the coast of California, where the valleys were clothed with flowers of every hue, these diminutive and interesting little creatures were continually flitting before us.

19. PANYPTILA MELANOLEUCA, Baird, (p. 141.)—White-throated Swift.

PLATE XVIII, FIG. I.

6017. Camp 123. Bill Williams' Fork, New Mexico, February 16, 1854. (169.) Kennerly and Möllhausen.

First described from the specimen collected by the expedition.

This curious and interesting bird was found in the month of February among the cañons of Bill Williams' Fork. We did not observe it elsewhere during our journey. Large flocks at any time could be seen in the vicinity of these cañons, flying and circling around very high, and far beyond the reach of shot. Towards the close of the day, when the sun had sunk behind the hills, they occasionally descended lower. We found them only where the walls of the cañons were very high and consisted of almost perpendicular masses of rocks. Sometimes we have seen them sweeping down and then ascending nearly perpendicularly very near the stones, as if examining them in order to select a place for their nests. The construction of these had obviously not yet commenced, as we saw none engaged in the work, nor did we observe any old nests, unless these birds build like the common cliff swallow, (*Hirundo fulva*), of which there were many also in this region, and whose nests were found in many places. Mr. Möllhausen, however, is inclined to the opinion that they build in the holes and crevices of the cliffs. In its flight and habits, as far as we were able to observe, it closely resembles the common chimney swift, (*Chaetura pelagica*.)

20. ANTROSTOMUS NUTTALLII, Cassin, (p. 141.)—Nuttall's Whipporwill.

6004. Camp 130, New Mexico, February 23, 1854. (177.) Kennerly and Möllhausen.

The only specimen of this bird that we saw was presented to us on the Great Colorado river by a Mexican boy, who had captured it alive by some means.

21. MILVULUS FORFICATUS, Swainson, (p. 169.)—Scissor-tail.

7381. San Antonio, Texas, July, 1853. (15.) Dr. Kennerly.

We frequently saw this beautiful and singular fly-catcher as we marched from the Gulf of Mexico several hundred miles into western Texas, but beyond this limit we saw them no more. We found them among the thick mezquite (*Algarobia*) bushes, as well as upon the open prairie. When perched they were generally on the summit of a bush or tall weed, the tail being constantly in motion. Frequently they would dart off after some passing insect, circling around, showing occasionally the singular bifurcation of the tail, but seldom alighting again on the same bush, as many other fly-catchers do. We have sometimes seen it upon the open prairie fly for a long distance near the earth, as if in search of its insect prey.

22. SAYORNIS NIGRICANS, Bonap, (p. 183.)—Black Fly-catcher.

7215. Camp 105, Pueblo creek, New Mexico, March 19, 1854. (189.) K. & M.

After passing the mountains of California and descending into the valley of the San Gabriel river, we found this little bird quite abundant, though we had not noticed it before. It was generally found perched upon the summit of a bush, from which it would occasionally make short excursions in search of its prey. At this season, March, they were rarely found in pairs, so I presumed that they were hatching.

23. SAYORNIS SAYUS, Baird, (p. 185.)—Say's Fly-catcher.

7228. Bill Williams' Fork, New Mexico, February 10, 1854.—7233. Do. February 16, 1854. (88, 170.) K. & M.

We found this bird common in Texas and as far to the westward as the Great Colorado river. It built its nest under the cliffs along the stream, and in its notes, and in every other respect, closely resembles the common pewee, (*Tyrannula fusca*.)

24. SIALIA MEXICANA, Swainson, (p. 223.)—Western Blue Bird.

7637. Camp 110, New Mexico, January 31, 1854. (60.) K. & M.—7635. Fort Conrad, New Mexico, October, 1853. (52.) Dr. Kennerly.

We found this beautiful bird very abundant during our march up the Rio Grande, and from thence to the Great Colorado. At the time of which we write, from November to the latter part of January, they were always seen in large flocks, near the different streams that we passed.

25. SIALIA ARCTICA, Swainson, (p. 224.)—Rocky Mountain Blue Bird.

7607. 75 miles west of Albuquerque, November 1853. (15.) K. & M.

26. REGULUS CALENDULA, Licht. (p. 226.)—Ruby-crowned Wren.

7177. Camp 105, January 24, 1854. (55.)—7167. Camp 116, New Mexico, February 8, 1854. (75.) K. & M.

We found these beautiful little kinglets in the Aztec mountains, in the month of January, and along Bill Williams' Fork in the month of February. They were found in the thickest bushes, and seemed always to be busily engaged in searching for their insect food and chirping as they hopped about.

27. DENDROICA AUDUBONII, Baird, (p. 273.)—Audubon's Warbler.

7663. Cocomongo Ranch, California, March 19, 1854. (190.)

This beautiful little bird was found by Dr. Woodhouse in the mountainous districts of New Mexico, but it did not attract our attention until we reached the border settlements of California. In the vicinity of the Cocomongo Rancho we found it very abundant among the low bushes in the month of March. The song of this bird somewhat resembles that of the summer yellow bird, (*Dendroica aestiva*.)

28. COTYLE SERRIPENNIS, Bonap. (p. 313.)—Rough-winged Swallow.

6031. Camp 124, New Mexico, February 21, 1854. (176.) K. & M.

We found this swallow very abundant along the Great Colorado river in the month of February. In its flight it resembles the common barn swallow (*Hirundo rufa*.) We did not have an opportunity of noticing anything in connexion with its nidification, as the season, I presume, had not yet arrived for nest building.

29. PHAINOPEPLA NITENS, Sclater, (p. 320.)

8281. Camp 120, February 12, 1854. (96.)—8282. Camp 113, New Mexico, February 5, 1854. (69.) K. & M.

This beautiful little bird we found very abundant along Bill Williams' Fork and the Great Colorado. It usually perched upon the topmost branch of a small tree, watching closely your approach, and whether flying and resting continually uttered its short and singular cry. On account of its shyness we found it difficult to procure a specimen.

30. MYIADESTES TOWNSENDII, Cab. (p. 321.)—Townsend's Flycatcher.

8286. Near Zuñi, New Mexico. K. & M.

We procured several specimens of this bird in the Rocky mountains and in the vicinity of the Pueblo of Zuñi. From thence westward we saw it occasionally. It inhabited generally the cedar thickets, upon the berries of which, I presume, it feeds.

31. COLLYRIO EXCUBITOROIDES, Baird, (p. 327.)—White Rumped Shrike.

8715. Camp 130, New Mexico, February 23, 1854. K. & M.

This bird we saw occasionally on the Little Colorado river in the month of December, and on the Great Colorado in February. It was very shy and when seen was generally perched upon the summit of a small bush or weed watching eagerly for its prey.

HARPORHYNCHUS.

This bird attracted my attention particularly after reaching the head waters of Bill Williams' Fork. From thence to the Great Colorado we saw it frequently, but found it very difficult to procure a specimen of it, as it inhabited the thickest weeds and artemisia bushes, running very rapidly, and with difficulty made to fly, and then its flight was very rapid and short, darting suddenly down and disappearing in the bushes. The species was probably *H. crissalis*, Henry.

32. MIMUS POLYGLOTTUS, Boie, (p. 344.)—Mocking Bird.

8164. Bill Williams' Fork, February 9, 1854. (83.) K. & M.

During our march through Texas we were frequently delighted with the music of this wonderful songster; nor were we altogether without his company while crossing New Mexico. We always found him in the vicinity of the little streams that we passed, and at evening and the early dawn, mounting the summit of some bush or small tree, he warbled forth his imitative and fantastic songs.

33. OREOSOPTES MONTANUS, Baird, (p. 347.)—Mountain Mocking Bird.

8136. Near Zuñi, New Mexico. November 26, 1853.—8137, 8138. Bill Williams' Fork. Camp 119, 120, February 11, 18, 1854. (49, 50.) K. & M.

After leaving the Rio Grande we first met with this bird near the Pueblo of Zuñi; and frequently afterwards we heard its notes while travelling over the arid mesas or among the

bushes in the valleys. While singing it was perched upon some small tree or bush. We frequently saw it seeking food upon the ground and when approached too nearly did not generally fly away, but running very rapidly soon disappeared among the weeds or bushes.

34. *CATHERPES MEXICANUS*, Baird, (p. 357.)—White-throated Wren.

7116. Camp 116. Bill Williams' Fork, February, 1854. (66.) K. & M.

Among the hills bordering the Big Sandy, where the rocks were piled up thick and high, we found this little bird darting from rock to rock and creeping among the crevices with great activity, and keeping up continually its singular notes. The rapidity of its motions around the rocks rendered it difficult to procure a specimen. We did not observe it elsewhere.

35. *CERTHIA AMERICANA*, Bonap. (p. 372.)—Creeper.

7154. Pueblo creek, New Mexico, January 22, 1854. (47.) K. & M.

This little creeper attracted my attention particularly in the Aztec mountains, where we found it very abundant among the rough-barked cedars. Its retreat was generally discovered by hearing its quick and sharp notes, and then by a close and careful search it was generally seen proceeding leisurely upwards and downwards, in straight or spiral lines towards the top of the tree, dodging dexterously to the opposite side from the observer, and only resuming his occupation when assured of solitude and safety.

36. *SITTA ACULEATA*, Cassin, (p. 375.)—Western Nuthatch.

PLATE XXXII, FIG. 3. Fig 4 represents the head of *S. carolinensis*.

6807. One hundred miles west of Albuquerque, New Mexico. (26.) Kennerly and Möllhausen.

We found this little bird quite abundant among the pines of the Sierra Madre, and frequently afterwards in the mountains that we crossed. When seen he was generally busily engaged in searching for food on the trees, passing up and down and around, accompanying his motions with his peculiar notes.

37. *SITTA PYGMAEA*, Vigors, (p. 378.)—California Nuthatch.

6804. Cold Spring, Rocky mountains, November 17, 1853. (22.)—6803. San Francisco mountains, New Mexico, December 27, 1853.

This little bird we found quite abundant in the Sierra Madre and San Francisco mountains, even high up where the snows were deep. Here he still lingered to seek his insect food on the lofty pines. After leaving this latter range of mountains, however, we did not observe this bird again.

38. *POLIOPTILA PLUMBEA*, Baird, (p. 382.)

PLATE XXXIII, FIG. 2.

7189. Camp 119, Bill Williams' Fork, New Mexico, February 11, 1854. (91.)—Camp 113, February 5, 1854. (70.) Kennerly & Möllhausen.

First described from these specimens.

We found this little bird quite abundant along Bill Williams' Fork, in the month of February. In its habits it very closely resembles the *Psaltriparus plumbeus*.

39. LOPHOPHANES WOLLWEBERI, Bon. (p. 386.)

6795. Pueblo creek, New Mexico, January 22, 1854. (50.) Kennerly and Möllhausen.

This little bird was found in the thick bushes along Pueblo creek. When noticed it was ever in motion, hopping from twig to twig, searching for its food. We found it also among the pines of the Aztec mountains.

40. PSALTRIPARUS PLUMBEUS, Baird, (p. 398.)

PLATE XXXIII, FIG. 2.

Little Colorado, New Mexico, November 1853. (40.)—6776, 6777. Camp 111, Bill Williams' Fork, New Mexico, February 1, 1854. (62, 63.)—6774. Camp 120, Bill Williams' Fork, February 12, 1854. (94, 95.) Kennerly & Möllhausen.

First described from these specimens.

We found this little bird first along the Little Colorado river, among the scattered bushes, in large flocks. They passed rapidly from place to place, uttering their short, quick notes. We found them again along the head waters of Bill Williams' Fork, inhabiting the tops of the cottonwood trees. Attracted by their notes, they could only be seen by a very careful search. A singular fact in connexion with them is, that those along the Little Colorado all had black eyes, while the eyes of those found on the Fork were yellow. No other possible difference could be discovered. Had they been found together, or even near each other, it might be a fair conclusion to consider them of different sexes, merely; but they were separated by a distance of several hundred miles.

41. EREMOPHILA CORNUTA, Boie, (p. 403.)—Sky Lark.

8727, 8728. Near Zuñi, New Mexico, November 19, 1853. (26, 27.) Kennerly and Möllhausen.

We found this bird throughout Texas and New Mexico, living, for the part, in naked and desert districts, often far from water. They were never seen except in flocks. We were almost sure to find them about the settlements of the prairie dog, (*Cynomys ludovicianus*.) When on the wing they whirled around from time to time near the earth, keeping close together, and descending suddenly when about to alight. They accompanied their flight with a low chirping note, and sometimes kept this up while running on the ground. We never observed them perched on a bush or tree.

42. CARPODACUS CASSINII, Baird, (p. 414.)

PLATE XXVII, FIG. 1.

6420, 6421. Pueblo creek, New Mexico, January 22, 1854. (48, 52.) Kennerly and Möllhausen.—6422. Albuquerque, November 15, 1853. Dr. Kennerly.

First described from these specimens.

This interesting bird we found inhabiting various points between the Rio Grande and the Great Colorado. We found them very abundant along Pueblo creek; not only in the low

valley but high up in the Aztec mountains, among the snows. It inhabits, for the most part, the thick bushes along the running streams; in this and other respects resembling the *Carpodacus familiaris*.

43. CARPODACUS FRONTALIS, Gray, (p. 415.)—House Finch.

6427. Camp 118, New Mexico, February 10, 1854. (86.) Kennerly and Möllhausen.

This little bird is very common along the valley of the upper Rio Grande. There it is said to be quite domestic in its habits, frequenting the houses and building about the churches and other buildings. Dr. Woodhouse found it very abundant as high up as Santa Fé. We saw it frequently during our marches to the westward as far as the Great Colorado. The winter season does not seem to frighten it from this region. It was generally found in the vicinity of the various creeks that we passed.

44. CHRYSOMITRIS PSALTRIA, Bonap. (p. 422.)—Arkansas Finch.

6397, 6398, 6399, 6400. Bill Williams' Fork, New Mexico, February, 1854. (97, 78, 74, 76.) Kennerly and Möllhausen.

This beautiful little bird we found very abundant in the month of February, feeding on the young buds of the cottonwood trees along Bill Williams' Fork. At this season they were in small flocks; and the only note we heard from them was a short chirp as they hopped from twig to twig, or flew from one tree to another.

45. COTURNICULUS PASSERINUS, Bonap. (p. 450.)—Yellow-winged Sparrow.

6334. Bill Williams' Fork, New Mexico. (175.)

We found this bird among the thick bushes along the valley of Bill Williams' Fork, as well as along the Great Colorado river. In some places they were quite numerous, going in flocks of five or six or more.

46. ZONOTRICHIA GAMBELII, Gambel, (p. 460.)—Gambel's Finch.

6201, 6202, 6203. White Cliff creek, New Mexico, February, 1854. (65, 64, 61.) Kennerly and Möllhausen.

This sparrow we first noticed upon approaching the Big Sandy creek; from thence to the Great Colorado we found them abundant. At this season (February) they were mostly in flocks, and were generally found among the bushes in the vicinity of the water.

47. JUNCO OREGONUS, Selater, (p. 466.)—Oregon Snow Bird.

6266. Zuñi, New Mexico. (30.) Kennerly and Möllhausen.

We frequently saw this little bird in the vicinity of the Pueblo of Zuñi, in the month of October and the latter part of November. It was very abundant among the cedar to the westward of this settlement as far as the Little Colorado. Its note at this season was a short chirp, closely resembling that of the common snow bird, (*J. hyemalis*.)

48. *POOSPIZA BELLII*, Sclater, (p. 470.)

6336. Colorado river, California, December 15, 1853. Kennerly and Möllhausen.

This little bird was found in the month of December along the Little Colorado river, wherever the weeds and bushes were thick. It was never observed very far from the water, and its food at this season seemed to consist of the seeds of various kinds of weeds. In its motions it was quick; and when made to fly, its flight was short, rapid, and near the earth.

49. *SPIZELLA MONTICOLA*, Baird, (p. 472.)—Tree Sparrow.

6354, 6355. Little Colorado river, New Mexico, December 18, 20, 1853. (39.) Kennerly and Möllhausen.

Along the Little Colorado river, in the month of December, we found this little sparrow quite abundant, feeding upon the seeds of the grapes and weeds that grow along the valley.

50. *SPIZELLA BREWERI*, Cassin, (p. 475.)—Brewer's Sparrow.

6358. Camp 127. Bill Williams' Fork, New Mexico, February 26, 1854. (174.) Kennerly and Möllhausen.

We found this bird throughout New Mexico, from the Rio Grande to the Great Colorado, along the different streams, where it fed upon the seeds of various kinds of weeds.

51. *MELOSPIZA FALLAX*, Baird, (p. 481.)

PLATE XXVII, FIG. 2.

Pueblo creek, New Mexico, January 22, 1854. (51.) First described from this specimen.

We observed this little bird only along Pueblo creek, in the month of January. It did not confine itself to the open valley, but was often seen among the thick bushes that margined the creek far up in the Aztec mountains, where the snow covered the ground. In its habits it very closely resembles the *Poospiza bellii*, being very restless and rapid in its motions, accompanying them with a short chirp, feeding upon the seeds of the weeds that remained uncovered by the snow. Its flight was also rapid and near the earth. Being very shy, I found it difficult to procure many specimens.

52. *MELOSPIZA LINCOLNII*, Baird, (p. 482.)—Lincoln's Finch.

6325. Camp 131, New Mexico, February, 1854. (100.) K. & M.

This bird we found in the month of February, from the Big Sandy to the Great Colorado river. It confined itself to the thick bushes along the stream, and when seen was generally busily hopping from twig to twig in search of food. When made to fly, its flight was noticed to be very rapid and near the earth.

53. *CYANOSPIZA CIRIS*, Baird, (p. 503.)—Painted Finch.

6277, 5278. San Antonio, Texas, July, 1853. (14, 17.) Dr. Kennerly.

We often listened with pleasure to the melodious warblings of this beautiful finch, in the vicinity of San Antonio, Texas, where we found it very abundant among the thick mezquite (*Algarobia*) bushes, in the month of July. It is deservedly a great favorite there on account of the beauty both of its plumage and its notes.

54. *PIPILO MEGALONYX*, Baird, (p. 515.)

6733. Pueblo creek, New Mexico, Camp 104, January 22, 1854. (49.) K. & M.

The bird first attracted our attention in the month of January, in the Aztec mountains, along Pueblo creek. Here we saw it often, but generally singly. It inhabited the thickest bushes, and its motions were so constant and rapid, as it hopped from twig to twig, that we found it difficult to procure a specimen. Its flight was also rapid and near the ground.

55. *PIPILO ABERTII*, Baird, (p. 516.)—Abert's Finch.

PLATE XXX.

6750. Camp 114, February 6, 1854. (72.)—6751. Camp 120, Bill Williams' Fork, New Mexico, February 12. (92.) K. & M.

In the month of February, while travelling down the Big Sandy creek and Bill Williams' Fork, we found this bird very abundant. They confined themselves to the thick bushes near the water. Generally, two or three were seen together. Their motions were very rapid and their note was a peculiar, loud, chattering sound, sharp but not disagreeable. After leaving the Great Colorado we did not see it again.

56. *PIPILO MESOLEUCUS*, Baird, (p. 518.)

PLATE XXIX.

6827. Bill Williams' Fork, New Mexico, February 5, 1854. (67) K. & M.
First described from this specimen.

57. *PYRANGA HEPATICA*, Swainson, (p. 302.)

PLATE XXXI.

Seen in the San Francisco mountains, New Mexico.

58. *AGELAIUS PHOENICEUS*, Vieillot, (p. 526.)—Red-wing Blackbird.

8574 ♂. Fort Conrad, New Mexico, October, 1853.—8576. Cold Spring, New Mexico, November 17, 1853, (23.)—Camp 150. Cocomongo Ranch, California, March 19, 1854, (187.) K. & M.

We found these birds quite abundant in various places in New Mexico, wherever we found marshes and swampy grounds. We saw them also in the Sierra Madre, near Cold Spring, and Dr. Woodhouse found them also in the San Francisco mountains, near the Laguna Enematio.

59. AGELAIUS GUBERNATOR, B o n . (p. 529.)—Red-shouldered Blackbird.

8597. Camp 150. Cocomongo Ranch, California, May 19, 1854, (188.) K. & M.

In the month of October, near the ruins of Valverde, on the Rio Grande, we procured two specimens of a bird belonging to this genus, but cannot assert positively that it is this species, owing to the imperfect condition of the plumage. But during our marches along Bill Williams' Fork, along the Great Colorado, and the Mohave river, we found them quite numerous; but more abundant still along the creeks and swampy grounds that we passed as we approached near the settlements of California. Large flocks could here be seen whirling around in graceful curves like dark clouds, chattering joyfully as they moved along, or settling as a black veil on the topmost branches of some tree, indulging loudly in their harsh music.

60. STURNELLA NEGLECTA, A u d . (p. 537.)—Western Meadow Lark.

8616. Fort Conrad, New Mexico, October, 1853.—8611. Camp 117, New Mexico, February 9, 1854.—8612. Camp 126, New Mexico, February 19, 1854, (173.) K. & M.

This bird is abundant in Texas, and we found it along the valley of the Rio Grande as far as Albuquerque; from thence westward as far as the Pueblo of Zuñi we saw it occasionally. But after leaving this village we did not meet with it again until we reached Bill Williams' Fork, from thence, however, to the Pacific coast it was very common along all of the streams that we passed. In its habits it closely resembles the *S. ludoviciana*, but I think close attention will discover some difference in the notes. In the former these are not so prolonged, and end more abruptly.

61. ICTERUS SPURIUS, B o n . (p. 547.)—Orchard Oriole.

6706. San Antonio, Texas, July, 1853. Dr. Kennerly.

This beautiful little oriole we found very abundant near San Antonio, Texas, in the month of July. It seemed to prefer the places where the mezquite (*Algarobia*) grew the thickest.

62. CORVUS CACALOTL, W a g l e r , (p. 563.)—Colorado Raven.

PLATE XX.

6855. Bill Williams' Fork, New Mexico, February 7, 1854. 73? 102, 97. Camp 110, January 31, 1854, (54.) K. & M.

This bird was one of our most constant companions during our marches from the Rio Grande westward. Four or five of them would frequently follow our train for several days over sandy and dreary plains, where no other living object was seen, and nothing heard save their dismal croaks. I have known them to become quite tame after following us in this manner undisturbed, and to walk about among our mules and in the camp, permitting themselves to be approached frequently quite closely, without seeming disposed to fly away. When we evacuated the camp, they immediately took possession of it and enjoyed what was left hurriedly, quarrelling at the same time with the coyotes should they dare to intrude.

63. CORVUS CRYPTOLEUCUS, C o u c h , (p. 365.)—White-necked Crow.

PLATE XXII.

Seen abundantly on the Llano Estacado.

64. PICICORVUS COLUMBIANUS, B o n . (p. 573.)—Clark's Crow.

8474, 8475. 75 miles west of Albuquerque, November 15, 1853. K. & M.

In the thick pine woods skirting the eastern slope of the Rocky mountains we found this bird quite abundant. We seldom saw more than two or three together; and when seen they were generally busily engaged in searching for food, flying alternately from the ground to the trees, and keeping up continually their loud song. After leaving the mountains we did not see it again.

65. GYMNOKITTA CYANOCEPHALA, P r . M a x . (p. 574)—Maximilian's Jay.

8468. 95 miles west of Albuquerque, November 16, 1853. K. & M.

Between the Puebla of Laguna and the Sierra Madre we frequently saw large flocks of this bird during the latter part of the month of November. They frequented chiefly the water courses, and when scared would circle around rising higher above our heads, uttering their singular cry, then suddenly descending would alight in the top of some tree on the adjoining cliffs. Its voice somewhat resembles that of the common cat-bird (*Mimus carolinensis*.) After leaving the Rocky mountain range we saw it no more.

66. PICA HUDSONICA, B o n a p . (p. 576.)—Magpie.

8480. Fourth Camp, Little Colorado, New Mexico, December 8, 1853. Kennerly and Möllhausen.

We found this beautiful magpie in great numbers soon after leaving the Rio Grande, and from time to time afterwards as we marched towards the coast of California. It seems to live indifferently in the deep cañons, among the hills, or in the valleys, but is never found except in the vicinity of water.

67. CYANURA MACROLOPHUS, B a i r d , (p. 582.)—Crested Jay.

8351. One hundred miles west of Albuquerque, New Mexico, November 17, 1853. (20.)—Camp 105, January 23, 1854. (53.) Kennerly and Möllhausen.

First described from these specimens.

Among the lofty pines of the Sierra Madre we first saw this bird. Leaving this range we did not find it again until we crossed the Aztec mountains; here it was less abundant than in the former place, and for the most part was found among the cedars on the high grounds, though sometimes seen among the clumps of large pines that were scattered along the valley. After leaving this vicinity we did not observe it again.

68. CYANOCITTA CALIFORNICA, S t r i e k l a n d , (p. 584.)—California Jay.

8462. Camp 149, California, March 16, 1854. (186.) Kennerly and Möllhausen.

We found what we supposed was this bird from the Rocky mountains to the coast of California, wherever we found the piñon trees. It is probable that they feed upon the nuts of this tree. They seldom remain long in one position, but are almost continually hopping from limb to limb, or flying from tree to tree, and keeping up all the time their well-known cry. It is probable, however, that all those seen east of the Coast mountains of California were in reality *C. woodhousii*.

69. ZENAIDURA CAROLINENSIS, B o n a p . (p. 604.)—Dove.

8748. Bill Williams' Fork, New Mexico, February 28, 1854. (181.) Kennerly and Möllhausen.

This bird is very common in Texas, in the vicinity of San Antonio, also along the Gulf coast; but travelling towards the west, for about two hundred miles from the former place, it seemed suddenly to disappear, and we saw it no more.

70. LOPHORTYX CALIFORNICUS, B o n a p . (p. 644.)—California Quail.

9388. Mohave river, March 14, 1854. (183.) Kennerly and Möllhausen.

We did not see this beautiful partridge until we reached the waters of the Mohave river, some forty miles below the Spanish trail; but during our march up this stream we found it very abundant, as well as among the settlements near the coast. In its habits it does not differ from the *Lophortyx gambelii*.

71. LOPHORTYX GAMBELII, N u t t . (p. 645.)—Gambel's Partridge.

9360. Camp 97, New Mexico, January 10, 1854. (44.) Kennerly and Möllhausen.

This beautiful bird we found in great numbers during our march up the Rio Grande. Large flocks were frequently crossing the road before us, or seen huddled together under a bush. After leaving the river we found them again so numerous along Partridge creek as to give origin to the name of the stream. From thence to the Great Colorado we occasionally saw them, but after leaving the river we did not find them again. These birds are said to become quite domesticated when unmolested. But when pursued they can seldom be made to fly, depending more upon their feet as a mode of escape than upon their wings. They run very rapidly, and seldom, if ever, hide and remain close in the grass or bushes, like the common Virginia partridge.

72. GRUS FRATERCULUS, C a s s i n , (p. 656.)—Little Crane.

PLATE XXXVII.

10378. Albuquerque, New Mexico, October, 1853. Kennerly and Möllhausen.

First described from this specimen.

73. BUTORIDES VIRESCENS, B o n . (p. 676.)—Green Heron.

9490. Sans Bois creek, Choctaw country. H. B. Möllhausen.

74. NYCTHERODIUS VIOLACEUS, R e i c h . (p. 679.)—Yellow-crowned Night Heron.

9482. Fort Smith, Arkansas. H. B. Möllhausen.

75. IBIS ORDII, B o n a p . (p. 685.)—Glossy Ibis.

9505. San Francisco, California, March 28, 1854. (196.) Kennerly and Möllhausen.

This bird we first observed at San Eleazario, Texas, where we found it feeding about the lagoons in the vicinity of the town. There, being unmolested, it was very tame, and could be approached without difficulty. At Fray Christobal we found them very abundant, and observed

them occasionally as we marched towards the Pacific. In the market at San Francisco it is a very common bird. When on the wing they arrange themselves either in a straight line or a wedge-shaped figure, accompanying their flight with their peculiar notes.

76. *AEGIALITIS VOCIFERUS*, Cassin, (p. 692.)—Killdeer.

6590. Camp 121, New Mexico. Kennerly and Möllhausen.

Throughout Texas and New Mexico we found this bird wherever there was permanent water. Its well-known cry we often heard late at night as it flew over our camp or ran along the shore of some pool or running stream.

77. *GALLINAGO WILSONII*, Bon. (p. 710.)—English Snipe.

6614. Camp 123, New Mexico, February 16, 1854. Kennerly and Möllhausen.

We found this snipe abundant in the swamps along Bill Williams' Fork in the month of February; but we did not observe it elsewhere during our journey.

78. *GAMBETTA MELANOLEUCA*, Bon. (p. 731.)—Tell-tale.

We found small flocks of this bird only on Bill Williams' Fork and on the Mohave river, during the latter part of February and the month of March. Here they were very gentle and easily approached.

79. *NUMENIUS LONGIROSTRIS*, Wils. (p. 743.)—Long-billed Curlew.

San Francisco, California. (195.)

This bird we did not meet with until we reached San Francisco, where we found it very common in the market.

80. *RALLUS ELEGANS*, Aud. (p. 746.)—King Rail.

San Francisco, California. (196.)

We saw this bird first in the vicinity of San Francisco, where it was quite abundant in the month of March. It was one of the most numerous water birds that we found in the market.

81. *BERNICLA CANADENSIS*, Boie, (p. 764.)—Canada Goose.

1954. Rio Rita, Laguna, New Mexico, November, 1853. Kennerly and Möllhausen.

We found this goose very abundant along the Rio Grande, and met with it frequently from thence to the Pacific. During the period of which we write, from October to March, they were always seen in flocks.

82. *DAFILA ACUTA*, Jenyns, (p. 776.)—Pin-tail Duck.

Bill Williams' Fork, New Mexico. (172.) Kennerly and Möllhausen.

We found this a very abundant species in the marshes along Bill Williams' Fork, where they congregated with hundreds of other ducks of various species; was quite troublesome and annoying on account of its watchfulness. It was generally on such occasions the first to take to the wing, and by its cries give the alarm.

83. *NETTION CAROLINENSIS*, Baird, (p. 777.)—Green-winged Teal.

9722. ♂, ♀. Rio Rita, Laguna, New Mexico, November 12, 1854. (3.)—9723. ♀.
Ditto. Kennerly and Möllhausen.

This duck was probably more abundant than any species that we met with. Besides finding great numbers along the Rio Grande, we scarcely ever failed to see it during our westward journey, wherever we found running water.

84. *QUERQUEDULA CYANOPTERA*, Baird, (p. 780.)—Red-breasted Teal.

9750. Mohave river, March 11, 1854.—9740. ♂. Camp 123, February 16, 1854. (166.)
Kennerly & Möllhausen.

We saw this bird frequently on Bill Williams' Fork, Great Colorado and Mohave rivers. The male, when in full plumage, is one of the most beautiful of all the ducks; but they seemed to be remarkably scarce in comparison with the number of females.

85. *CHAULELASMUS STREPERUS*, Gray, (p. 782.)—Gadwall.

9796. ♂. San Francisco, California, March, 1854.

86. *AIX SPONSA*, Boie, (p. 785.)—Summer Duck.

9776. San Francisco, California, ♂, February, 1854. Kennerly and Möllhausen.

This beautiful duck we did not see before reaching San Francisco, in the vicinity of which place we found it very abundant.

87. *FULIX AFFINIS*, Baird, (p. 792.)—Little Black Head.

We found this duck very common in the vicinity of San Francisco, but did not observe it before reaching that place.

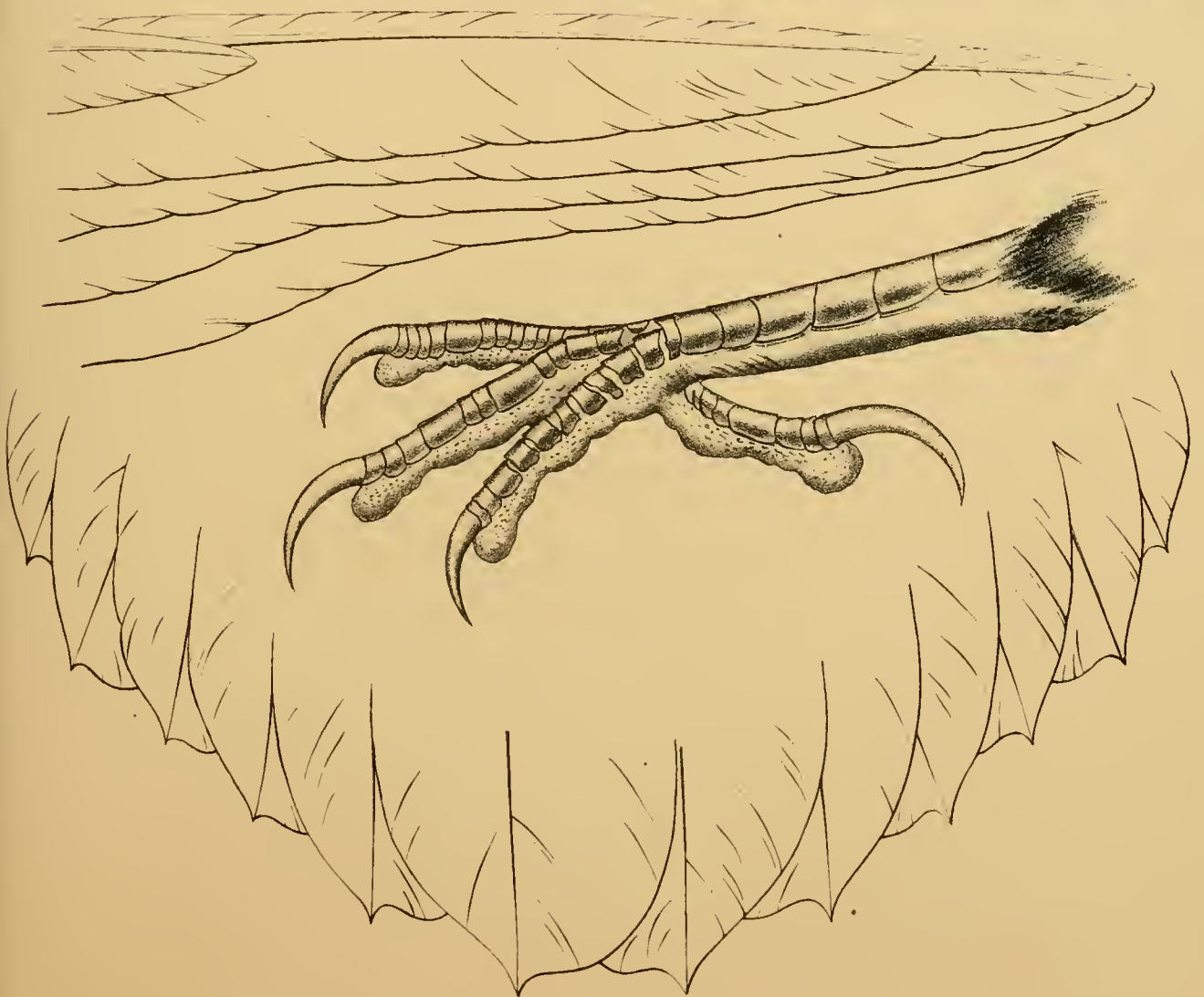
88. *BUCEPHALA ALBEOLA*, Baird, (p. 797.)—Butter Ball.

9813. Bill Williams' Fork, New Mexico, February, 1854. (89.)

This expert little diver we saw occasionally in small flocks, in the month of February, along Bill Williams' Fork and the Great Colorado river.







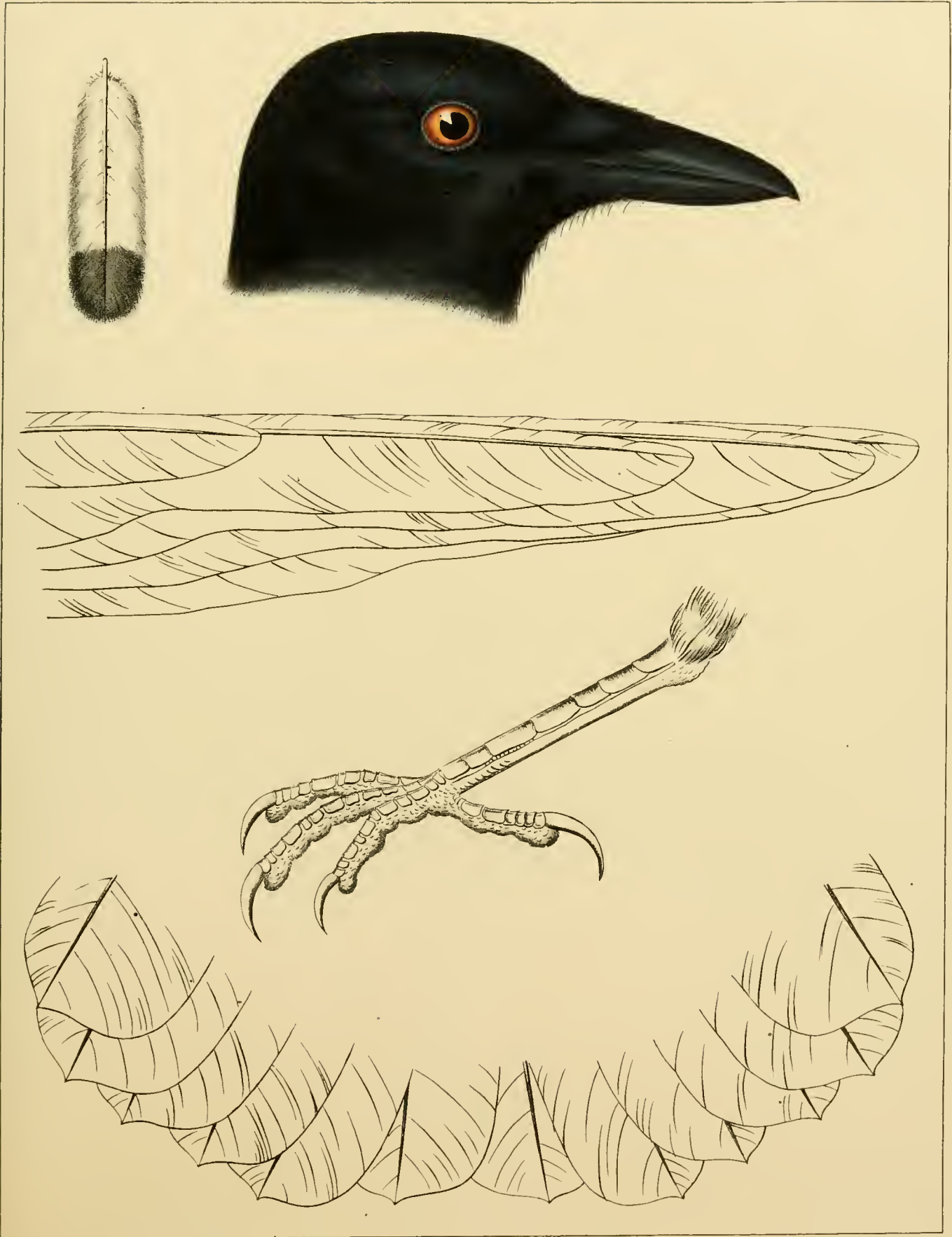




Fig II

Fig I.









Fig 1



Fig 3



Fig 4



Fig 2



Fig 5





No. 4.

REPORT UPON THE REPTILES OF THE ROUTE.

BY S. F. BAIRD.

SCELOPORUS UNDULATUS, Wieg m.

Stellio undulatus, LATREILLE, Hist. Rep. II, 1812, 40.

Tropidolepis undulatus, CUVIER, R. A.—HOLBROOK, N. Am. Herp. II, 1842, 73; pl. ix.

Sceloporus undulatus, WIEGMANN, Isis, 1828, 369.

2874. Near mouth of Poteau river, Arkansas. B. Möllhausen.

SCELOPORUS SPINOSUS, Wieg m.

Sceloporus spinosus, WIEGM. Isis, 1828, 369.

Tropidolepis spinosus, GRAY, Syn. Rept. Griff. An. King. IX, 1831, 43.

2938. San Antonio, Texas. Dr. Kennerly.

SCELOPORUS CONSOBRINUS, B. & G.

Sceloporus consobrinus, B. & G. Marey's Report, 1853, 237.

2910. Canadian Fork. B. Möllhausen.

SCELOPORUS THAYERI, B. & G.

Sceloporus thayeri, B. & G. Pr. A. N. S. VI, August, 1852, 127.

2907. Coal creek, Arkansas. B. Möllhausen.

CROTAPHYTUS COLLARIS, Holbrook.

Agama collaris, SAY, Long's Exped. II, 1823, 252.

Crotaphytus collaris, HOLBROOK, N. Am. Herp. II, 1842, 79; pl. x.

2701 Fort Smith, Arkansas.—2707. Near the Gold mountains, Arkansas.—4106. Coal creek of Arkansas.—2715. Near Canadian. B. Möllhausen.—2690. Pecos to Rio Grande. Dr. Kennerly.

CROTAPHYTUS WISLIZENII, B. & G.

Crotaphytus wislizenii, B. & G. Pr. A. N. Sc. VI, April, 1852, 69.

New Mexico. Dr. Kennerly.

UTA STANSBURIANA, B. & G.

Uta stansburiana, B. & G., Pr. A. N. Sc. VI, April, 1852, 69.—*Id.* Stansbury's Great Salt Lake, 1852, 345; Reptiles, plate v.

2682. Albuquerque. Kennerly and Möllhausen.

¹ The diagnoses of most of the serpents have been prepared by Mr. Robert Kennicott, and of the toads by Dr. Charles Girard.

HOLBROOKIA MACULATA, Girard.

- Holbrookia maculata*, GIRARD, Pr. Am. Assoc. for 1850, 1851, 201.—*IB.* Stansbury's Report, 1852, 342, pl. vi, fig. 1, 3.
2810. Near Canadian. B. Möllhausen.

HOLBROOKIA TEXANA, B. & G.

- Cophosaurus texanus*, TROSCHEL, Wiegmann's Archiv for 1850, 1852, 329; pl. vi.
Holbrookia texana, B. & G., Pr. A. N. Sc. VI, August, 1852, 125.
2797. Pecos to Rio Grande. Dr. Kennerly.

TAPAYA HERNANDEZII, Girard.

- Tapaya hernandezii*, GIRARD, Herp. U. S. Ex. Ex., 1858, 395.
198. Santa Fé, New Mexico. Kennerly and Möllhausen.

TAPAYA ORNATISSIMA, Girard.

- Phrynosoma orbiculare*, HALLOWELL, Sitgreaves' Exped. 1853, 125; pl. viii.
Tapaya ornatissima, GIRARD, Herp. U. S. Ex. Ex., 1858, 396.
199.—203. Along Canadian river to Albuquerque. Möllhausen and Kennerly.

PHRYNOSOMA CORNUTUM, Gray.

- Agama cornuta*, HARLAN, J. A. N. Sc. IV, II, 1825, 299.
Phrynosoma cornutum, GRAY, Syn. Rept. Griff. Chv. IX, 1831, 45.—HOLBROOK, N. Am. Herp. II, 1842, 87; pl. xi.—
GIRARD, Herp. U. S. Ex. Ex. 1855, 403; pl. xxi, fig. 6, 9.
138. Pecos to Rio Grande. Dr. Kennerly.—140. Near Canadian. B. Möllhausen.

DOLIOSAURUS MODESTUS, Girard.

- Phrynosoma modestum*, GIRARD, Stansbury's Report, 1852, 361; pl. vi, fig. 4—5.
Doliosaurus modestus, GIRARD, Herp. U. S. Ex. Ex., 1858, 409.
172. Near Canadian river. B. Möllhausen.—173. Near Albuquerque. B. Möllhausen.

CNEMIDOPHORUS SEX-LINEATUS, Dum. Bib.

- Laercta sex-lineata*, LINN. Syst. Nat. 1766, 361.
America sex-lineata, HOLBROOK, N. Am. Herp. I, 1833, 63; pl. vi.
Cnemidophorus sex-lineatus, DUM. Bib. Erp. Gen. V, 1839, 131.
3005. Fort Smith, Arkansas. B. Möllhausen.

CNEMIDOPHORUS GULARIS, B. & G.

- Cnemidophorus gularis*, B. & G. Pr. A. N. Sc. VI, August, 1852, 123.
Cnemidophorus guttatus, HALLOWELL, Pr. A. N. Sc. VII, October, 1854, 192.
2990. San Antonio to Fort Inge, Texas. Dr. Kennerly.—3016. Near Canadian. B. Möllhausen.

HELODERMA HORRIDUM, Wiegmann.

- Heloderma horridum*, WIEGMANN, Isis, 1829, 627.—*IB.* Herp. Mex. 1834; plate.
BAIRD, Reptiles, U. S. and Mex. Boundary; plate.
Mohave river. Kennerly & Möllhausen.

PLESTIODON FASCIATUS.

Lacerta fasciata, LINN. Syst. Nat. I, 1758, 290.

Scincus fasciatus, HOLBROOK, N. Am. Herp. II, 1842, 127; pl. xviii.

Lacerta quinquelineata, LINN. Syst. Nat. 1766, 366.

Scincus quinquelineatus, HOLBROOK, N. Am. Herp. II, 1842, 121; pl. xvii.

Plestiodon erythrocephalus, HOLBROOK, N. Am. Herp. II, 1842, 117; pl. xvi.

3176. Fort Smith. Dr. Shumard.

PLESTIODON OBSOLETUS, B. & G.

Plestiodon obsoletum, B. & G. Pr. A. N. Sc. VI, August, 1852, 129.

3113. Coal creek, Arkansas. B. Möllhausen.

This specimen is very young and is the only one in the collection which exhibits the typical coloration of the species.

LYGOSOMA LATERALE, Dum. Bib.

Scincus lateralis, SAY, Long's Exped. II, 1823, 324.—HOLBROOK, N. Am. Herp. II, 1st ed. I, 1836, 71.

Lygosoma lateralis, DUM. Bib. Erp. Gen. V, 1839, 719.—HOLBROOK, N. Am. Herp. II, 1842, 133; pl. xix.

3132. Fort Inge, Texas.—3135. San Antonio. Dr. Kennerly.

CROTALUS DURISSUS, Linn.—Rattlesnake.

Crotalus durissus, LINN. Syst. Nat. I, 1766, 372.—HOLBROOK, N. Am. Herp. III, 1842, 9; pl. i.—B. & G. Catal. N. Am. Serpents, 1853, 1.

SPEC. CHAR.—Head small, narrow; superciliaries, frontals, and other large plates smooth and uncorrugated. Sub-orbital chain continuous; two rows between this and the labials. Labials 12-14 above, 13-16 below. Dorsal rows of scales 23-25, all carinated; carinations of outer row obsolete. No defined light lines on head or body, and no lighter edgings to the plates of the head; tail black. Above yellow or yellowish brown, with a double dorsal series of brown or blackish confluent rhomboids, with another series opposite on each side. A distinct narrow reddish dorsal stripe, three or four scales in width from head to tail. A broad dark stripe from the lower and posterior angle of the orbit across the angle of the mouth; this stripe sometimes obsolete.—(Kennicott.)

No. 277. Fort Smith, Arkansas. Dr. G. G. Shumard.

CROTALUS ATROX, B. & G.

Crotalus atrox, B. & G. Catal. N. Am. Serp. 1853, 5.

SPEC. CHAR.—Nose broad, obtuse. Plates of head elongated and much imbricated; two rather small anterior frontals in contact; two larger imbricated plates between these and each superciliary; space enclosed occupied by scales of smaller size but larger than those between the posterior half of the superciliaries. Superciliaries usually bordered by a row of larger scales, of which the anterior is much largest. All the larger plates of the crown very much corrugated, and the anterior plate generally with their edges turned up; this, together with their corrugated surfaces, presenting a very rough appearance. Three rows of scales between the sub-orbital chain and labials. Labials 15-16 above, 15-17 below. Dorsal rows 25-27; central row strongly carinated, with additional small ridges converging to the apex of each scale. Tail with black rings. Color dull yellowish brown, with a dorsal series of rhomboidal blotches, margined by lighter lines much the same as in *C. adamanteus*, but the lateral markings represented in *C. adamanteus* all obsolete. Abdomen without spots. A single transverse light line on the superciliary, sometimes obsolete. Light stripe from posterior angle of orbit below the superciliary to the upper labials in front of the angle of the mouth. No light lines in front of the nostril, or light edgings on rostral.—(Kennicott.)

No. 4225. Rocky Dell creek, Indian territory. B. Möllhausen.

CROTALUS CONFLUENTUS, Say.

Crotalus confluentus, SAY, Long's Exped. II, 1823, 48.—B. & G. Catal. N. Am. Serp. 1853, 8
Crotalus lecontei, HALLOW, Pr. A. N. Se. VI, 1851, 8.

SPEC. CHAR.—Plates on crown irregular, angulated, imbricated, and frequently tuberculated, smoother and less elongated than in *C. atrox*. Three, rarely four, rows of scales between the sub-orbital series (which extends to the centre of the orbit) and the labials. Labials 14-18 above, 14-18 below. Dorsal rows of scales 25-29. Dorsal blotches brown, margined by narrow whitish lines, sub-quadrate, emarginate before and behind; posteriorly intervals greater and spots transversely quadrate, ultimately becoming twenty-five to thirty half rings. Colors not deeper posteriorly in old specimens. Two transverse lines on superciliary enclosing about one-third, sometimes obsolete. Light stripe from orbit below superciliary to angle of jaw passes angle of mouth on the second or third row of scales above the labials. Rostral margined with lighter.—(Kennicott.)

No. 291. Canadian river. B. Möllhausen.

CROTALOPHORUS MILIARIUS, Holbrook.

Crotalus miliarius, LINN. Syst. Nat. I, 1766, 372.
Crotalophorus miliarius, HOLBROOK, N. Am. Herp. III, 1842, 25; pl. xv.—B. & G. N. Am. Serp. 1853, 11.

SPEC. CHAR.—Twenty-one to twenty-three dorsal rows of scales all carinated, the two lateral rows but slightly. Greyish ash with black blotches. A vertebral reddish line. Vertical plate obtuse posteriorly, widening but little anteriorly, slightly concave on the sides. A narrow white line from the lowest point of the orbit passes obliquely backward to the angle of the mouth.—(Kennicott.)

No. 489. Fort Smith, Arkansas. B. Möllhausen.

TOXICOPHIS PISCIVORUS, B. & G.

Trigonocephalus piscivorus, HOLBROOK, N. Am. Herp. 1st ed. II, 1838, 63; pl. xiii.—1st ed. III, 1842, 33; pl. vii.
Toxicophis piscivorus, B. & G. Catal. N. Am. Serp. 1853, 19.

SPEC. CHAR.—No loral. Inferior wall of orbit constituted by third labial. Twenty-five dorsal rows. Dark chestnut brown, with indistinct vertical dark bars. Line from superciliary along the edge of the head, through the middle of the second supra-labial row. A second line from the lowest point of the orbit parallel to the first.

No. 823. Fort Smith, Arkansas. B. Möllhausen.

EUTAENIA PROXIMA, B. & G.

Culuber proximus, SAY, Long's Expedition, I, 1823, 187.
Eutainia proxima, B. & G. Catal. N. Am. Serp. 1853, 25.

SPEC. CHAR.—Body stouter than *E. saurita* or *E. fairryi*. Brown or blackish above. Three longitudinal stripes; the dorsal ochraceous yellow or brown; lateral greenish white or yellow on the third and fourth lateral rows. Dorsal stripe one and over two half scales wide. Lateral row of scales usually the color of the abdomen. Total length about $3\frac{1}{2}$ times that of the tail. Dorsal rows 19.—(Kennicott.)

No. 762. San Antonio, Texas—742. Between Pecos and Rio Grande. Dr. Kennerly.

EUTAENIA DORSALIS, B. & G.

Eutainia dorsalis, B. & G. Catal. N. Am. Serp. 1853, 31.

Dimensions of *E. sirtalis*. Color olivaceous green. Dorsal stripe broad, whitish yellow, margined with black. A row of spots above the lateral stripe. Lateral stripe on second and third rows. Dorsal rows 19.

No. 978. Fort Conrad, New Mexico. Dr. Kennerly.

EUTAENIA VAGRANS, B. & G.

Eutainia vagrans, B. & G. Catal. N. Am. Serp. 1853, 35.—GIRARD, Herp. U. S. Ex. Ex. 1858, 154; pl. xiv, figs. 5—10.

SPEC. CHAR.—Head large and high. Eight labials above, sixth and seventh very large, higher than wide; the sixth extending above the level of the lower edge of the eye; the seventh much larger than the fifth. Light olive brown above, with two series of black spots on each side, the upper of which encroaches upon the dorsal stripe, constricting it at regular intervals, while the lower encroaches upon the indistinct lateral stripe. Lateral stripe on second and third rows. Dorsal rows 21.—(Kennicott.)

No. 926. Near the Gold mountains. Möllhausen.

EUTAENIA MARCIANA, B. & G.

Eutainia marciana, B. & G. Catal. N. Am. Serp. 1853, 37.

SPEC. CHAR.—Head triangular, short, very broad posteriorly; nose pointed. Upper labials eight, sixth largest, seventh nearly as large. Body rather stout, sub-cylindrical; tail short. Prominent color light brown; a vertebral paler line and one lateral on each side, more or less indistinct. Three series of square black spots on each side, of about 56–60 in each series, from occiput to anus. Sides of head black, with a crescentic patch of yellowish posterior to the labial plates. Three and sometimes four black vittæ radiating from the eye across the jaws. A double white spot with a black margin on the suture of occipital plates. Dorsal rows 21.

No. 856. Pecos to Rio Grande, Texas.—1424. San Antonio, Texas. Dr. Kennerly.

NERODIA WOODHOUSII, B. & G.

Nerodia woodhousii, B. & G. Catal. N. Am. Serp. 1853, 42.

SPEC. CHAR.—Form of *N. erythrogaster*, but the head broader behind and more flattened above. Twenty-five dorsal rows of scales, all carinated. Three rather large post-orbitals; ante-orbital narrow; loreal large. Three series of quadrangular dark blotches on a brownish clay-colored ground. The middle series separated by narrow white lines, the latter by intervals of the ground color, wider than themselves; the three series perfect to the head. A double yellow occipital spot; a yellow spot between the superciliary and vertical plates; an indistinct black line from the posterior rim of the eye to the angle of the mouth. Abdomen unspotted.—(Kennicott.)

No. 1318. Antelope creek, Arkansas.—1325. Near Canadian river, Arkansas. H. B. Möllhausen.

NERODIA ERYTHROGASTER, B. & G.

Coluber erythrogaster, SHAW, Gen. Zool. III, 1804, 458.

Tropidonotus erythrogaster, HOLBROOK, N. Am. Herp. 2d ed. III, 1842, 33; pl. viii.

Nerodia erythrogaster, B. & G. Catal. N. Am. Serp. 1853, 40.

SPEC. CHAR.—Head elongated, narrowing forwards; occipital region flattened; convex on the snout. Vertical plate pentagonal, very large, as are also the occipitals. Three post-orbitals. An elevated loreal. Dorsal rows of scales 23 in number, all very strongly carinated. Uniform dark bluish black above, lighter on the sides; a lateral or external band of dull blue extending on the abdominal scutellæ. Body beneath uniform dull coppery yellow, sometimes with the anterior edge of each scutellæ bluish. No distinct spots on the abdomen, as in *N. sipedon*. Indications of three series of dorsal blotches, as in *N. woodhousii*, in young specimens.

No. 1324. Fort Smith, Arkansas. Dr. Shumard.

HETERODON NASICUS, B. & G.

Heterodon nasicus, B. & G. Stansbury's Expl. Salt Lake, 1852, 352.—IB. Catal. N. Am. Serp. 1853, 61.

SPEC. CHAR.—Vertical broader than long. Rostral excessively broad and high. Azygos plate surrounded behind and on the sides by many small plates, (12–15.) A second loreal. Labials short and excessively high. Dorsal rows of scales 23, exterior alone smooth. A dorsal series of about 50 blotches, with four or five others on each side. Body beneath, black. A narrow white line across the middle of the superciliaries; a second behind the rostral. A broad, dark patch from the eye to the angle of the mouth, crossing the last two labials.

No. 1280. Near Canadian, Arkansas. Möllhausen.

PITYOPHIS BELLONA, B. & G.

Churchillia bellona, B. & G., Stansbury's report, 1852, 350.

Pityophis bellona, B. & G., Catal. N. A. Serpents, 1853, 66.

Pityophis affinis, HALLOWELL, Pr. A. N. Sc. VI, 1852, 181.

SPEC. CHAR.—Head broad behind, tapering to the snout. Snout rather pointed, but less so than in *P. sayi*, elevated. Crown flattened between the eyes and posteriorly. Vertical plate broad, anteriorly narrow, and elongated posteriorly. Ante-orbitals 2, sometimes 1; post-orbitals 3 or 4. Frequently a supplemental plate before the vertical. Dorsal rows of scales 29 to 35, the 7 outer rows smooth. Head spotted with black; transverse frontal bar from one orbit to the other well marked; the oblique post orbital stripe rather narrow. Color of the body whitish yellow; a dorsal series of 45–65 subquadrate blotches from head to anus, transversely elongated posteriorly; 3 or 4 smaller series on each side. The lateral blotches longitudinally elongated near the head; vertically elongated posteriorly when they form a series of jet black vertical bars. Ten or fifteen transverse black bands on the tail. Abdomen yellow with an external series of black spots on each side.—(Kennicott.)

No. 1528. San Antonio to Austin, Texas. Möllhausen.

ARIZONA ELEGANS, Kennicott.

Arizona elegans, KENNICOTT, in Mex. Bound. Report, II, 1859; Baird Rep. Reptiles, 18, plato xiii.

SP. CH.—Body rather more slender than in *Pityophis sayi* and *P. bellona*, and head narrower; otherwise bearing a general resemblance in form to these and other species of *Pityophis*, especially in the protruding and recurved rostral. The tail forms nearly one-sixth of the total length. Head depressed anteriorly, arched, and much more elevated posteriorly, where it is not much wider than high, nor much wider than the neck. Vertical plate sub-pentagonal, broad in front, tapering, and very acute posteriorly. Occipitals large, perfect, longer than the vertical. Superciliaries small. Pre-frontals of greater longitudinal extent than post frontals, separated for more than two-thirds of their length by the apex of the nostril, the anterior angle extending down in front of the pre-nasal to below the level of the nostril. Post-nasal more than twice as large as pre-nasal. Loral very narrow, as long as both nasals together, and longer than the post-frontals. One ante-orbital, sometimes a second very small one below; two post orbitals of about equal size. Two narrow and much elongated temporal shields just behind the post-orbitals, entirely filling the space between the seventh upper labial and the occipital; behind this, small scale-like temporal shields. Eight upper labials, seventh twice as large as any other. Fourteen lower labials, seventh largest. Dorsal scales in 29 to 31 rows all perfectly smooth; central rows not much smaller; outer row largest, but not as high as long.

Body whitish yellow above, with a dorsal series of transversely quadrate light olive brown blotches and two smaller lateral series on each side. Abdomen uniform clear whitish. The dorsal series of blotches are indistinctly edged white blackish; they cover three or four scales longitudinally and twelve or thirteen rows transversely, and are separated by regular intervals of one and a half scales of the ground color. The lateral blotches become more or less indistinct in age from a dark suffusion over the ground color. Each dorsal scale occupying a dark blotch is edged with lighter. In the young, the head above is light brown, with a blackish bar across the post-frontals and through the eyes to the angles of the mouth; there is also a dark blotch below the eye and some smaller ones on the crown posteriorly. In older specimens these markings become obsolete, leaving the head uniform light glossy olive brown.—(Kennicott.)

1705. Between Pecos river and Rio Grande. Dr. Kennerly.

SCOTOPHIS ALLEGHANIENSIS, B. & G.

Coluber alleghaniensis, HOLBROOK, N. Am. Herp. I, 1836, 111; pl. xx.—1st 2d ed. III, 1842, 85; pl. xix.

Scotophis alleghaniensis, B. & G. Catal. Serp. 1853, 73.

SPEC. CHAR.—Snout broad, rounded, much depressed. Vertical plate longer than broad. Superciliaries proportionally small. Anterior frontals large. Occipitals rather small. Loral, nasals and anterior upper labial less elevated than in *S. obsoletus* and *S. lindheimeri*. 25–27 dorsal rows, central rows elongated, moderately carinated. Entirely pitch black above. Abdomen slate colored posteriorly; yellow with quadrangular black blotches anteriorly. Sometimes lighter in the young, with dark dorsal blotches on a light ground.—(Kennicott.)

No. 2257. Fort Smith, Arkansas. H. B. Möllhausen.

SCOTOPHIS EMORYI, B. & G.

Scotophis emoryi, B. & G. Catal. Serpents, 1853, 157.

SPEC. CHAR.—Head narrow, elongated, widening suddenly behind the eyes. Snout elongated, narrow, elevated, obtuse; outline anterior to the eye subquadrangular. Crown flattened, eyes very large. Vertical plate much longer than wide, narrow posteriorly, much wider in front; superciliaries narrow. Loral large, trapezoidal, acutely angled behind. Dorsal rows 25–27, carinations very faint, barely perceptible on the central rows. Above ash grey with a dorsal series of transverse brown blotches, on each side of which are two others of smaller size; indistinct traces of a third. A frontal brown vitta passing back through the eye, and crossing the angle of the mouth on to the side of the neck. Two blotches on the upper labials which are not margined with black.—(Kennicott.)

No. 1716. Pecos to Rio Grande, Texas. Dr. C. B. Kennerly.

OPHIBOLUS EVANSII, Kennicott.

SPEC. CHAR.—Light olivaceous brown or grey, with a dorsal series of about sixty subquadrangular dark chestnut brown blotches, emarginate anteriorly and posteriorly, and two smaller lateral series on each side. Dorsal scales in 25 rows.—(Kennicott.)

No. 1702. Canadian river, Arkansas. H. B. Möllhausen.

OPHIBOLUS SPLENDIDUS, B. & G.

Ophibolus splendidus, B. & G. Catal. N. A. Serpents, 1853, 83.

SPEC. CHAR.—Black above; the sides black with a yellowish white spot on each scale. The body crossed by transverse bands consisting of yellowish white spots, one in each scale. Throat marked with black. Dorsal rows 23.—(Kennicott.)

No. 1709. Pecos to Rio Grande, Texas. Dr. C. B. R. Kennerly.

MASTICOPHIS TESTACEUS, B. & G.

Coluber testaceus, SAY, Long's Exped. II, 1823, 84 — HOLBROOK, N. Am. Herp. III, 1842, 63; pl. xiii.

Masticophis testaceus, B. & G. Catal. N. Am. Serp. 1853, 151.

Psammodphis flavigularis, HALLOWELL, Pr. A. N. Sc. VI, 1852, 178.

Masticophis flavigularis, B. & G. Catal. N. Am. Serp. 1853, 99.

SPEC. CHAR.—In alcohol, light dull yellow, tinged with brown above. Beneath, two longitudinal series of blotches, most distinct anteriorly. When the epidermis is removed, the whole animal appears of a soiled white. In life tinged with rose color; some specimens entirely brick red. Tail one-fifth of the total length. Dorsal rows 17.—(Kennicott.)

No. 1994. Pecos to Rio Grande. Dr. Kennerly.

LEPTOPHIS MAJALIS, B. & G.

Leptophis majalis, B. & G. Catal. N. A. Serp. 1853, 107.

SPEC. CHAR.—Reddish green above, yellowish white beneath. Body proportionally stouter and tail shorter than in *L. aestivus*. Snout and whole head, including vertical, longer than in latter species. Dorsal scales in 17 rows.

No. 1427. Fort Smith, Arkansas. Dr. Shumard.

DIADOPHIS DOCILIS, B. & G.

Diadophis docilis, B. & G. Catal. N. A. Serp. 1853, 114.

SPEC. CHAR.—Body above uniform ash grey; yellowish white beneath, sparsely spotted with black. A proportionately broad yellowish white occipital ring. Dorsal scales in 17 rows.—(Kennicott.)

No. 2078. Pecos to Rio Grande, Texas. Dr. Kennerly.

BUFO AMERICANUS, Leconte.

PLATE XXV, FIG. 2.

Bufo americanus, LECONTE, Holbrook's N. Am. Herpetology, V, 1842, 17; pl. iv.—GIRARD, in Reptiles U. S. B. S. 1859, 25; pl. xxxix, fig. 1-4.

SPEC. CHAR.—Head above grooved, a ridge from the snout to the occiput, hence at almost right angle to the tympanum. The ridge from either side is slightly diverging from before backwards. Skin upon the head thick, and adhering to the skull. Parotids sub-reniform. Tympanum well developed. A subgular vocal sac in the male sex. Limbs large and stout. First finger larger than the second. A large carpal corneous disk and a small one. No membranous fold at the inner lower edge of the tarsus. Toes semi-palmated. Two metatarsal tubercles, the internal large and spade-shaped, the external small and sub-conical. Large papilla on the back. Greenish or yellowish brown above, with scattered black patches or spots. A vertebral fuscous vitta or streak. Two black patches under the eye, occasionally spotted about the nostrils and over the jaws. Beneath dirty yellowish.—(Girard.)

2558, 2559. Fort Smith, Arkansas. Dr. Shumard.

BUFO NEBULIFER, Girard.

Bufo granulosus, B. & G. Pr. A. N. Sc. VI, 1852, 173. (Not of Spix.)
Bufo nebulifer, GIRARD, Pr. A. N. Sc. VII, May, 1854, 87.

SPEC. CHAR.—Upper surface of head deeply excavated or concave; concavity bordered with conspicuous ridges. Skin very thin and firmly adhering to the skull. Parotid small; eyes and tympanum rather large. Tongue moderate, broadest posteriorly. Upper jaw emarginated. Inner finger much longer than the second, which is longer than the fourth. Two well developed carpal disks. No membranous fold along the tarsus. Toes semi-palmated; two metatarsal tubercles. Palm of hands and sole of feet tuberculous. Yellowish brown with a dorsal broad streak of the same tint. An interocular black bar on either side of the dorsal streak extending to the whole length of the body. Sides maculated; upper part of limbs barred. Beneath unicolor in the adult, spotted in the young.—(Girard.)

2592. San Pedro, Texas.—2601. San Antonio. Dr. Kennerly.

BUFO WOODHOUSII, Girard.

PLATE XXV, FIG. 1.

Bufo dorsalis, HALLOWELL, Pr. A. N. Sc. VI, 1852, 181.—IB. Sitgreaves' Report, 1853, 142; pl. xix. (Not of Spix.)
Bufo woodhousii, GIRARD, Pr. A. N. Sc. VII, May, 1854, 86.

2632. Canadian river; and 2646. Antelope Hills. H. B. Möllhausen.

BUFO COGNATUS, Say.

PLATE XXVI.

Bufo cognatus, SAY, Long's Exped. II, 1823, 190.—HOLBROOK, N. Am. Herp. V, 1842, 21; pl. v.—B. & G. Macey's Report, 1853, 242; pl. xi.

Red river, Arkansas. *Bufo lentiginosus* is represented on Plate XXVII for comparison.

ACRIS CREPITANS, Baird.

Hylodes gryllus, DEKAY, N. Y. Zool. III, 1842, 70; pl. xxii, fig. 61. (Not of Leconte)
Acris crepitans, BAIRD, Pr. A. N. Sc. VII, 1854, 59.

SPEC. CHAR.—Brownish above. The median region of head and body above bright green; a dark triangle between the eyes. Three oblique blotches on the sides, nearly equidistant; the first behind the eye, the last on the flanks and running up on the

back; all usually margined with lighter. A narrow white line from the eye to the arm. Beneath yellowish white. Inferior face of thigh plain. Tibia a little more than half the length of the body; foot rather smaller. Head rather obtuse, scarcely longer than broad. Web of hind foot extending to the penultimate articulation of the fourth toe.

Fort Smith, Arkansas.—3270. Gypsum creek. Möllhausen.—3262. San Pedro, Texas. Dr. Kennerly.

RANA CATESBIANA, Shaw.—Bull Frog.

Rana catesbiana, SHAW, Gen. Zool. III, Amphibia, 1802, 106; pl. xxxiii.

Rana boans, LACEP. Hist. Nat. Quad. Ovip. 1793.

Rana pipiens, HARLAN, Sill. Am. Jour. X, 1825, 62.—HOLBROOK, N. Am. Herpet. IV, 1842, 77; pl. xviii. (Not of Linnæus.)

Fort Smith, Arkansas. Dr. Shumard.—3336. Shawnee village. H. B. Möllhausen.—3319. San Antonio. Dr. Kennerly.

RANA CLAMITANS, Daud.

Rana clamitans, DAUDIN, in Sonnini and Latreille, Hist. Rept. II, 1802, 157.—HOLBROOK, N. Am. Herp. IV 1842, 85; pl. xx.

Rana clamata, DAUDIN, Hist. Nat. Rept. VIII, 1803, 104.—DUM. Bib. Erp. Gen. VIII, 1841, 373.

Rana fontinalis, LECONTE, Ann. N. Y. Lyc. I, 1825, 281.—HOLBROOK, N. Am. Herp. IV, 1842, 87; pl. xxi.

Ranaria melanota, RAFINESQUE, Annals of Nature, 1820, No. 25.

Rana flavoviridis, HARLAN, Sill. Am. Jour. X, 1825, 58.

Rana horiconensis, HOLBROOK, N. Am. Herp. 1st ed. III, 1838, 91; pl. xviii.

Rana nigricans, AGASSIZ, Lake Superior, 1850, 379; pl. vi, figs. 4, 5.

Fort Smith, Arkansas. Lieutenant Whipple.

RANA HALECINA, Kalm.

Rana halecina, KALM.—DAUDIN, Hist. Nat. Rept. VIII, 1803, 122.—HOLBROOK, N. Am. Herp. IV, 1842, 91; pl. xci.

Rana pipiens, GMELIN, Syst. Nat. 1788, 1052.

Rana utricularis, HARLAN, in Silliman's Journal, X, 1825, 60.

3323. Fort Smith, Arkansas. Dr. Shumard.

RANA BERLANDIERI, Baird.

Rana berlandieri, BAIRD, Rep. Mex. Bound. Survey, II, 1859, Reptiles, 27; pl. xxxvi.

SPEC. CHAR.—Size large. Body stout, robust. Eye distant not quite one and a half times its diameter from tip of snout, and contained two and two-third times in the length of jaw from rictus. Tympanum two-thirds the diameter of the eye. A vocal vesicle on each side of the head. A glandular fold on each side the jaw, and another broad and depressed on each side of the body. Between these is one pair of ridges along the coccyx; several pairs more interrupted anterior to it. Skin corrugated and irregular, quite pustular in some specimens. Feet webbed from the bulb of the toes; web excavated on the inner edges; last joint of longest toe free. Femur about half the length of body, shorter than the tibia.

Color above greenish olive, with distant sub-circular blotches of darker, scarcely areolated in the preserved specimens. Beneath yellowish white, with brown mottlings on the throat. An indistinct whitish line on the side of the head, especially in the young; the lateral ridge bronzed.

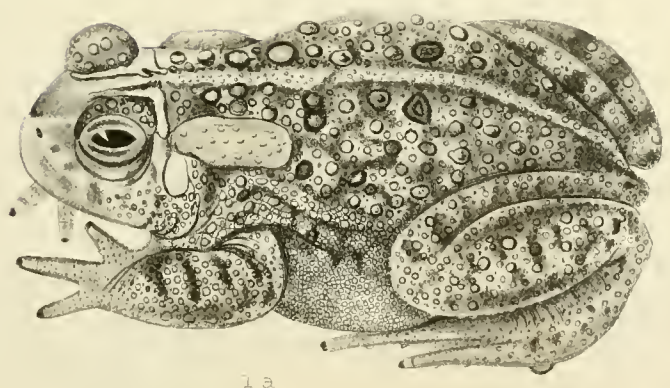
San Antonio to Fort Inge. Dr. Kennerly.

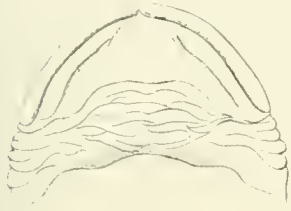
NECTURUS LATERALIS, Baird.

Triton lateralis, SAY, Long's Exped. R. Mts. I, 1823, 5.

Menobranchus lateralis, HARLAN, Ann. N. Y. Lyc. I, 1825, 221.—HOLBROOK, N. Am. Herp. III, 1842, 119; pl. xxx.

4058. Fort Smith, Arkansas. Dr. Shumard.





2 c



3 c



1 d



3 b



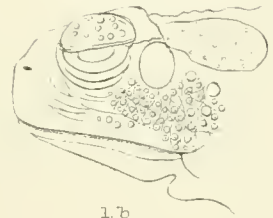
3 e



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3 f



1 b



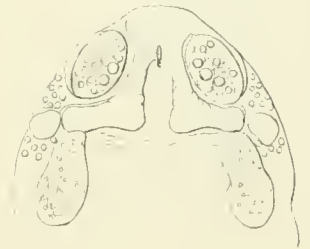
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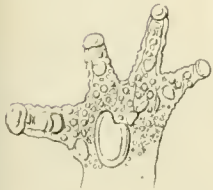
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1 c



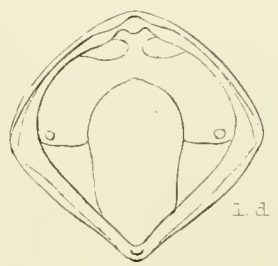
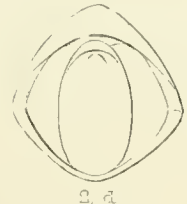
1 e



1 a



1 f



No. 5.

REPORT UPON FISHES COLLECTED ON THE SURVEY.

BY C. GIRARD, M. D.

1. *DIOPLITES NUECENSIS*, Gr d.—Trout, or River Bass.

GEN. REP. PAGE 4.¹

SPEC. CHAR.—Body elongated, sub-fusiform. Head constituting a little less than the third of the entire length. Posterior extremity of maxillary extending to a vertical line drawn posteriorly to the orbit. Scales on the cheeks nearly equal in size to those on the gill covers. Origin of ventrals posterior to the base of pectorals. Upper regions reddish brown, maculated. A lateral dark band. Inferior regions whitish, unicolor.

396, 401. Rio Blanco, Frio, Seco, and Medina, Leon river, Texas. Dr. C. B. Kennerly.

2. *AMBLOPLITES INTERRUPTUS*, Gr d.—The Perch of the San Franciscans.

GEN. REP. 10. PLATE II, FIGS. 1—4.

SPEC. CHAR.—Posterior extremity of maxillary reaching a vertical line drawn back of the pupil. Posterior margin of caudal fin sub-emarginated. Origin of anal fin opposite the eleventh ray of the dorsal. Interrupted dark bands on the sides. Two streaks diverging from the eye—one running towards the opercular spot, the other obliquely downwards.

280. San Francisco, California. Dr. C. B. Kennerly.

3. *CALLIURUS MELANOPS*, Gr d.

GEN. REP. 11. PLATE III.

SPEC. CHAR.—Mouth very large; cleft directly obliquely upwards. Posterior extremity of maxillary extending to a vertical line drawn posteriorly to the orbit. Eye large. Insertion of ventrals situated opposite the base of the pectorals, a little in advance of the origin of the dorsal; their tips not extending to the vent. Scales very large. Ground color reddish brown, with a blackish spot upon the centre of each scale. A black patch at the upper and posterior margin of the opercle. Soft portion of dorsal and anal spotted at their base.

281. Leon river, Texas.—373. Rio Medina, Texas. Dr. C. B. Kennerly.

4. *CALLIURUS DIAPHANUS*, Gr d.

GEN. REP. 13. PLATE IV, FIGS. 1—4.

SPEC. CHAR.—Mouth large; gape oblique upwards. Posterior extremity of maxillary extending to a vertical line drawn in advance of the pupil. Eye large. Insertion of ventrals situated posteriorly to the base of pectorals, and the origin of the dorsal; their tips overlapping the vent. Scales large. Greyish olive above; yellowish or whitish beneath. Soft portion of dorsal and anal fins provided with a black spot.

374. Rio Blanco, Texas. Dr. C. B. Kennerly.

5. *CALLIURUS FORMOSUS*, Gr d.

GEN. REP. 14. PLATE V, FIGS. 1—4.

SPEC. CHAR.—Mouth large; gape oblique upwards. Posterior extremity of maxillary extending to a vertical line passing beyond the middle of the pupil. Eye moderate. Insertion of ventrals situated under the base of pectorals and a little poste

¹ This reference is to the General Report on Fishes, (Part IV,) in the present volume.

riorly to the anterior margin of the dorsal, their tips reaching the vent. Scales moderate. Reddish brown above, spotted with black; greyish beneath. Soft portion of dorsal and anal fins provided with a black patch.

375. Tributary of Gypsum creek, Canadian. H. B. Möllhausen.

6. CALLIURUS LONGULUS, G r d .

GEN. REP. 16. PLATE V, FIGS. 5—8, and PLATE VI, FIGS. 5—8.

SPEC. CHAR.—Mouth moderate; gape oblique upwards. Posterior extremity of maxillary extending to a vertical line intersecting the pupil. Eyes moderate. Insertion of ventrals situated opposite the inferior edge of the base of the pectorals and posteriorly to the origin of the dorsal, their tips extending to the vent. Scales moderate. Reddish brown above; greyish beneath. Soft portion of dorsal and anal fins provided with a black patch.

407. Rio Seco, Texas. Dr. C. B. Kennerly.

7. CALLIURUS MICROPS, G r d .

GEN. REP. 17. PLATE IV, FIGS. 5—8.

SPEC. CHAR.—Mouth moderate; gape oblique upwards. Posterior extremity of maxillary extending to a vertical line drawn midway between the anterior rim of the orbit and the pupil. Eye small. Insertion of ventrals situated posteriorly to the base of pectorals and the origin of the dorsal; their tips not reaching the vent. Scales moderate. Reddish brown above, with centre of scales lighter; greyish beneath. Soft portion of dorsal provided with a black patch.

413 and 414. Rio Brazos, Texas. Dr. George G. Shumard.

8. BRYTTUS ALBULUS, G r d .

GEN. REP. 19. PLATE VI, FIGS. 1—4.

SPEC. CHAR.—Body sub-elliptical, rather contracted and deep. Nape convex, and snout sub-conical. Posterior extremity of maxillary extending to the anterior rim of the orbit. Insertion of ventrals situated posteriorly to the base of the pectorals and the anterior margin of the dorsal; their tips overlapping the vent. Scales rather large. Pale reddish brown, lighter beneath than above. Fins greyish olive; dorsal with a black patch.

421. Rio Blanco, Texas. Dr. C. B. Kennerly.

9. BRYTTUS SIGNIFER, G r d .

GEN. REP. 20. PLATE VII, FIGS. 5—8.

SPEC. CHAR.—Body contracted and deep. Nape convex, and snout sub-conical. Posterior extremity of maxillary extending to a vertical line drawn in advance of the pupil. Insertion of ventrals situated posteriorly to the base of pectorals and the origin of dorsal, their tips overlapping the vent. Scales moderate. Reddish brown, lighter beneath than above; dorsal and anal fins provided with a black patch.

422. Rio Medina, Texas. Dr. C. B. Kennerly.

10. BRYTTUS HUMILIS, G r d .

GEN. REP. 21. PLATE VII, FIGS. 9—24.

SPEC. CHAR.—Body sub-elliptical. Nape convex, and snout sub-conical. Posterior extremity of maxillary extending beyond the anterior rim of the orbit. Insertion of the ventrals situated posteriorly to the base of pectorals, and a little in advance of the origin of the dorsal, their tips overlapping the vent. Scales large. Reddish brown or dusky, maculated. Fins unicolor; dorsal sometimes blotched.

423—428. Near Rock Mary, Old Fort Arbuckle, Sugar-loaf creek, Arkansas. H. B. Möllhausen.

11. POMOTIS SPECIOSUS, B. & G.—The Southern Sunfish.

GEN. REP. 23. PLATE VIII, FIGS. 5—8.

SPEC. CHAR.—Body sub-elliptical in profile; head small, snout bluntly sub-conical; mouth small; posterior extremity of maxillary extending to the anterior rim of the orbit; inferior edge of preorbital bone, and limb of preopercle finely serrated, opercular flap small; spinous portion of dorsal fin elevated; anal spines well developed; caudal emarginated. Reddish brown, lighter beneath, young transversally banded; fins greyish or yellowish; a black patch upon the dorsal.

436 and 437. Rio Medina, Rio Seco, Texas. Dr. C. B. Kennerly.

12. POMOTIS HEROS, B. & G.

GEN. REP. 24. PLATE IX, FIGS. 13—16.

SPEC. CHAR.—Head, mouth, and eye larger than in *P. speciosus*; edge of preopercle inconspicuously serrated; pectorals projecting beyond the tips of ventrals; anal fin provided occasionally with a black patch, as well as the dorsal.

444. Rio Blanco, Texas. Dr. C. B. Kennerly.

13. POMOTIS AQUILENSIS, B. & G.

GEN. REP. 25. PLATE IX, FIGS. 1—4, and PLATE X, FIGS. 8—11.

SPEC. CHAR.—Body sub-elliptical in profile. Head moderate; snout bluntly sub-conical. Mouth moderate; posterior extremity of maxillary extending to a line intersecting the anterior rim of the orbit. Eye moderate. Edge of the preopercle slightly denticulated or serrated. Opercular flap variable, oftentimes elongated and well developed. Extremities of pectorals not extending as far back as those of the ventrals, which overlap the vent and reach the anterior margin of the anal fin. Reddish brown; fins greyish olive, unicolor; dorsal and anal provided with a black patch.

452, 455. Near San Pedro, Texas; near San Antonio, Texas; Leon river, Texas; Rio Blanco, Texas. Dr. C. B. Kennerly.—481. Sugar-loaf creek, Arkansas. H. B. Möllhausen.

14. POMOTIS FALLAX, B. & G.

GEN. REP. 27. PLATE VIII, FIGS. 9—12; PLATE IX, FIGS. 5—12, and PLATE X, FIGS. 1—7.

SPEC. CHAR.—Body sub-circular or sub-elliptical. Head moderate; snout bluntly sub-conical. Mouth large; posterior extremity of maxillary extending to the anterior rim of the pupil. Eye moderate. Edge of preopercle not crenated. Opercular flap very large, Spinous portion of dorsal fin of medium height; its origin situated opposite the base of the pectorals. Caudal emarginated posteriorly. Tips of ventrals extending to the anterior margin of the anal. Blackish or reddish brown; lighter beneath than above. Sides of head provided with bluish spots, sometimes confluent into irregular lines. A black patch upon the base of the dorsal fin.

463 and 464. Sans Bois creek and tributary of Gypsum creek, Canadian. H. B. Möllhausen.
465, 467. Rio Seco and Rio Medina, Texas. Dr. C. B. Kennerly.

15. CHIROPIS CONSTELLATUS, G r d.

GEN. REP. 42. PLATE XIX.

SPEC. CHAR.—Dorsal fins contiguous. Caudal fin posteriorly sub-concave. Anal exteriorly rounded, or convex. Scales on the middle of the flanks conspicuously larger than elsewhere. Greenish brown with groups of black dots on the anterior part of body and sides of head. Pectorals densely dotted with black.

263. San Francisco, California. Dr. C. B. Kennerly.

16. SEBASTES ROSACEUS, G r d.

GEN. REP. 78. PLATE XXI.

SPEC. CHAR.—Upper surface of head provided with horizontal and acute ridges. Posterior extremity of maxillary extending to a vertical line intersecting the pupil. Origin of dorsal fin situated in advance of the base of the pectorals. Uniform reddish, lighter beneath than above.

343. San Diego, California. Lieutenant W. P. Trowbridge.

17. AMBLODON GRUNNIENS, R a f i n.—Buffalo Perch, Grunting Perch, &c.

GEN. REP. 96. PLATE XXIII.

SPEC. CHAR.—Profile of the head depressed on the nape. Snout thick, blunt, and short. Posterior extremity of maxillary extending to a vertical line intersecting the anterior rim of the pupil. Extremities of pectorals almost even with the tips of ventrals, or else projecting slightly beyond them. First anal spine diminutive; second one stout and well developed. Caudal fin posteriorly convex. Color bluish-gray, lighter beneath than above. Fins grayish-olive; anal maculated.

621. Arkansas river, near Fort Smith.—624. Near mouth of Poteau river. Dr. George G. Shumard.

18. ATHERINOPSIS CALIFORNIENSIS, G r d.—California "Smelt."

GEN. REP. 103. PLATE XXIIc.

SPEC. CHAR.—Head small and sub-quadrangularly pyramidal, constituting the sixth of the entire length. Base of anal fin much longer than that of the second dorsal. Greyish brown above; light brown or silvery beneath. Fins olivaceous, unicolor.

353. San Francisco, California. Dr. C. B. Kennerly.

19. PORICHTHYS NOTATUS, G r d.

GEN. REP. 134. PLATE XXV.

SPEC. CHAR.—Upper surface of head quite flat. An acute preopercular spine stretching across the opercle. Posterior extremity of maxillary bone extending to a vertical line drawn posteriorly to the orbit. Four series of pores on either side of the body. A sub-gular and an abdominal series, as also several of those on the sides of the head. Upper regions dark bluish violet; sides and belly silvery grey. A sub-crescentic vitta beneath the eye.

520. San Francisco, California. Dr. C. B. Kennerly.

20. MORRHUA PROXIMA, G r d.

GEN. REP. 142. PLATE XLa, FIGS. 5—8.

SPEC. CHAR.—Snout sub-conical; thickish; upper jaw protruding beyond the lower one. Posterior extremity of maxillary bone extending to a vertical line which would intersect the pupil. Dorsal and anal fins all distinct from one another. Anterior anal longer than the second dorsal. Caudal fin posteriorly sub-truncated. Yellowish ash or brown above; sides and belly silvery white.

524. San Francisco, California. Dr. C. B. Kennerly.

21. PAROPHRYS VETULUS, G r d.

GEN. REP. 153.

SPEC. CHAR.—Body quite elongated and sub-elliptical; peduncle of the tail slender. Posterior extremity of maxillary extending to a vertical line drawn inwardly to the anterior rim of the orbit. Origin of anal fin placed posteriorly to the base of the pectorals. Dorsal and anal fins nearly even posteriorly. Scales minute; lateral line very conspicuous. Color of body and head reddish ash; fins olivaceous, maculated.

699. San Francisco, California. Dr. C. B. Kennerly.

22. PSETTICHTHYS SORDIDUS, G r d .

GEN. REP. 55. PLATE XLb.

SPEC. CHAR.—Body elongated and sub-elliptical. Eyes large, situated on the left side; interocular space very narrow. Jaws nearly even when mouth is closed. Posterior extremity of the maxillary extending to a vertical line intersecting the pupil. Anterior rays of dorsal fin gradually increasing in height. Dorsal and anal fins nearly even posteriorly. Origin of anal situated on a line passing immediately behind the base of the pectorals, and preceded by a very small spine. Scales moderate sized; lateral line almost straight from head to tail. Ground color of a soiled yellow; the scales being margined with black.

702. San Francisco, California. Dr. C. B. Kennerly.

23. GLYPHISODON RUBICUNDUS, G r d .

GEN. REP. 161. PLATE XXIV.

SPEC. CHAR.—Body very deep and sub-elliptical in profile. Head moderate; mouth and eye small. Opercular scales very large. Spinous portion of dorsal fin very low; soft portion of dorsal and anal sub-lanceolated. Posterior margin of caudal deeply emarginated, the lobes being rounded off. Tips of ventrals reaching the vent. Lateral line ending under the soft portion of the dorsal fin. Color uniform deep crimson

484. Monterey, California. Lt. W. P. Trowbridge. 930, (by error 868.) San Diego, California. Lt. W. P. Trowbridge.

24. EMBIOTOCA LINEATA, G r d .

GEN. REP. 174. PLATE XXXI & PLATE XXVI, FIGS. 5 & 6.

SPEC. CHAR.—Body sub-elliptically elongated. Anal fin elongated, with external margin nearly straight, diminishing gradually in depth posteriorly, its origin being opposite to the sixth articulated ray of the dorsal. Tip of pectorals reaching a vertical line intersecting the base of last but one dorsal spine. Eyes of medium size. Posterior extremity of maxillary even with the vertical of anterior rim of orbit. Frontal region slightly depressed above the eyes. Branchiostegals five in number. Sixty-two scales in lateral line. Ground color of upper region dark olive or reddish brown; reddish yellow beneath. Sides of abdomen with light longitudinal stripes intersecting the point of union of the rows of scales. Anal deep purple, with a yellowish vitta at its base.

537. San Francisco, California. Dr. C. B. Kennerly.

25. HOLCONOTUS RHODOTERUS, A g a s s .

GEN. REP. 193. PLATE XXXV; PLATE XXXVI, FIGS. 1—4, and PLATE XXVI, FIGS 7 & 8.

SPEC. CHAR.—General form elongated, neither elliptical nor fusiform. Frontal region sub-concave. Head sub-conical; mouth small; posterior extremity of maxillary not quite reaching the vertical of anterior rim of orbit. Eyes rather large and circular. Branchiostegals, five. About forty-four scales in lateral line. Bluish grey or olive above, silvery or yellow upon the sides, with rose colored spots disposed in longitudinal series.

565 and 566. Presidio, California. Lt. Wm. P. Trowbridge.

26. AMPHISTICHUS ARGENTEUS, A g a s s .

GEN. REP. 201. PLATE XXXIX.

SPEC. CHAR.—General form sub-elliptical, more convex above than below. Snout anteriorly rounded. Posterior extremity of maxillary reaching a vertical line passing behind the pupil. Anterior anal spines rather large. Sixty-eight scales in lateral line. Branchiostegals, six. Bluish grey above, sides silvery with indistinct olivaceous transverse bands. Vertical fins and ventrals olivaceous; pectorals yellowish.

558. San Francisco, California. Dr. C. B. Kennerly.

27. PIMELODUS CATULUS, G r d .

GEN. REP. 208. PLATE XII, FIGS. 4—6.

SPEC. CHAR.—Head very much depressed, constituting a little less than the fourth of the total length. Jaws equal; mouth of medium size. Eye rather small, sub-circular; its diameter entering about six and a half times in the length of the side of the head, and four times over the interocular space. The base of the anal enters five times in the total length. Caudal posteriorly sub-truncated, and constituting the sixth of the total length. Pectoral spines serrated upon their inner and outer aspects.

926 and 927. Fort Smith, Arkansas. Dr. Geo. G. Shumard.

28. PIMELODUS ANTONIENSIS, G r d .

GEN. REP. 209.

SPEC. CHAR.—Head quite depressed, nearly wedge-shaped, constituting about the fourth of the total length. Upper jaw longest; mouth large. Eye small, sub-elliptical; its diameter entering about eight times in the length of the side of the head, and somewhat over four times in the interocular space. Dorsal spine slender, slightly serrated posteriorly. Base of anal fin somewhat longer than the head. Caudal fin posteriorly rounded, forming a little less than the sixth of the total length. Pectoral spine serrated upon its inner edge. Reddish brown above; whitish beneath.

923. Near San Antonio, Texas. Dr. C. B. Kennerly.

29. PIMELODUS FELINUS, G r d .

GEN. REP. 209.

SPEC. CHAR.—Head very much depressed, entering four and a half times in the total length. Mouth large; jaws equal. Eye moderate, sub-circular; its diameter being comprised about six times in the length of the side of the head, and about thrice on the interocular space. Dorsal spine slender, posteriorly serrated. Base of anal fin entering four times and one-third in the total length. Caudal rounded off posteriorly, forming the sixth of the total length. Pectoral spines serrated upon their inner and outer edges.

924. Trib. of Gypsum creek, Canadian. H. B. Möllhausen.—925. Coal creek, Arkansas. H. B. Möllhausen.

30. MOXOSTOMA CLAVIFORMIS, G r d .

GEN. REP. 219. PLATE XLVIII, FIGS. 5—9.

SPEC. CHAR.—Head constituting the fifth of the total length. Mouth rather small; lips conspicuously plaited or ridged. Eye moderate sized, circular; its diameter contained about four times in the length of the side of the head. Anterior margin of dorsal fin nearer the snout than the base of the caudal. Ventrals inserted opposite the fifth ray of the dorsal. Caudal fin posteriorly concave. Anal fin narrow and deep. Scales much longer than deep, very much imbricated. Yellowish brown, rather dusky along the dorsal region.

165. Coal creek, tributary of South Fork of Canadian. H. B. Möllhausen.

31. DIONDA PLUMBEA, G r d .

GEN. REP. 228. PLATE LII, FIGS. 21—25.

SPEC. CHAR.—Body elongated, sub-fusiform, compressed. Head sub pyramidal, anteriorly blunt, constituting the fifth of the total length. Gape of mouth slightly arched, its angle not extending as far as a vertical line drawn in front of the orbit. The eye is large, sub-circular. The caudal fin enters about six times in the total length. Insertion of ventrals situated slightly backwards of the anterior margin of the dorsal. Scales moderate sized, deeper than long. Greyish brown above; whitish or yellowish beneath, with a black spot at the base of the caudal.

35. Head waters of Canadian river. H. B. Möllhausen.

32. DIONDA SPADICEA, Grd.

GEN. REP. 229. PLATE LII, FIGS. 26—30.

SPEC. CHAR.—Body slender and sub-fusiform, compressed. Head sub-conical, constituting about the sixth of the total length. Gape of mouth very slightly arched, its angle not reaching a vertical line drawn in advance of the orbit. Eye moderate, sub-circular. Caudal entering about five times in the total length. Insertion of ventrals situated under the anterior margin of the dorsal. Scale moderate sized, somewhat longer than deep. Reddish brown above; dull whitish beneath, with a black spot at the base of the caudal.

34. Fort Smith, Arkansas. H. B. Möllhausen.

34. DIONDA GRISEA, Grd.

GEN. REP. 230. PLATE LII, FIGS. 6—10.

SPEC. CHAR.—Body rather deep upon its middle; greatest depth nearly equal to the length of the head. Head sub-conical and slender, contained five times and a half in the total length; snout tapering; gape of mouth nearly horizontal, its angle being far from reaching a vertical line drawn in advance of the orbit. Eye moderate, sub-circular. Caudal fin entering nearly five times and a half in the total length. Insertion of ventrals situated somewhat posteriorly to the anterior margin of the dorsal. Scales moderate sized, deeper than long. Reddish ash above; olivaceous beneath; fins unicolor.

931. Twenty miles west of Choctaw agency. H. B. Möllhausen.

35. HYBORHINCHUS PERSPICUUS, Grd.

GEN. REP. 231. PLATE LII, FIGS. 16—20.

SPEC. CHAR.—Head constituting about the fifth of the total length. Eye sub-elliptical, its diameter entering three times in the length of the side of the head. Greatest depth of the body nearly equal to the length of the head. Caudal fin entering five times and a half in the total length. Insertion of ventrals situated under the anterior margin of the dorsal. Scales anteriorly sub-truncated. Reddish brown above, sulphur yellow beneath; lateral line minutely dark spotted. A black spot at the base of the caudal, and at the anterior margin of the dorsal also.

144. Arkansas river, near Fort Smith. Dr. George G. Shumard.

36. HYBORHYNCHUS PUNICEUS, Grd.

GEN. REP. 232. PLATE LII, FIGS. 1—5 and FIGS. 11—15.

SPEC. CHAR.—Head constituting the fifth of the total length. Eye sub-circular; its diameter entering three times and a half in the length of the side of the head. Greatest depth of body less than the length of the head. Caudal fin entering six times in the total length. Insertion of ventrals situated somewhat posteriorly to the anterior margin of the dorsal. Scales rounded upon their anterior edge. Uniformly pale red, lighter beneath than above; fins olivaceous.

145. Antelope creek, tributary of Canadian. Dr. Kennerly.—146. Llano Estacado. H. B. Möllhausen.

37. HYBORHYNCHUS TENELLUS, Grd.

GEN. REP. 231.

SPEC. CHAR.—Head entering about five times and a half in the total length. Eye large, sub-circular, its diameter being contained somewhat over three times in the length of side of head. Greatest depth of the body less than the length of head. Caudal fin constituting about the sixth of the total length. Insertion of ventrals situated somewhat in advance of the anterior margin of the dorsal. Reddish brown above; yellowish beneath.

143. Twenty miles west of Choctaw agency. H. B. Möllhausen.

38. HYBORHYNCHUS CONFERTUS, G r d .

GEN. REP. 233. PLATE LIX, FIGS. 11—15.

SPEC. CHAR.—Head constituting the fifth of the total length. Eye sub-circular; its diameter entering nearly four times in the length of the side of the head. Greatest depth of the body more than the length of the head. Caudal fin entering five times in the total length. Insertion of ventral fins situated opposite the anterior margin of the dorsal. Scales rounded upon their anterior edge also. Pale reddish above; yellowish beneath. A black spot at the anterior margin of the dorsal. Peduncle of tail with a dark streak along its middle.

147. Hurrah creek, tributary of Rio Pecos. H. B. Möllhausen.

39. HYBOGNATHUS ARGYRITIS, G r d .

GEN. REP. 235. PLATE LIII, FIGS. 5—8.

SPEC. CHAR.—Body sub-fusiform in profile. Head sub-conical, contained five times and a half in the total length. Eye large and sub-circular. Anterior margin of dorsal fin nearer the extremity of the snout than the base of the caudal. Insertion of ventrals equidistant between the two points just alluded to in reference to the dorsal. Caudal fin entering four times and a half in the total length. Scales anteriorly sub-truncated. Olivaceous brown above, yellowish beneath, with a silvery streak along the middle of the flanks. Fins unicolor, greyish olive.

86. Arkansas river, near Fort Smith. Dr. George G. Shumard.

40. GOBIO VERNALIS, G r d .

GEN. REP. 249.

SPEC. CHAR.—Head contained about five times and a half in the entire length, in which the caudal fin enters four times. Eye large, sub-circular; its diameter entering three times and a half in the length of the side of the head. Body sub-fusiform, rather thick anteriorly; anterior margin of dorsal fin nearer the extremity of the snout than the insertion of the caudal. Tip of pectorals not extending as far as the origin of the ventrals; tip of ventrals extending to the anterior edge of the vent. Yellowish brown; sides silvery.

78. Arkansas river, near Fort Smith. Dr. George G. Shumard.

41. LEUCOSOMUS PALLIDUS, G r d .

GEN. REP. 251. PLATE LXI, FIGS. 6—10.

SPEC. CHAR.—Head moderate sized, rather elongated, entering four times and a half in the total length. Snout sub-conical and tapering. Eye moderate; its diameter being contained five times in the length of the side of the head. Gape of mouth somewhat oblique; posterior extremity of the maxillary extending to a vertical line intersecting the anterior rim of the pupil. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Insertion of ventrals situated somewhat in advance of the anterior edge of the dorsal. Greyish brown above, yellowish white beneath; a black spot at the base of the caudal and anterior edge of the dorsal fin.

157. Antelope creek, tributary of Canadian. Dr. C. B. Kennerly.

42. LEUCOSOMUS INCRASSATUS, G r d .

GEN. REP. 252. PLATE LXI, FIGS. 1—6.

SPEC. CHAR.—Head rather large, sub-conical, constituting about the fourth of the total length. Eye moderate sized; its diameter entering a little over five times in the length of the side of the head. Gape of the mouth slightly oblique; posterior extremity of maxillar bone reaching a vertical line drawn within the anterior rim of the orbit. Anterior margin of dorsal fin equidistant between the fork of the caudal and the extremity of the snout. Insertion of ventrals situated in advance of the anterior edge of the dorsal. Dark greyish above, light greyish beneath, with a black spot at the anterior edge of the dorsal. Other fins unicolor, light yellowish olive.

156. Twenty miles west of Choctaw agency. H. B. Möllhausen.

43. EXOGLOSSUM MIRABILE, G r d .

GEN. REP. 256. PLATE LVI, FIGS. 5—8.

SPEC. CHAR.—Head sub-conical, blunt, and constituting the sixth of the total length. Mouth small; posterior extremity of maxillar bone even with a vertical line drawn across the nostrils. Eye sub-circular; its diameter entering four times in the length of the side of the head. Anterior margin of dorsal much nearer the extremity of the snout than the base of the caudal. Insertion of ventrals placed somewhat posteriorly to the anterior margin of the dorsal, their tip nearly reaching the vent. Reddish brown above; middle of flanks with a silvery band; beneath light reddish.

47. Arkansas river, near Fort Smith. Dr. George G. Shumard.

44. CLIOLA VIVAX, G r d .

GEN. REP. 258.

SPEC. CHAR.—Head contained somewhat over five times in the total length. Eye moderate; its diameter entering three times and a half in the length of the side of the head. Posterior extremity of maxillar bone not reaching a vertical line drawn in front of the orbit. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Yellowish with an obsolete greyish streak along the middle of the flanks, and a black spot at the base of the caudal.

30. Leon river, Texas. Dr. C. B. Kennerly.

45. ALBURNELLUS DILECTUS, G r d .

GEN. REP. 259. PLATE LVII, FIGS. 9—12.

SPEC. CHAR.—Head forming a little more than the sixth of the total length. Posterior extremity of maxillar bone reaching a vertical line drawn at the anterior rim of the orbit. Diameter of eye entering three times in the length of the side of the head. Anterior margin of dorsal fin somewhat nearer the fork of the caudal than the extremity of the snout. Insertion of ventrals nearer the extremity of the snout than the base of the caudal fin. Pectorals slender, though far from reaching the insertion of the ventrals. Reddish yellow, with a lateral silvery streak.

71. Arkansas river, near Fort Smith. Dr. George G. Shumard.

46. ALBURNELLUS UMBRATILIS, G r d .

GEN. REP. 260.

SPEC. CHAR.—Head constituting about the fifth of the whole length. Posterior extremity of the maxillary extending to a vertical line drawn at the anterior rim of the orbit. Diameter of the eye entering three times and a half in the length of the side of the head. Anterior margin of dorsal fin nearer the extremity of the snout than the fork of the caudal. Insertion of ventrals nearer the extremity of the snout than the base of the caudal. Pectorals not reaching the insertion of the ventrals. Dorsal region greyish brown; flanks silvery grey; belly reddish yellow.

73. Sugar-loaf creek, Arkansas. H. B. Möllhausen.

47. ALBURNOPS BLENNIUS, G r d .

GEN. REP. 261. PLATE LVII, FIGS. 13—16.

SPEC. CHAR.—Head constituting the fifth of the entire length. Snout blunt and abbreviated; lower jaw shorter than the upper; posterior extremity of maxillar bone extending to a vertical line drawn within the anterior rim of the orbit. Anterior margin of dorsal fin nearer the extremity of the snout than the insertion of the caudal. Insertion of ventrals situated slightly behind the anterior edge of the dorsal; their tips approximating the vent. Reddish brown, darker above than beneath, silvery on the sides; fins unicolor.

67. Arkansas river, near Fort Smith. Dr. George G. Shumard.

48. ALBURNOPS SHUMARDI, Grd.

GEN. REP. 261. PLATE LVII, FIGS. 1—4.

SPEC. CHAR.—Head constituting the fifth of the total length. Snout sub-conical, lower jaw shorter than the upper. Posterior extremity of the maxillary reaching a vertical line drawn across the anterior rim of the pupil. Anterior margin of dorsal fin equidistant between the extremity of the snout and the insertion of the caudal. Insertion of ventrals situated slightly behind the anterior margin of the dorsal; their tips approximating the vent. Reddish brown; flanks silvery.

68. Arkansas river, near Fort Smith. Dr. George G. Shumard.

49. ALBURNOPS ILLECEBROSUS, Grd.

GEN. REP. 262. PLATE LVII, FIGS. 5—8.

SPEC. CHAR.—Head contained five times and a half in the total length. Snout sub-conical; lower jaw shorter than the upper. Posterior extremity of maxillary bone extending to a vertical line drawn in front of the orbit. Anterior margin of dorsal fin equidistant between the extremity of the snout and the insertion of the caudal. Insertion of ventrals situated somewhat in advance of the anterior edge of the dorsal; their tips reaching the vent. Reddish brown, lighter beneath than above, with the middle of the flanks silvery; fins unicolor.

66. Arkansas river, near Fort Smith. Dr. George G. Shumard.

50. CYPRINELLA UMBROSA, Grd.

GEN. REP. 266. PLATE LVIII, FIGS. 1—5.

SPEC. CHAR.—Body rather short; back very much arched. Peduncle of tail robust. Head constituting more than the fifth of the total length. Eye well developed and circular; its diameter entering four times in the length of the side of the head. Posterior extremity of maxillary reaching a vertical line drawn in front of the orbit. Anterior margin of dorsal fin equidistant between the tip of the snout and the insertion of the caudal. Origin of ventrals situated slightly in advance of the anterior margin of the dorsal. Pectorals moderate. Greyish red above; greyish yellow beneath. Fins unicolor.

133. Twenty miles west of Choctaw agency. H. B. Mollhausen.—134. Coal creek, Arkansas, H. B. Mollhausen.

51. CYPRINELLA SUAVIS, Grd.

GEN. REP. 268.

SPEC. CHAR.—Body rather short, sub-fusiform in profile; back slightly arched. Head constituting the fifth of the entire length. Diameter of eye entering nearly four times in the length of the side of the head. Gape of the mouth oblique. Posterior extremity of maxillary bone extending to a vertical line drawn behind the nostrils. Anterior margin of dorsal fin nearer the insertion of the caudal than the tip of the snout. Origin of ventrals situated somewhat in advance of the dorsal. Pectorals slender and elongated. Yellowish brown, lighter beneath than above; middle of flanks metallic white. Fins unicolor.

138. Near San Antonio, Texas. Dr. C. B. Kennerly.

52. CYPRINELLA LEPIDA, Grd.

GEN. REP. 268. PLATE LVIII, FIGS. 21—25.

SPEC. CHAR.—Body elongated, sub-fusiform. Peduncle of the tail robust. Head contained four times and a half in the total length. Eye well developed; its diameter entering four times in the length of the side of the head. Snout rather blunt; gape of mouth somewhat arched; posterior extremity of the maxillary extending to a vertical line drawn before the orbit. Anterior margin of dorsal fin nearer the insertion of the caudal than the tip of the snout. Origin of ventrals placed slightly in advance of the dorsal. Pectorals moderate. Reddish ash above; pale sulphur yellow beneath. Fins unicolor.

126. Rio Frio, Texas. Dr. C. B. Kennerly.

53. CYPRINELLA NOTATA, Gr d.

GEN. REP. 269. PLATE LVIII, FIGS. 16—20.

SPEC. CHAR.—Body elongated, sub-fusiform. Peduncle of the tail rather slender. Head constituting the fifth of the total length. Eye moderate sized; its diameter entering about three times and a half in the length of the side of the head. Snout anteriorly blunt; gape of mouth slightly arched; posterior extremity of maxillar bone reaching to a vertical line drawn behind the nostrils. Anterior margin of dorsal fin somewhat nearer the insertion of the caudal than the tip of the snout. Origin of ventrals placed in advance of the anterior margin of the dorsal. Pectorals small. Reddish brown above; yellowish beneath; a jet black spot at the base of the caudal; fins otherwise unicolor.

136. Rio Seco, Texas. Dr. C. B. Kennerly.

54. CYPRINELLA WHIPPLII, Gr d.

GEN. REP. 270. PLATE LVIII, FIGS. 6—10.

SPEC. CHAR.—Body elongated and sub-fusiform. Peduncle of the tail stoutish. Head constituting the fifth of the entire length. Eye rather large; its diameter entering nearly four times in the length of the side of the head. Snout sub-conical and tapering; gape of the mouth nearly horizontal; posterior extremity of maxillar bone corresponding to a vertical line drawn at the anterior rim of the orbit. Anterior margin of dorsal fin nearer the insertion of the caudal than the tip of the snout. Origin of ventrals situated under the anterior edge of the dorsal. Pectorals and ventrals slender. Reddish brown above; golden yellow beneath; a black patch at the posterior margin of the dorsal fin.

137. Sugar-loaf creek, Arkansas. H. B. Möllhausen.

55. MONIANA LUTRENSIS, Gr d.

GEN. REP. 272.

SPEC. CHAR.—Body sub-fusiform, elongated; back slightly convex. Head contained three times and a half in the total length. Eye moderate, sub-circular; its diameter entering four times in the length of the side of the head. Jaws equal; posterior extremity of maxillar bone not reaching a vertical line drawn at the anterior rim of the orbit. Anterior margin of dorsal fin equidistant between the tip of the snout and the base of the caudal. Insertion of ventrals situated in advance of the anterior edge of the dorsal. Pectorals slender; their tips not reaching quite the origin of the ventrals. Bluish black or brown; dorsal fin yellowish brown; other fins reddish.

107. Tributary of Gypsum creek, Canadian river. H. B. Möllhausen.

56. MONIANA LEONINA, Gr d.

GEN. REP. 273. PLATE LIX, FIGS. 6—10.

SPEC. CHAR.—Body rather short and deep. Head constituting about the fifth of the total length. Snout sub-conical; jaws equal; posterior extremity of maxillar bone extending to a vertical line drawn behind the nostrils. The eye is moderate sized; its diameter entering four times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the tip of the snout and the insertion of the caudal. Insertion of ventrals situated slightly in advance of the dorsal. Pectorals and ventrals moderately developed. Greyish brown above; white or dull yellowish beneath.

115. Leon river, Texas. Dr. C. B. Kennerly.

57. MONIANA DELICIOSA, Gr d.

GEN. REP. 274.

SPEC. CHAR.—Body slender and elongated. Head constituting the fifth of the total length. Snout sub-conical; upper jaw overlapping the lower. Posterior extremity of the maxillary extending to a vertical line drawn between the nostrils and the orbit. Eye large and circular; its diameter entering three times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the tip of the snout and the insertion of the caudal. Pectorals and ventrals slender and of moderate development. Reddish brown above; yellowish beneath; middle of flanks silvery.

119. Leon river, tributary of Rio San Antonio, Texas. Dr. C. B. Kennerly.

58. *MONIANA LAETABILIS*, Gr d.

GEN. REP. 275.

SPEC. CHAR.—Body elongated, sub-fusiform. Head contained four times and a half in the total length. Snout sub-conical; jaws equal. Posterior extremity of maxillary bone extending to a vertical line drawn in front of the orbit. Eye large and circular; its diameter entering a little over three times in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the tip of the snout. Pectorals and ventrals well developed. Reddish brown above; sides silvery; beneath yellowish.

120. Hurrah creek, tributary of Rio Pecos. H. B. Möllhausen.

59. *MONIANA PULCHELLA*, Gr d.

GEN. REP. 275. PLATE LVIII, FIGS. 11—15.

SPEC. CHAR.—Body rather short and deep. Head constituting the fifth of the whole length. Snout sub-conical; upper jaw overlapping slightly the lower one. Posterior extremity of the maxillary extending to a vertical line drawn behind the nostrils. Eye moderate sized and circular; its diameter entering three times and a half, or a little more, in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Ventrals and pectorals of moderate development. Reddish brown above, silvery upon the sides, and brownish yellow beneath. Fins unicolor.

121. Arkansas river, near Fort Smith. Dr. Geo. G. Shumard.

122. Sugar Loaf creek, tributary of Poteau river. H. B. Möllhausen.

60. *MONIANA FRIGIDA*, Gr d.

GEN. REP. 276. PLATE LIX, FIGS. 16—20.

SPEC. CHAR.—Body somewhat elongated, sub-fusiform. Peduncle of tail stoutish. Head constituting a little less than the fifth of the entire length. Snout sub-conical; upper jaw overlapping the lower. Posterior extremity of the maxillary extending to a vertical line drawn behind the nostrils. Eye moderate sized and circular; its diameter entering nearly four times in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the tip of the snout. Horizontal fins of moderate development. Reddish brown above; yellowish or whitish beneath.

99. Rio Frio, tributary of Rio Nueces, Texas. Dr. C. B. Kennerly.

61. *LUXILUS SECO*, Gr d.

GEN. REP. 281.

SPEC. CHAR.—Body rather elongated, sub-fusiform in its outline. Head small, contained five times and a half in the total length. Snout sub-conical, rather abbreviated. Gape of the mouth slightly oblique; posterior extremity of maxillary extending to a vertical line intersecting the anterior nostril. Eye very large, sub-circular; its diameter entering about three times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the extremity of the snout and the fork of the caudal. Vertical fins moderately developed; pectorals and ventrals rather small. Light reddish brown above; yellowish white beneath. Fins light olive.

60. Rio Seco, tributary of Rio Nueces, Texas. Dr. C. B. Kennerly.

62. *LUXILUS LUCIDUS*, Gr d.

GEN. REP. 282. PLATE LX, FIGS. 9—12.

SPEC. CHAR.—Body rather elongated, sub-fusiform in its outlines. Head moderate sized, contained five times in the total length. Snout sub-conical, tapering; gape of the mouth somewhat oblique; posterior extremity of maxillary bone extending to a vertical line drawn in front of the orbit. Eye well developed; its diameter entering three times and a half in the length of the side of the head. Anterior margin of dorsal fin somewhat nearer the tip of the snout than the insertion of the caudal. Greyish brown above; yellowish beneath. Fins unicolor, assuming the tint of the region to which they belong.

55. Coal creek, tributary of Canadian river.—56. Twenty miles west of Choctaw agency. H. B. Möllhausen.

63. MELETTA CŒRULEA; Grd.

GEN. REP. 330. PLATE LXXV, FIGS. 5—7.

SPEC. CHAR.—Body slender, elongated, sub-fusiform in profile. Head constituting more than the fifth of the total length. Posterior extremity of maxillar bone extending to a vertical line drawn through the middle of the orbit. Eye large and sub-circular; its diameter entering four times and a half in the length of the side of the head. Anterior margin of dorsal fin nearer the extremity of the snout than the insertion of the caudal. Base of anal fin entering about ten times in the total length. Insertion of ventrals opposite the posterior third of the base of the dorsal fin. Bluish black above; yellowish or whitish beneath, with metallic reflects. Fins unicolor.

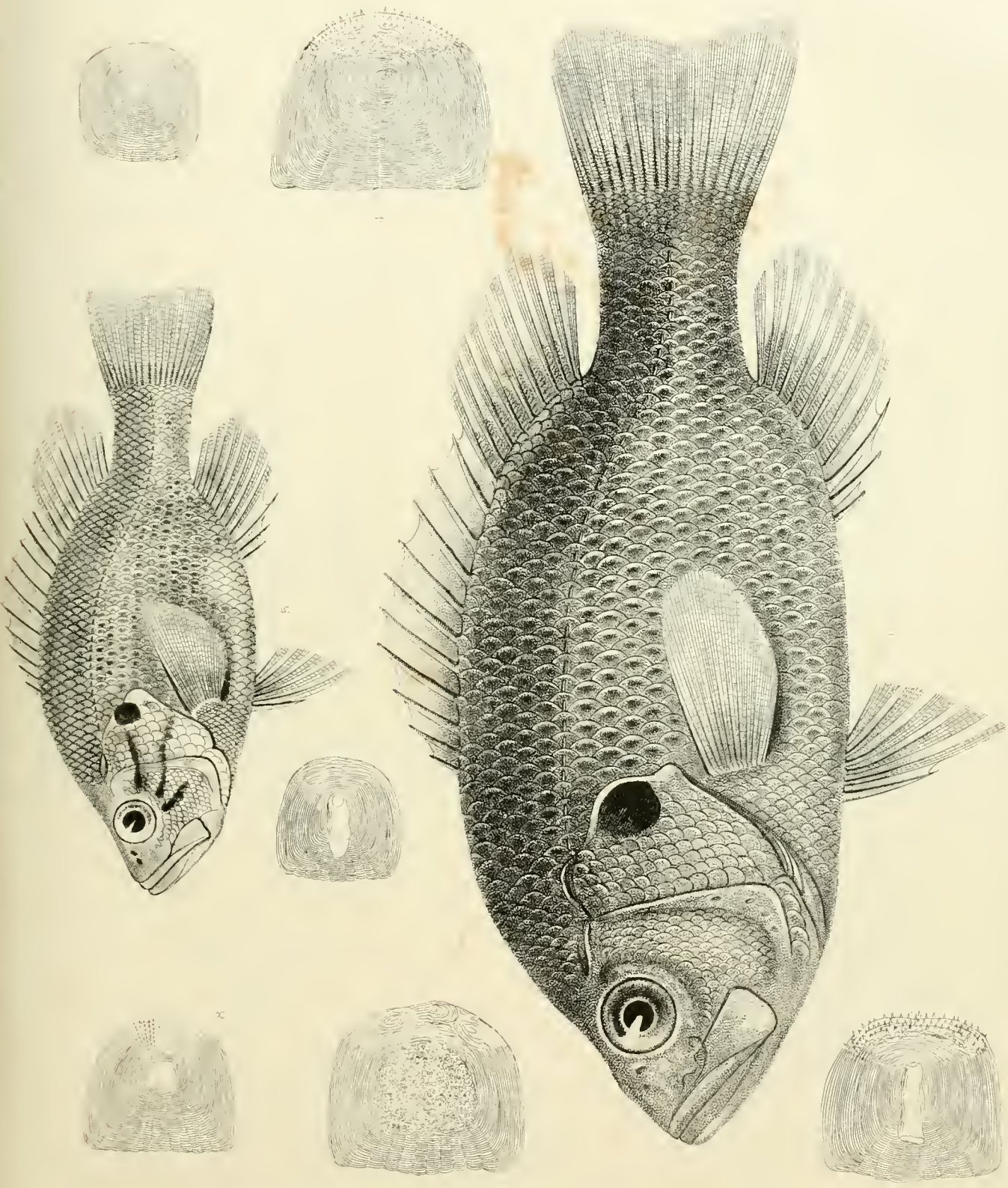
956. San Francisco, California. Dr. C. B. Kennerly.

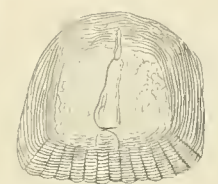
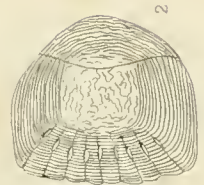
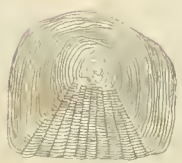
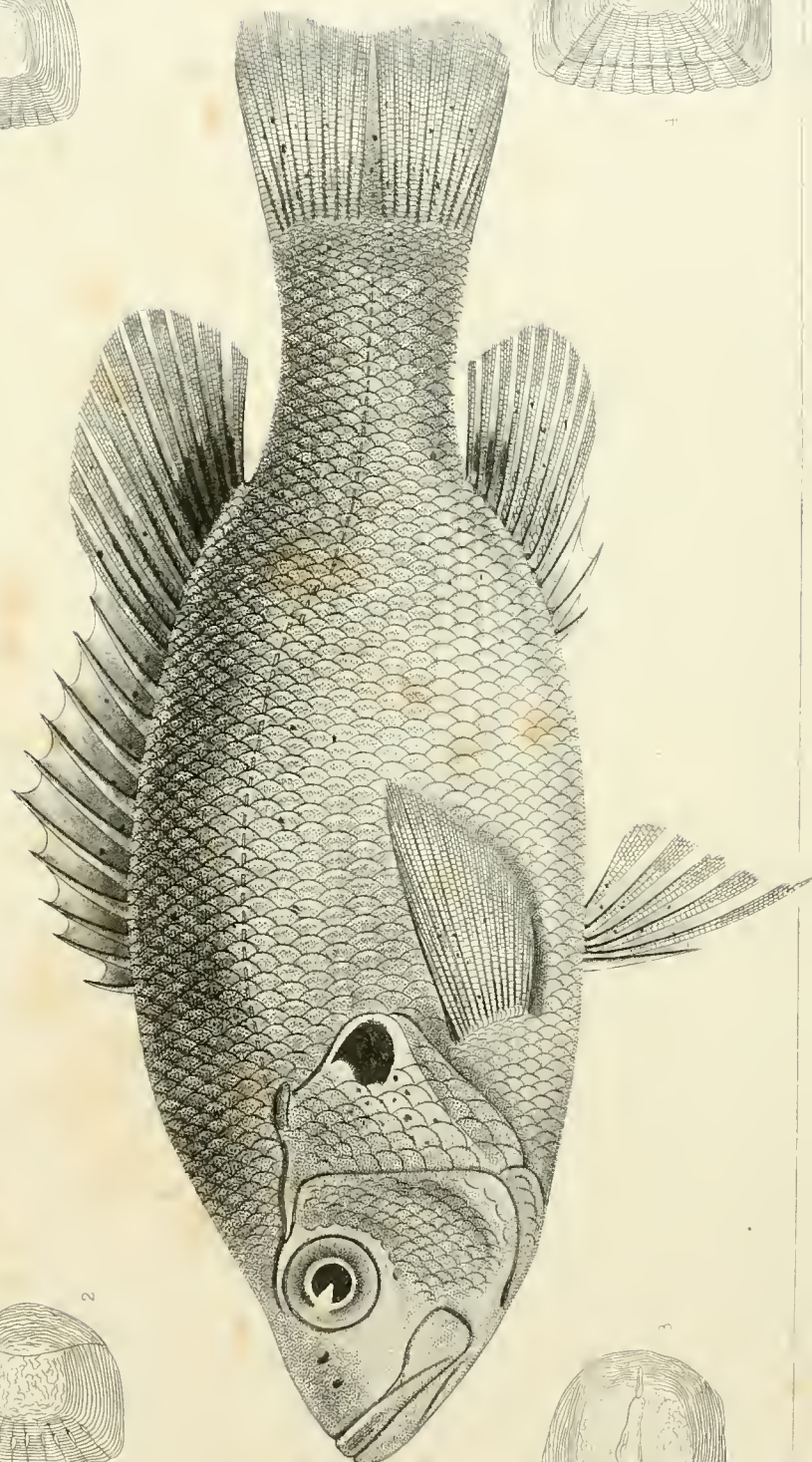
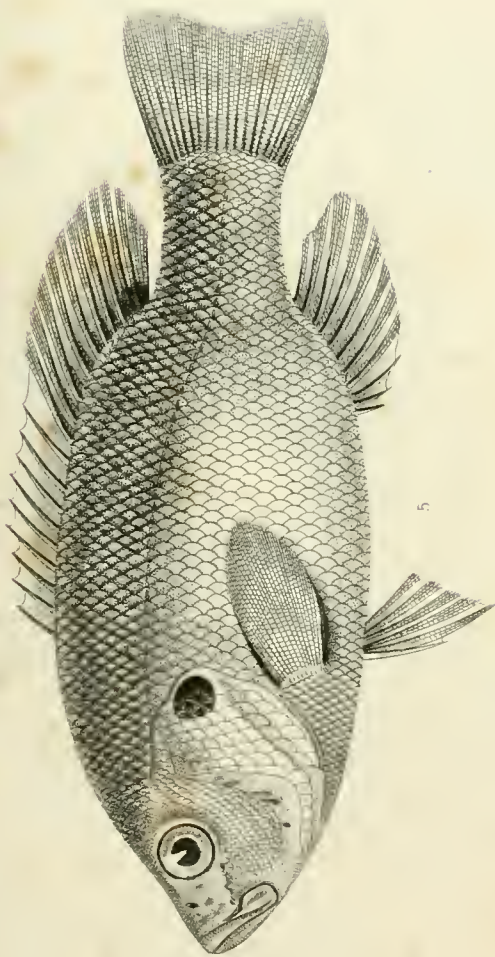
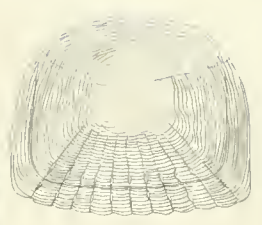
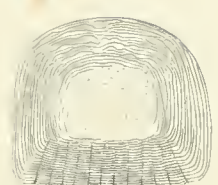
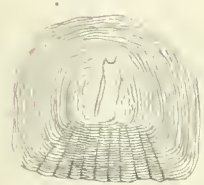
64. SCAPHIRHYNCHUS PLATYRHYNCHUS, Bd.—Shovel-nose Sturgeon.

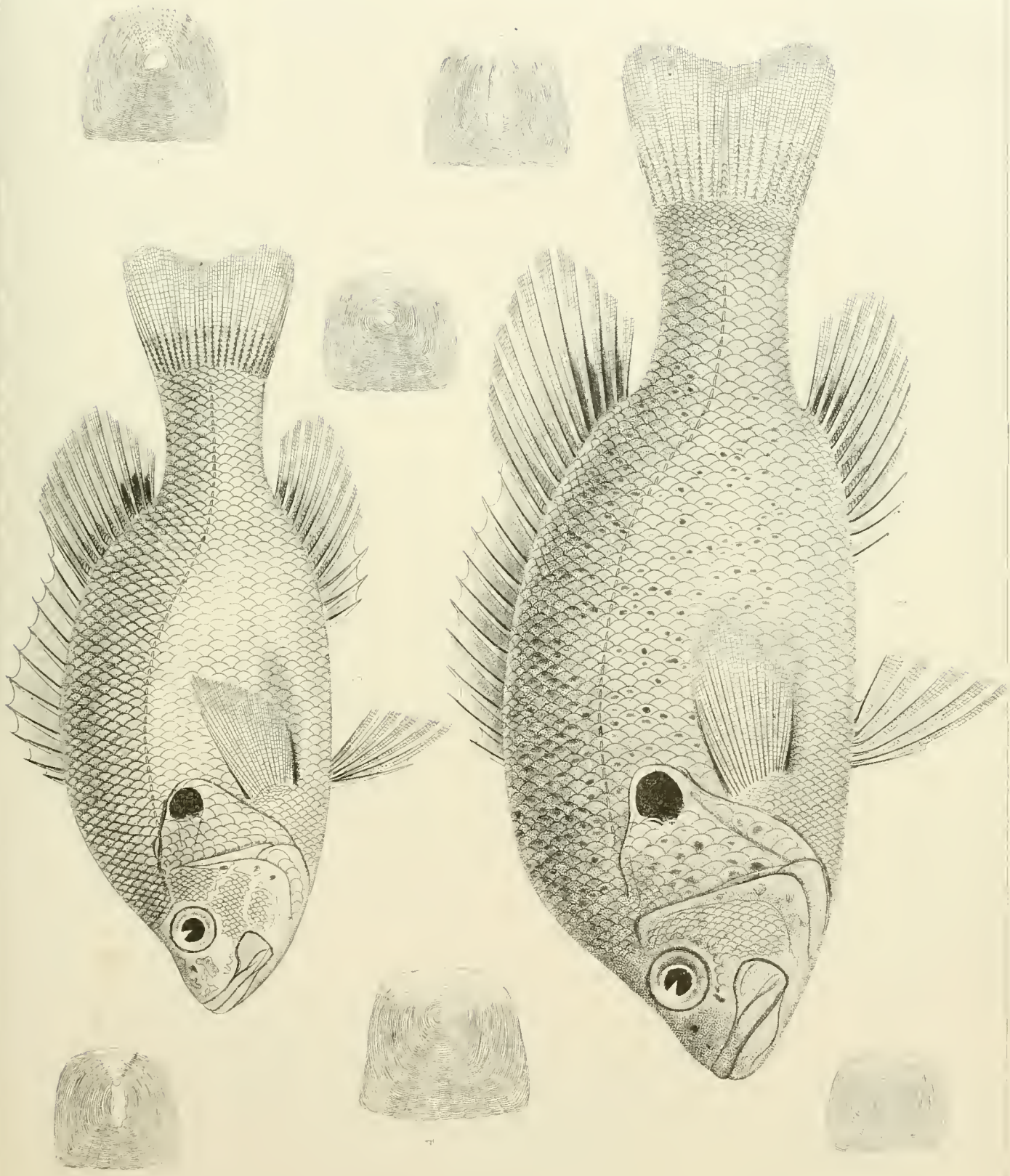
GEN. REP. 357.

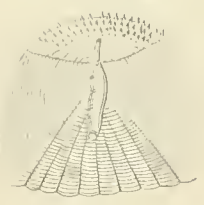
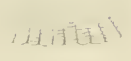
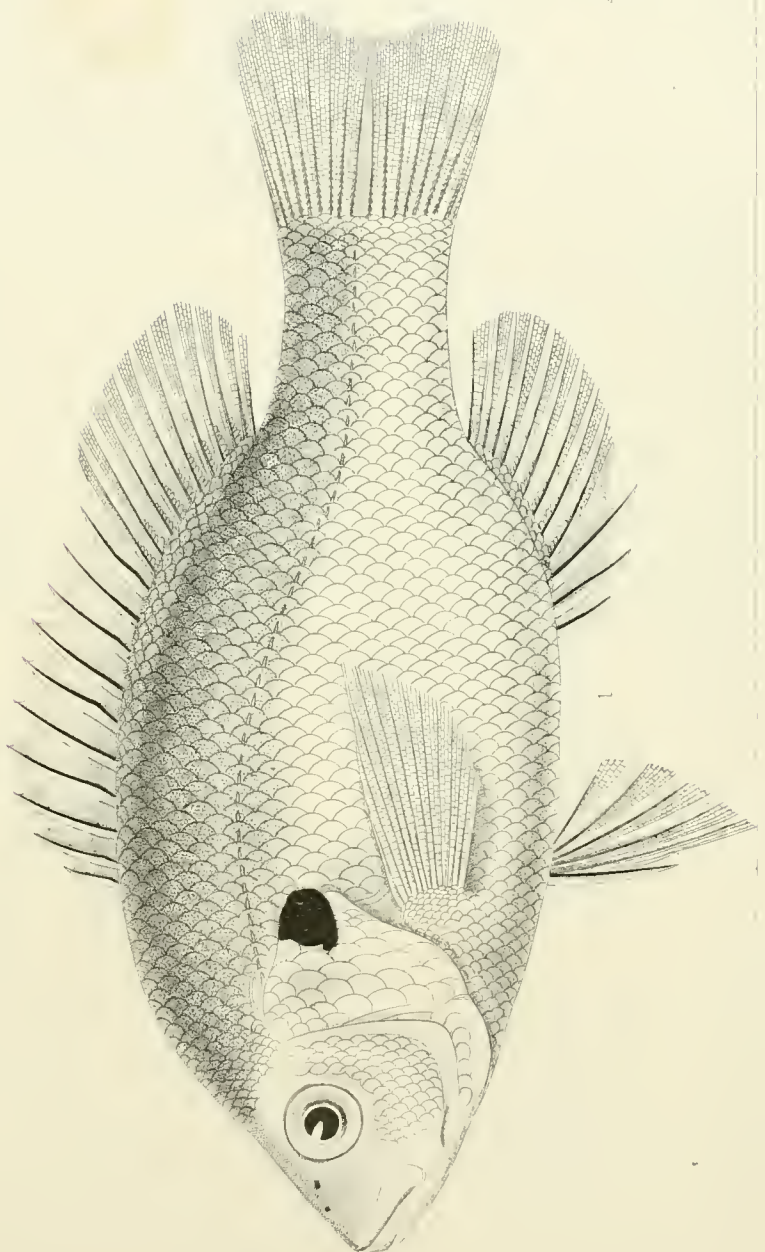
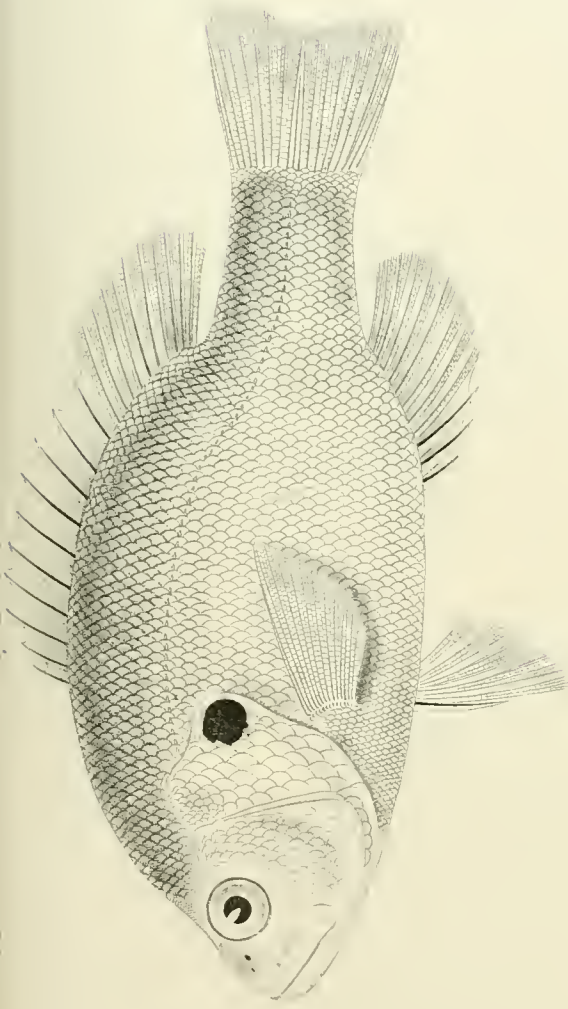
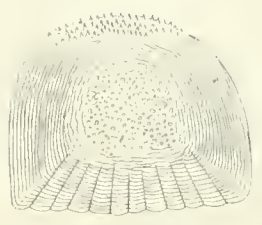
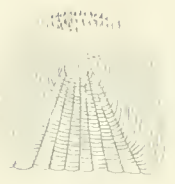
SPEC. CHAR.—Head terminating into a depressed, oval, spade-shaped snout. Lips provided with eight warty, fringed tufts. Barbels nearer the mouth than the extremity of the snout, and fringed also. Anal fin nearer the vent than the caudal fin. Brownish above; whitish beneath.

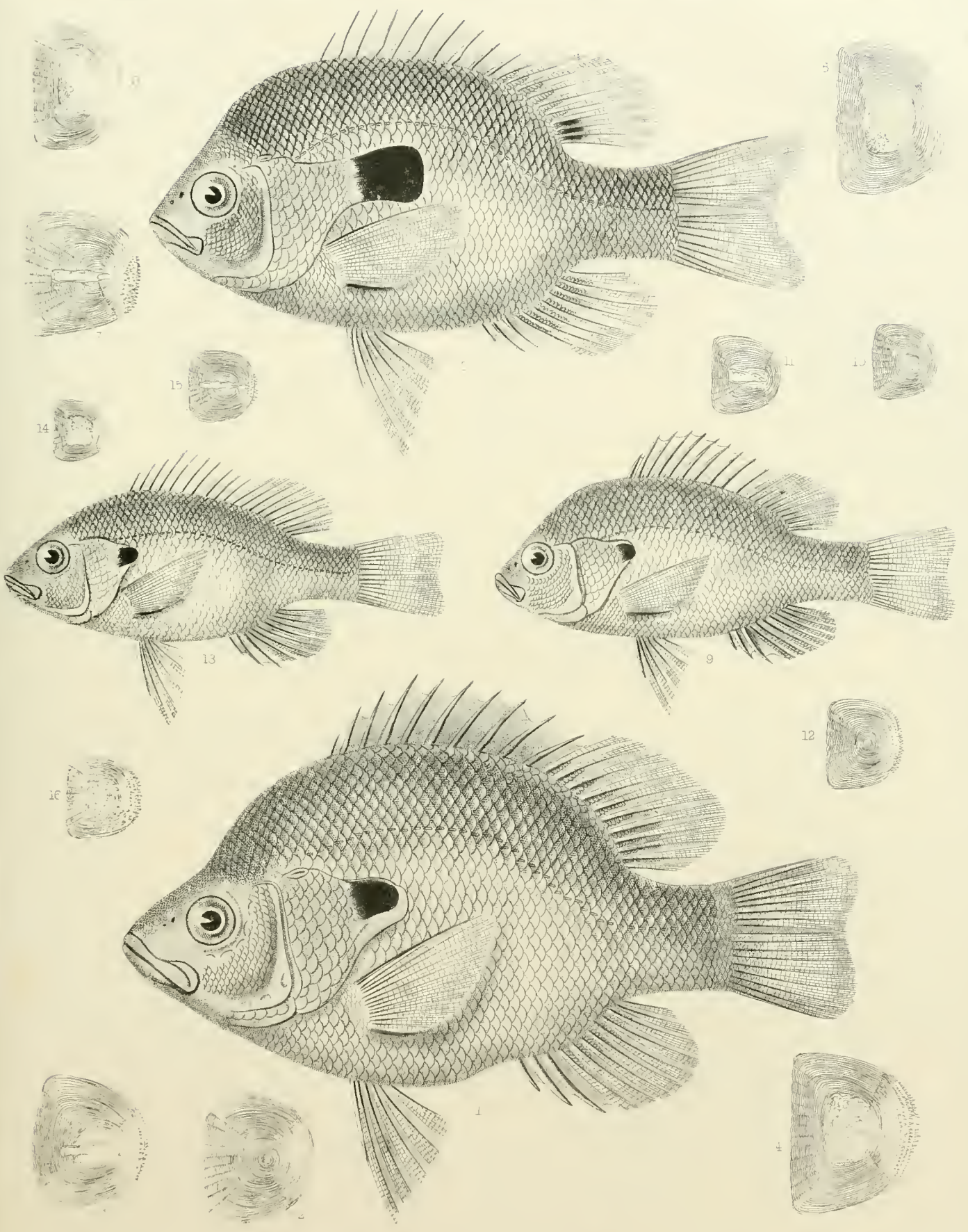
985 and 986. Missouri river. Dr. Geo. G. Shumard.

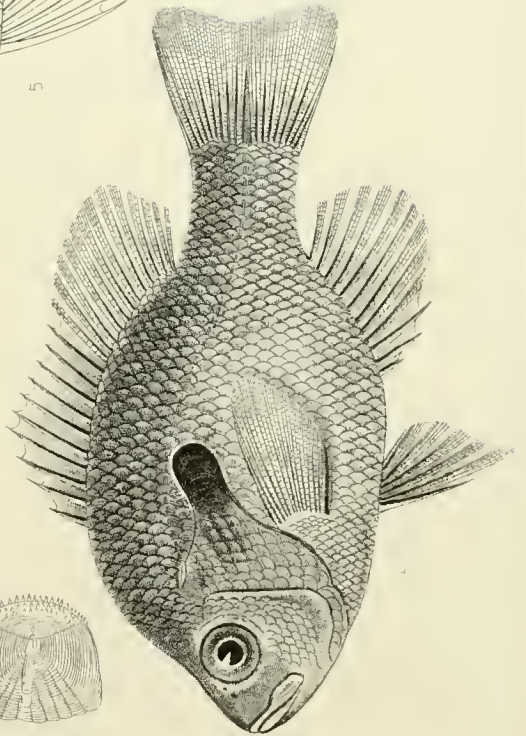
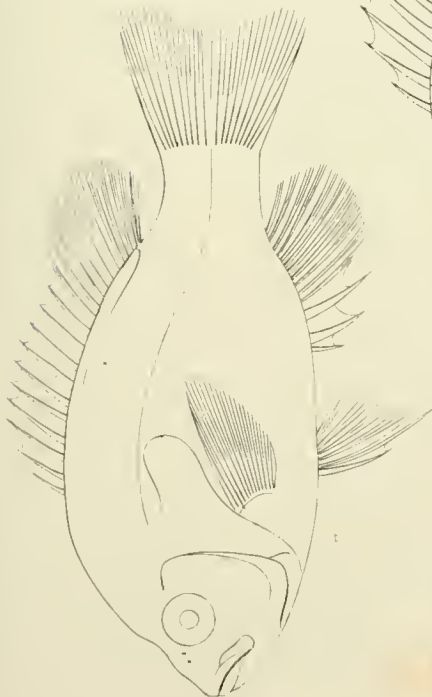
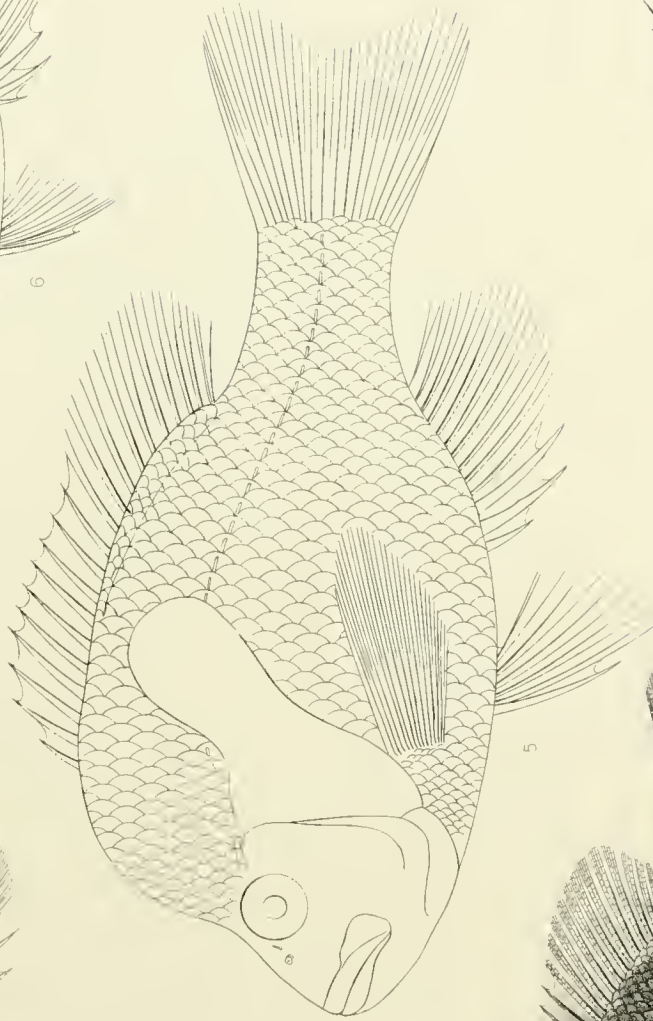
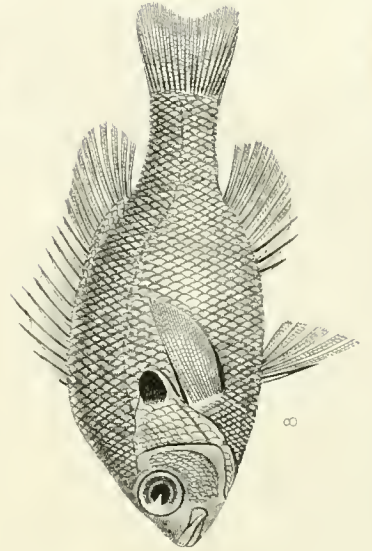


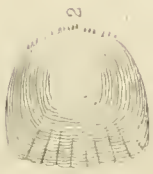
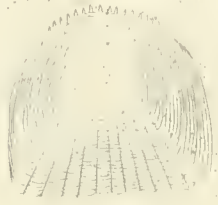
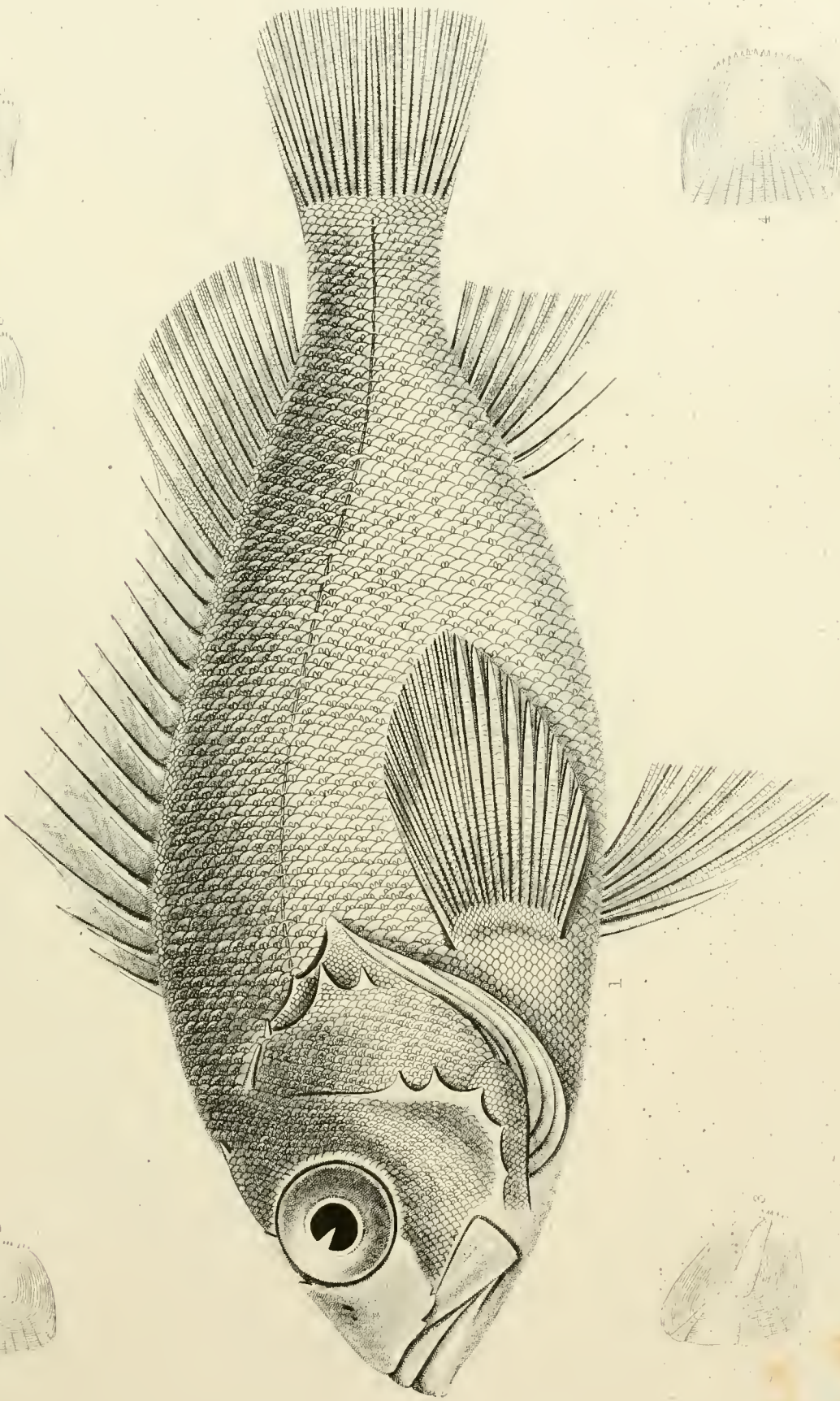


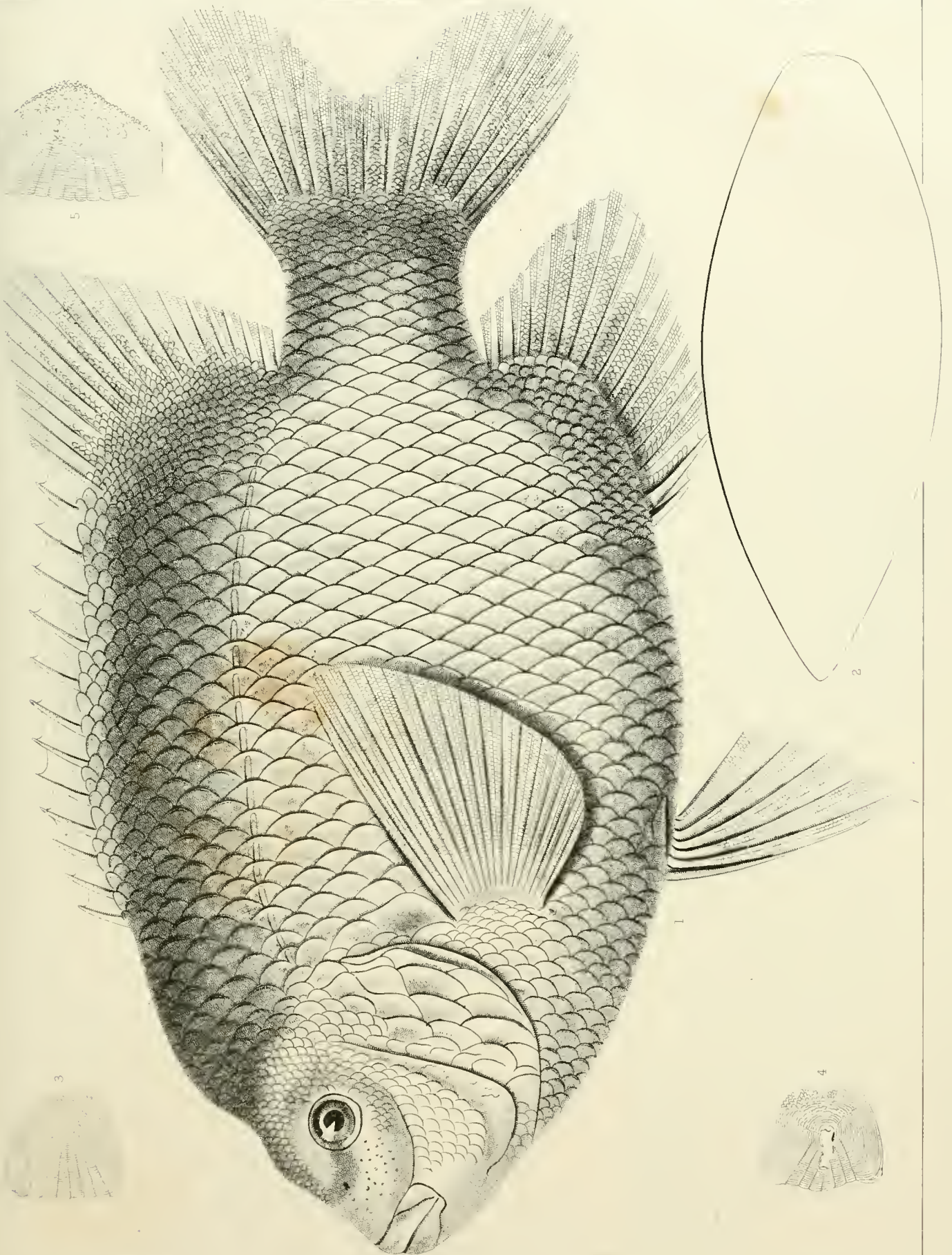




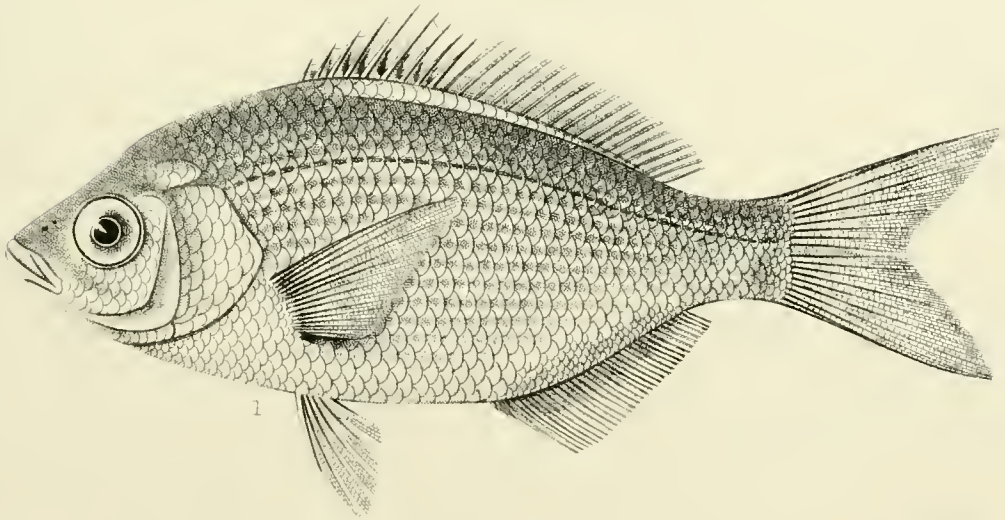
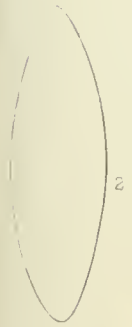
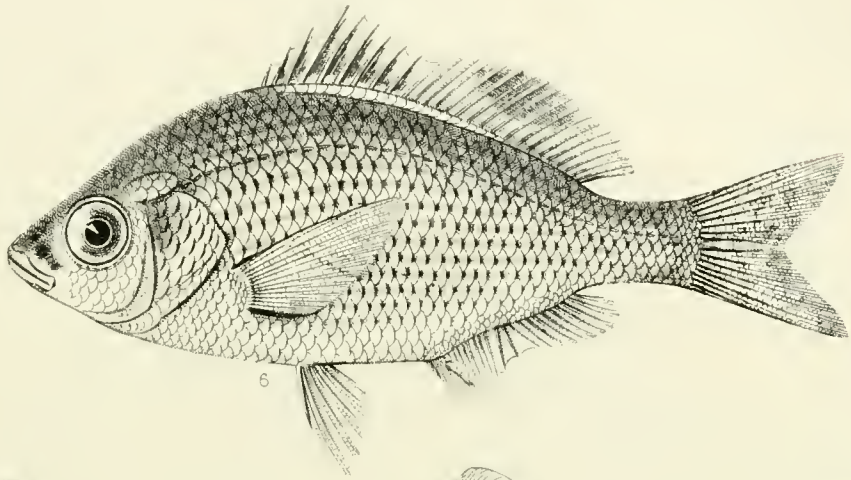
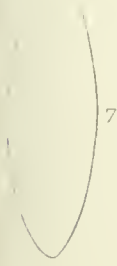


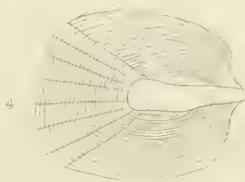
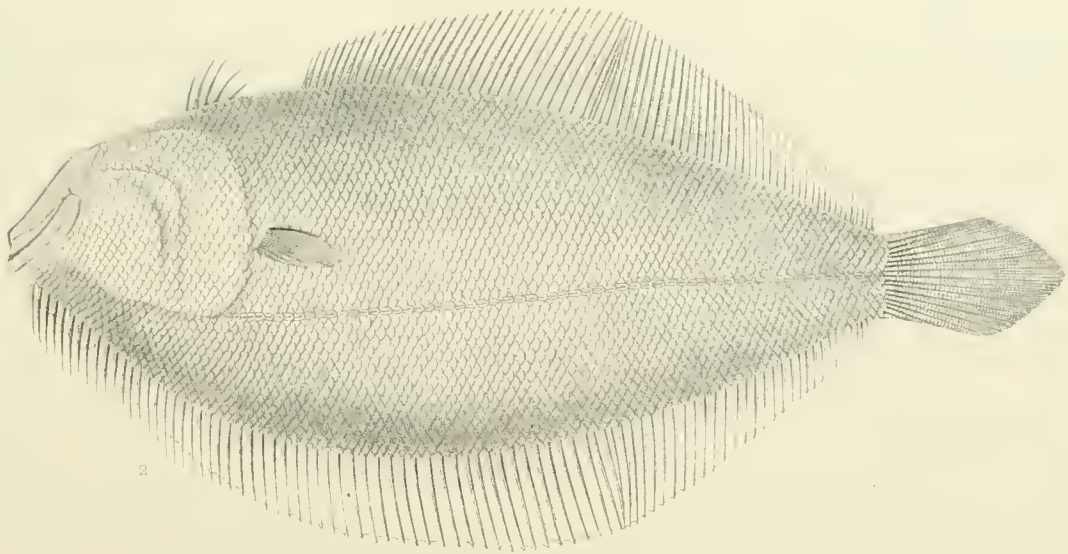
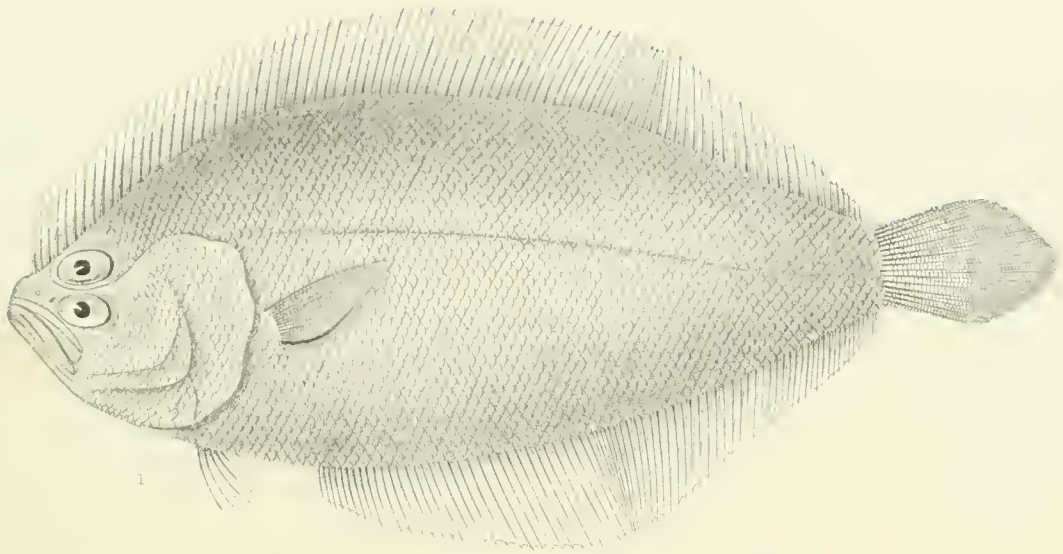




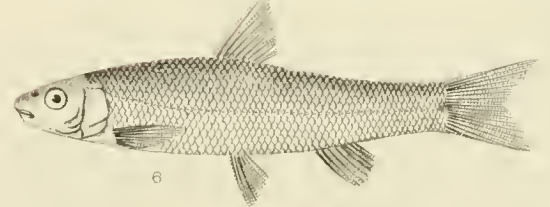
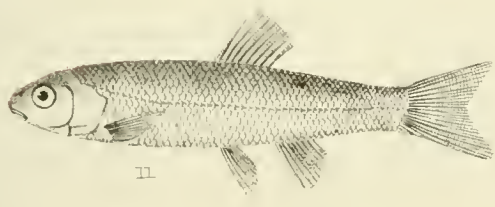
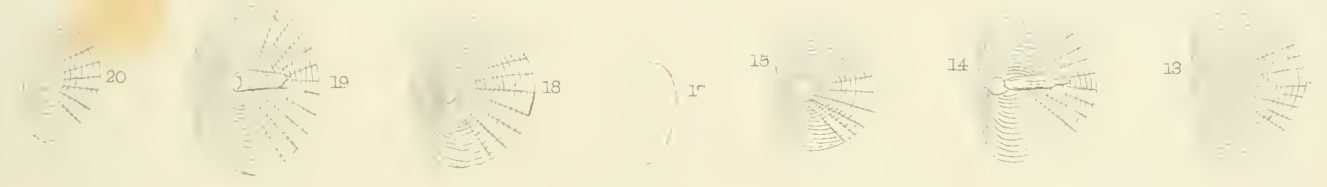
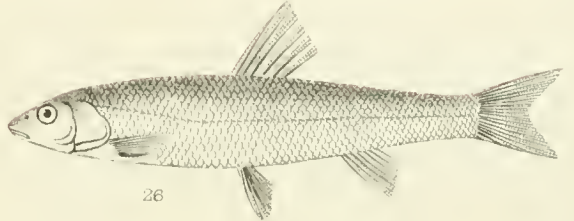
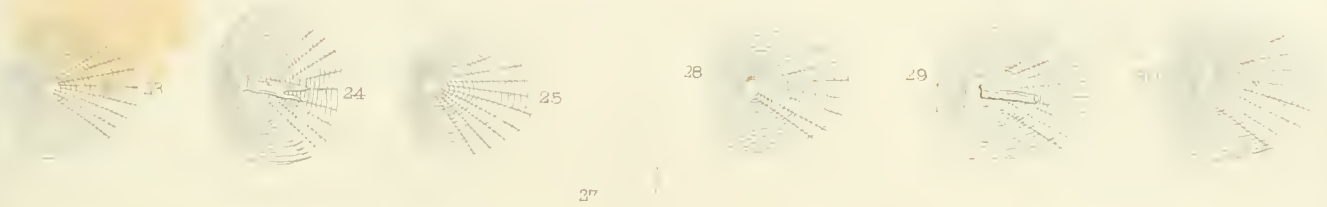


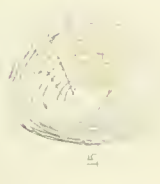




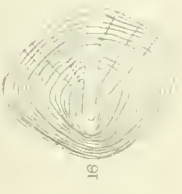




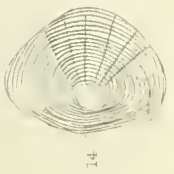




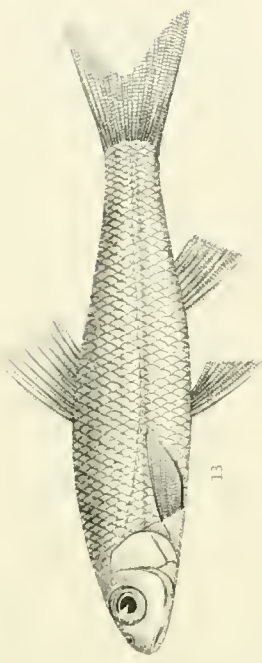
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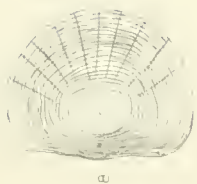
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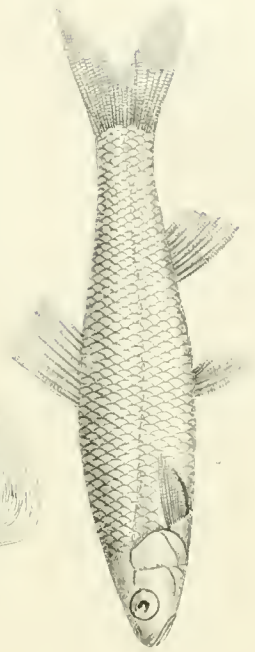
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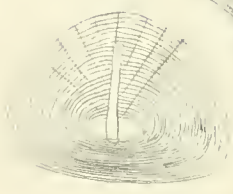
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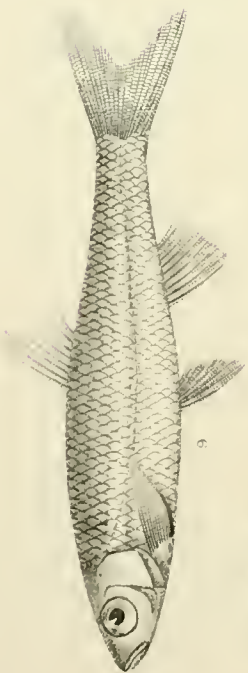
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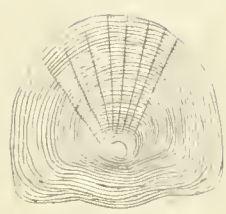
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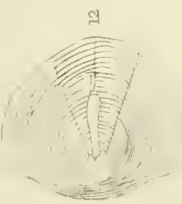
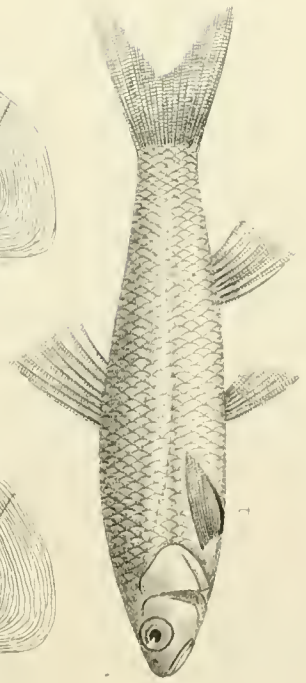
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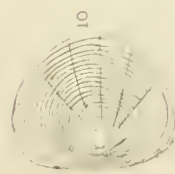
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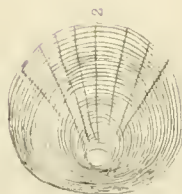
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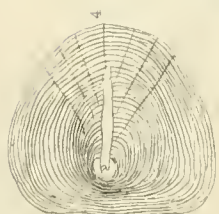
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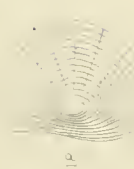
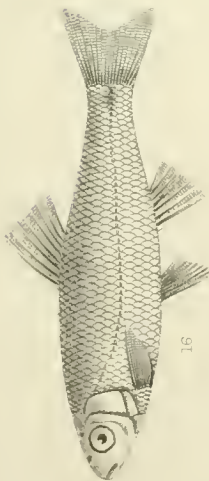
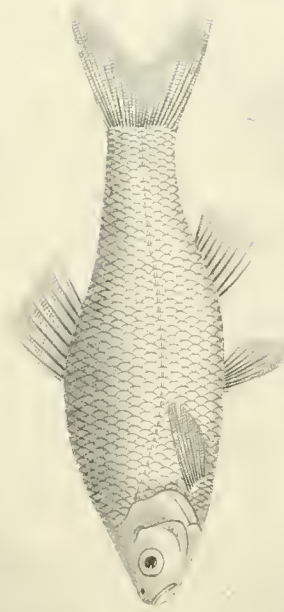
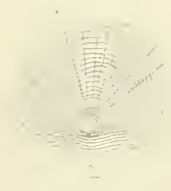
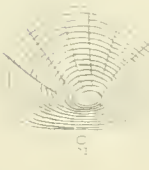
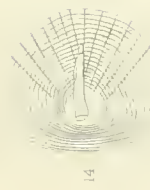
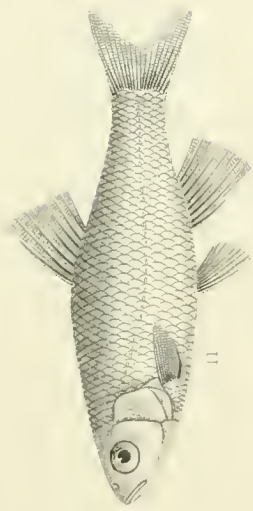
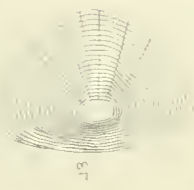
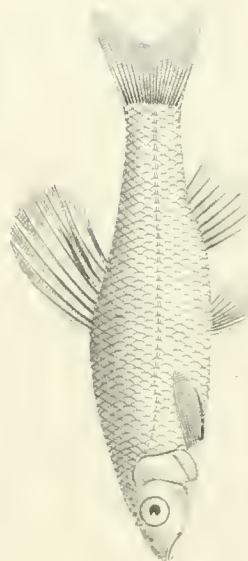
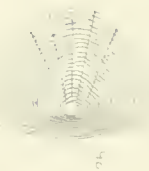
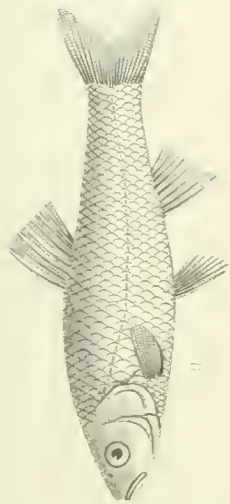
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EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.
WAR DEPARTMENT.

R E P O R T

OF

EXPLORATIONS FOR A RAILROAD ROUTE

NEAR

THE 32D PARALLEL OF NORTH LATITUDE,

LYING BETWEEN

DONA ANA, ON THE RIO GRANDE, AND PIMAS VILLAGES, ON THE GILA,

BY

LIEUTENANT JOHN G. PARKE,

CORPS OF TOPOGRAPHICAL ENGINEERS.

WASHINGTON, D. C.

1855.

EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.
WAR DEPARTMENT.

ROUTE NEAR THE THIRTY-SECOND PARALLEL, FROM THE RIO GRANDE TO THE PIMAS VILLAGES, EXPLORED
BY LIEUTENANT J. G. PARKE, CORPS OF TOPOGRAPHICAL ENGINEERS, 1853-'54.

ZOOLOGICAL REPORT.

WASHINGTON, D. C
1859.

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INTRODUCTORY LETTER.

PHILADELPHIA, *October 14, 1854.*

SIR: I have the honor of submitting to you the following report on the natural history of the country through which we passed during your late survey, commencing at the junction of the Colorado and Gila rivers, and continued through northern Mexico, New Mexico, and terminating at San Antonio, Texas.

The general barrenness of the country lying along our route proved a considerable obstacle to the pursuit of my favorite branch, Ornithology; though among the few species obtained some are new, and most of them rare, and concerning whose habits little was previously known.

Of the reptiles, in which these countries are very rich, I had succeeded in forming quite a handsome collection, but unfortunately the cans in which they were contained became leaky, and possessing neither the means to correct this mishap, nor the alcohol to supply that wasted, they were all lost with the exception of a few specimens which I preserved in bottles. These have been described and classified by Dr. E. Hallowell.

The fish, of which I had also obtained many species, met with the same fate as the reptiles.

It is much to be regretted that so many interesting objects should have been lost through unforeseen and, therefore, unavoidable accident.

I remain, sir, your most obedient servant,

A. L. HEERMANN, M. D.

Surgeon and Naturalist to the command.

Lieutenant J. G. PARKE,

United States Topographical Engineers, Washington, D. C.

No. 1.

REPORT UPON BIRDS COLLECTED ON THE SURVEY.

BY A. L. HEERMANN, M. D.

HYPOTRIORCHIS FEMORALIS, Gray.

PLATE I.

Falco femoralis, TEMM. Pl. Col. I, plate 121.—CASSIN, in Gen. Rep. P. R. R. Survey, IX, 1858, 11.

SP. CH.—*Male*.—Head, wings, and back, of a light slate color; the primaries being of a darker hue, and on their inner vanes barred with white, with which also the larger coverts are tipped. A white line, starting from above the eye, extends down the occiput, becoming rufous as it forms a collar on the hind neck. A deep slate colored moustache descends from the angle of the mouth one half inch on the throat; auriculars are of the same color. Chin, white. Breast, orange or yellowish white, and in some specimens marked with elongated spots of black. Abdomen, thighs, and under coverts of the tail, rufous. Sides and flanks, dusky black; each feather being banded with delicate transverse white lines, and often uniting so as to form a band in front at the junction of the breast and abdomen. In some specimens this band does not appear, as the dusky black feathers do not in all cases extend across the abdomen. Tail, of a light gray slate color, is composed of twelve feathers traversed by nine white bars; the ends of all these feathers being tipped with white except the two centre ones. Legs, yellow. Bill, yellow, tipped with bluish black. Length, 14 inches.

The female resembles the male in its plumage, but its colors are less brilliant and marked.

The young bird has the back and tail of a dusky brown, each feather being fringed with a narrow border of lighter shade. The primaries and tertiaries are edged with white. Breast yellowish white, covered with a broad band of dusky black, extending down to the thighs; these feathers often being edged with light clayish yellow. Moustache and auriculars, dusky brown.

I saw this bird twice on the vast plains of New Mexico, near the United States boundary line, before procuring it; flying over the prairies in search of small birds and mice, and at times hovering, as is the wont of our common sparrow hawk, (*Tinnunculus sparverius*.) We possess little information relative to its habits from those authors who have written on this bird. It appears to be a resident of Surinam, Cayenne, Brazil, Chili, and other portions of South America, and is used in Chili for hunting the partridge. Besides this species, the Mexican ibis, also from South America, comes yearly to incubate in California; and further researches will doubtless still add to our fauna from that continent and Mexico.

Superadded to their sharp talons and powerful beaks, the family of the *Falconidae*, to which this interesting species belongs, possesses strength and daring to a high degree. They nourish themselves exclusively on living animals, disdaining to devour that which they have not captured by their own address. Necessity forcing them to range over a large extent of country for their food, they naturally become wanderers. Assimilating in pairs during the breeding season, many species remain so mated during life; though not indispensably necessary to one another, each being able to provide for itself, yet by mutual assistance in the pursuit of prey the operation of procuring subsistence is vastly simplified and facilitated.

PANYPTILA MELANOLEUCA, Baird.—White-bellied Swift.

Cypselus melanoleucus, BAIRD, Proceed. Ac. Nat. Sc., Phil., Vol. VII, June, 1854, 118.

Panyptila melanoleuca, BAIRD, Gen. Rep. IX, 1858, 141.

SP. CH.—Head, dusky brown. Body tail and wings, dusky black. Throat breast and a band $\frac{1}{2}$ inch in breadth from breast to vent, white. Ends of larger coverts tipped with white. A large white patch on the flanks, a faint white line over the eye and the outer edge of the first primary, white. Length $5\frac{1}{2}$ inches.

I met this bird several times, first in San Fernando Pass, near Los Angeles; again near Palm Spring, between the Colorado desert and Vallecitta; again near Tucson, and lastly in Texas; always, however, flying at a great height, being either far beyond or on the extreme limit of gun shot range, and was therefore unable to do more than slightly wound one of them. From the extent of their wings, the birds of this family appear to be formed to live in the air, where, in fact, they pass most of their time, gliding about in extensive circles without effort and apparently little motion of the wings. This ease of flight stands them in good need in their migratory movements, allowing them readily to pass into warmer climes. During pleasant weather they find their insect prey in the upper air, but when cloudy or rainy we find them skimming the ground in their pursuit. When on the ground, the shortness and weakness of their legs, added to their length of wing, incapacitates them from again rising in the air; hence I have several times seen the European species, (*C. murarius*), picked up in the streets of Geneva, Switzerland, having fallen there during a quarrel with its fellows. When they wish to take rest during the day, which is rare, they always alight on some elevated point whence they can throw themselves into the air and take to wing. Though numbers were flying about the rocks near Tucson, I heard them utter no note. Sociable among themselves, gathering in large flocks, they never mingle with their nearly related brethren the swallows. They generally construct their nests in the crevices of rocks or the holes in old buildings, many species having secretory glands, exuding a glutinous substance with which to fasten them firmly. The eggs, from 4 to 6 in number, are pure white and of an elongated form. Previous to the settlement of this country by Europeans, the chimney swallow (*C. pelagius*) built its nest in the hollows of old trees, but has almost universally changed this habit, as indicated by its name, derived from the locality to which it now resorts for the purposes of incubation.

CERYLE AMERICANA, Boie.—Texas Kingfisher.

Alcedo americana, Gmel. Syst. Nat., vol. I, part I, p. 451.

Ceryle americana, BAIRD, Gen. Rep. IX, 1858, 159.

SP. CH.—*Male*.—Upper plumage dark glossy green, the head and wing coverts sprinkled with small white spots. A moustache of dark green from angle of lower bill. Wings, dark green, almost black, crossed by three bands formed by white spots on the primaries. Throat, vent, and band on hind neck, white. A broad band of dark rufous covers the breast. Flanks, sides, and under tail coverts, spotted with green. Tail, dark glossy green, the inner webs white, banded with dusky black spots. Bill and feet dusky. Length, 8 inches.

Female resembles the male, but in her the broad rufous breast band is replaced by one of glossy green, less perfect than in the male. Length, 8 inches.

I first saw this species near the Nueces in Texas, where it is said to be not rare, and it has frequently been brought from the Rio Grande by naturalists. The birds of this family live principally on fish. Remaining patiently for hours on a stake or branch over a stream, watching a favorable opportunity to pounce upon its prey, which seen, it plunges into the water, often disappearing entirely beneath its surface, seizes upon and swallows its victim whole; throwing

up at a later period, like the owl and the hawk, the indigestible parts in the form of a pellet. Watchful and shy, it flies off at the least approach of danger with great rapidity. The young resembles the female, taking on the full livery of the adult after the first year. The nest, composed of a few loose straws thrown negligently together, on which are laid 4 white eggs of a spherical form, is placed in a burrow varying in length from 2 to 10 feet, excavated in the steep river banks.

MILVULUS FORFICATUS, Sw.—Swallow-tailed Fly-catcher.

Muscicapa forficata, Gmel. Syst. Nat. vol. I, part II, p. 931.

Milvulus forficatus, Baird, Gen. Rep. IX, 1858, 169.

SP. CH.—Head, cheeks, and upper parts ash gray; back ditto, with the addition of a roseate tinge. A concealed patch of orange-vermilion on the top of the head. Rump of a brownish hue. Upper tail coverts sooty black. Wings dusky brown, the secondaries and coverts being edged with clear grayish white. Throat, white; breast an impure white, inclining towards the vent to a roseate blush. Axillary feathers scarlet. Tail twice the length of the body, forked, and composed of twelve feathers, the two outer ones roseate white to within one and a half or two inches of their tips, which are black. Outer tail feathers black. Length fourteen inches.

Female like the male, the tail being shorter, and the vermilion patch on the head less distinct. Length eleven and a half inches.

Abundant and frequenting the prairie lands of Texas. Of a quarrelsome disposition, they are often seen five or six in the air at a time fighting together, presenting a very beautiful sight as they turn and manœuvre, spreading at every movement their long forked tail to its fullest extent.

The family of the fly-catchers is both numerous and resident of every portion of the globe. In the deep forests of the tropics we find some of brilliantly colored plumage, while those of more temperate regions assume a more modest garb. Their food consists principally of insects, though occasionally varied with fruit. Certain species are in continual movement, actively engaged in seeking insects on the lofty trees, while others, perched silently on the bush tops or branches of a tree, await with patience their approach, when, after darting upon and devouring them, they resume their post. Tyrannical in the extreme, they frequently prove themselves especially courageous during the breeding season, attacking and driving off all intruders on their domain, not excepting even crows and hawks, so much larger and more powerful than themselves. In some species there are marked differences between the sexes, but this is not generally the case. The young take on the plumage of the adult after the first year. Their nest is generally built on a bush or tree; some choose the hollow of a tree, while others, under cover of a shelving rock or other sheltered situation, build a nest of mud. The eggs are generally four in number.

? HARPORHYNCHUS CURVIROSTRIS, Cabanis.—Curved-bill Mocking Bird.

Orpheus curvirostris, Sw. Phil. Mag. and Annals, 1827, p. 368.

Harporynchus curvirostris, Baird, Gen. Rep. IX, 1858, 351.

SP. CH.—Upper parts pale brown, increasing gradually in depth of color from the head to the tail. Under parts brownish gray, becoming of a feeble clay color towards the vent. Throat ash color. Breast and abdomen thickly covered with faint, rounded, dusky spots. Tail feathers tipped underneath and edged with ashy margins. Bill black. Feet brown. Length

I first met with this species in the thickets near Tucson, or saw it on the topmost branches of the mezquite tree, pouring forth its melody. Like the California mocking bird it possesses musical powers surpassed by few other birds. When alarmed, it dives immediately in the underbrush, whence it is almost impossible to dislodge it. Though the specimens shot were

procured in Mexico, still is it an interesting bird to us from the fact of its having been previously found in Texas. Its food consists of berries and fruits when in season, or of insects or their larvæ, and worms, which are collected among the trees or from the ground, on which it spends much of its time.

LOPHOPHANES ATRICRISTATUS, Cassin.—Black-crested Chickadee.

Lophophanes atricristatus, Cassin, Illus. B. of Tex. and Cal. p. 13, pl. 3.—BAIRD, Gen. Rep. IX, 345, p. 69.

Parus atricristatus, Cassin, Proceed. Ac. N. Sc. Phil. vol. V, p. 103, pl. 2.

SP. CH.—*Male*.—Front and chin white; under parts ashy white; lighter from the belly to vent. Cheeks gray. Crest black. Back slaty gray. Wings and tail brown, the latter formed of twelve feathers. Flanks and sides have a ferruginous tinge. Bill and legs black. Length five and a half inches.

Female.—Slightly smaller than male. Crest brownish black.

This bird, discovered in, and brought back from Texas by Dr. Woodhouse, while with Captain Sitgreaves' expedition to the Zuñi and Colorado rivers, was first observed by me near Fort Clark, Texas, where it was quite an abundant species. It is active and sprightly in its movements, searching with great assiduity for insects about the bark and branches of trees. While thus employed it keeps up a chattering note, varied with an occasional low plaintive whistle. Its habits much resemble those of our common chickadee, (*Parus atricapillus*.) The sub-family of the *Parinae* is found in North America, Europe, Asia, and Africa. Their usual resort is in the woods, and their habits, as above described, ceaselessly active, examining with care every crack in the bark, the under part of each leaf, and throwing themselves into every possible attitude while prosecuting their labors. They now and then vary their diet with grain, seeds, nuts, and rarely meat; sometimes, when urged by necessity, attacking and killing sickly birds by fracturing their skulls. The nest, made of grasses, feathers, wool, and mosses, and often containing from twelve to sixteen eggs, is generally built in the hollow of a tree, though some species construct them of a pendulous form, while others build a simple oval nest in the forks of two or more branches, having two holes for ingress or egress, or with a view to leave a convenient place for the projection of the long tail with which some of these species are adorned.

PEUCAEA CASSINII, Baird.

PLATE IV, FIG. 2.

Zonotrichia cassinii, Woodhouse, Pr. A. N. Sc. VI. 1852, 60.

Peucaea cassinii, Baird, Gen. Rep. IX, 1858, 485.

SP. CH.—Upper parts reddish brown; the centre of the feathers of the back and head deep brown, their margins being bluish gray. Primaries and secondaries brownish, edged with dirty white. Flexure of wing, yellow. Tail feathers, twelve in number, brown, tipped with grayish brown; the two outer and centre ones pale brown, the latter having a dark central line in their entire length and numerous little transverse bars. A narrow grayish yellow line from base of mandible over the eye. Throat and breast gray, with a short, sooty, narrow line from the base of lower mandible on each side. Breast and sides dirty gray. Belly, vent, and crissum dirty yellowish gray, some of the feathers of the latter having dark, longitudinal spots. Bill horn color, darker above. Feet flesh color. Length five and three-fourth inches.

My attention having been attracted by the sound of a new note while at Camanche Spring, Texas, I found, after some observation, that it proceeded from this bird. Rising with a tremulous motion of its wings some twenty feet or more, it descends again in the same manner to within a few yards of the spot whence it started, accompanying its entire flight with a lengthened and pleasing song. The country thereabouts is very barren, being covered with low stunted bushes, into which the bird takes refuge on being alarmed, gliding rapidly through the grass and

shrubbery, adroitly and effectually evading its pursuer. I observed them during four or five days of our travel, when they disappeared. They were probably migrating at the time, though their continued and oft-repeated song gave notice they were about preparing for the duties of incubation.

PLECTROPHANES MELANOMUS, B a i r d.—Black-shouldered Longspur.

Plectrophanes melanomus, BAIRD, Gen. Rep. IX, 1858, 436.

SP. CH.—*Male*.—Top of the head, flexure of wings, a patch behind the ears, the breast and abdomen, black. A broad band of chestnut on the hind neck, between which and the occiput is a spot of white. A line over the eye, the throat, and ears, of a dirty yellow gray. Under tail coverts white. Lesser wing coverts black, tipped with white, forming a white band. Upper parts light brown, each feather dark brown in its centre. Sides dark gray. The tail composed of twelve white feathers tipped with brown, this tipping increasing in depth from the outer to the central feathers until it extends about half-way down these latter. Bill dusky. Feet dark brown. Length $5\frac{1}{2}$ inches. During the winter a gray margin on the feathers nearly conceals all those portions which are black in spring. This disappearing by friction or otherwise, the spring livery is fairly donned.

Female.—Upper parts light brown, the centre of each feather marked with a dark brown spot. These spots being thicker and smaller on the top of the head give it a darker hue. Vent and throat gray, the latter margined by a line of pale brownish gray spotted feathers, which extends down to and spreads over the breast, belly, and sides. Tail, bill, and feet, like those of the male. Length $5\frac{1}{4}$ inches.

I first remarked this bird in flocks, associated with the *P. McCownii*, at a large prairie dog village some miles west of Puerto del Dado. Fresh meat having become scarce in camp, and desiring a few birds for supper, I fired into a flock covering densely quite a large space. Three dozen fell at the first discharge, and among them I was pleased to find this species and the *P. McCownii*. From this point to the Rio Grande we found both of these species abundant wherever we struck isolated water-holes; these being the only spots for miles around where drink can be obtained. When fired at they rise as if to fly away; but forced by thirst to return after describing a few curves to the only spot where their parched tongues can find relief, they may, if the hunter feels so inclined, be fairly slaughtered. I have often seen from 100 to 150 brought down in four or five discharges of a gun. While on a trip to the Rocky mountains in 1843, I met a closely allied species, *P. ornatus*, in small flocks and pairs, scattered over the prairies of the Platte river, and was fortunate enough to discover one of their nests. Built on the ground, it was composed of fine grasses and lined with hair. The eggs, four in number, were white, with black lines at the larger end, and a few faint neutral tint blotches scattered over the surface.

PLECTROPHANES MCCOWNII, L a w r e n c e.—Rufous-winged Lark Bunting.

Plectrophanes McCownii, LAW. Annals of N. Y. Lyceum, Vol. V. p. 123.—BAIRD, Gen. Rep. IX, 437.

SP. CH.—*Male*.—Top of head and crescent on breast black. Upper parts light brown, with dark brown linear spots in the centres of the feathers. Primaries and secondaries dusky brown, with margins of grayish white. Lesser wing coverts black, broadly tipped with chestnut. Line over the eye dirty white. A small black patch at the angle of the lower mandible. A line of small brown spots runs down the front of the neck from near the same point. Sides of neck and auriculars pale ash brown. Sides and flanks dark gray. Breast below the crescent gray, changing gradually to dirty white on the belly. Tail composed of twelve feathers; two central ones brown, the rest white, tipped with a broad band of dusky hue. Bill and feet dusky brown. Length $5\frac{1}{2}$ inches.

Female.—Upper parts light brown, each feather dark brown in its centre. Wings brown, fringed with dusky white. Line over the eye pale rusty color. Chin dusky white. Breast, sides, and flanks, pale rusty gray; abdomen paler. An indistinct pale brown band across the upper portion of the breast; auriculars and sides of head same color. Tail, bill, and feet as in the male. Length $5\frac{1}{4}$ inches.

I found this species congregated in large flocks with the preceding, engaged in gleaning the seeds from the scanty grass on the vast arid plains of New Mexico. Insects and berries form also part of their food, in search of which they show great activity, running about with ease and celerity. From Dr. Henry, U. S. A., I learned that in spring large flocks are seen at Fort Thorne, having migrated hither from the north the fall previous. With the return of mild weather they again go north for the purposes of incubation. Among these flocks I detected also the shore lark, (*Fremophila cornuta*), but it formed a small proportion of the numbers.

POOSPIZA BILINEATA, Sclater.—Black-throated Finch.

Emberiza bilineata, CASSIN, Pr. A. N. Sc. V, 104.

Poospiza bilineata, BAIRD, Gen. Rep. IX, 1858, 470.

Sp. CH.—*Male*.—White stripe commencing at the front and running over and five-eighths of an inch beyond the eye, being bordered above by a narrow black line. Another white line starting near the base of lower mandible and running down the neck. Space between the two stripes black near the bill, and becoming of a lighter hue at the auriculars. Lower eyelid white. Throat black. Breast and vent dirty white. Sides and flanks slaty yellow gray, changing to a light rusty white towards the vent. Upper parts brown, tinged with olive; the head a little darker than the back. Primaries dusky brown, edged with light brown. Tail feathers deep brown, the three outer ones being edged and tipped with white. Bill and feet dark blue, black. Length $5\frac{1}{2}$ inches. Female like the male.

I first remarked this beautiful little finch just before reaching Tucson, Sonora, Mexico, where I found it associated with several other species of sparrows. They were collected in large flocks, flying from bush to bush, and alighting on the ground to pick up grass seeds and insects. It appeared to be quite numerous, and I followed it as far in Texas as the spring of the Dead Man's Hole, between El Paso and San Antonio. Though not very wild, its restlessness as it flew about the undergrowth made it difficult to procure. It uttered only a chirp during the time I observed it.

CYANOSPIZA CIRIS, Baird.—Painted Bunting.

Emberiza ciris, LINN. Syst. Nat. I, 313.

Cyanospiza ciris, BAIRD, Gen. Rep. IX, 1858, 503.

Sp. CH.—*Male*.—Head, neck, auriculars, and flexure of wing, of a rich purplish blue. Chin and lores green. Eyelids, throat, and lower parts, rich vermilion, paler towards sides and vent. Centre of abdomen sometimes strongly tinged with yellow. Back and scapulars glossy green, tinged with yellow. Back, rump, and tail coverts, purplish red. Lesser wing coverts purple; larger, green. Wings purplish brown, edged with purplish green. Upper surface of tail purplish brown. Under surface of tail and wings slate gray. Bill black above, lighter beneath. Legs brown. Length $5\frac{1}{2}$ inches.

Female.—Upper parts olive green, brighter towards rump. Lower parts dusky Naples yellow, brightest on the belly, and tinged on the breast with olive green. Bill pale lead color, darker above. Legs lead color. In size a little smaller than the male.

This, the most brilliant of our finches, is quite abundant in Texas, and is seen pouring forth at short intervals during the day its sweet and lively ditty from the bush and tree tops.

PIPILO CHLORURA, Baird.

Fringilla chlorura, TOWNS. in AUD. Orn. Biog. V, 1839, 336.

Pipilo chlorurus, BAIRD, Gen. Rep. IX, 1858, 519.

Fringilla blandingiana, GAMBEL, Pr. A. N. Sc. I, 1843, 269.

Sp. CH.—Crown, bright chestnut. Front, lores, a line running from lower mandible and breast, slaty gray; being darkest on the front and lores. A small patch at base of upper mandible; a line from angle of mouth, throat, and abdomen, white. Sides

and flanks brownish, fading to rust color on approaching the vent. Flexure of wing and under coverts bright yellow. Upper parts olive brown, the wings and tail having a brighter greenish yellow tinge. Bill dark brown above, paler beneath. Legs dusky brown. Length 7 inches.

I first discovered this bird near Tucson, frequenting in numbers the thick undergrowth, and seeking seeds and insects on the ground and inclined to shun observation, always keeping in the most retired situations, though sociable among themselves, going about single or in pairs associated with the *Poospiza bilineata* and two or three other species of finch. When started they fly low, diving into the bushes, and soon disappearing from sight. Occasionally, until reaching El Paso, Texas, birds of this species were met, mingled with the flocks of migrating *Fringillidae*. I there found and procured a pair about entering upon the duties of incubation.

PIPILO ABERTII, Baird.—Abert's Ground Finch.

Pipilo abertii, BAIRD, Stansbury Ex. to Great Salt Lake, p. 325.—IB. Gen. Rep. IX, 516.

SP. CH.—Upper parts of a pale rusty brown, wings and tail being of a darker hue. Under parts of a brighter rusty color, the lower part of breast paler than the rest. Vent and under tail coverts bright rufous. Under margin and tips of tail feathers light brown. Chin and lores smutty black, this color extending to some of the feathers down the throat. Bill and feet light brown. Length 9 inches.

On the borders of the Gila, east of Fort Yuma, this bird was quite abundant, keeping to the close sheltered thickets, where, secure from intrusion, it sought among the dead leaves for various seeds, insects and their larvæ, on which it feeds. Its habits much resemble those of the *P. fusca*, or cañon finch, diving into the bushes when alarmed, and repeating at intervals a short chirp. After leaving the Gila river we saw them no more, as we no longer followed the course of any large stream, for the borders of which these birds seem to have a decided preference.

PIPILO MESOLEUCUS, Baird.

Pipilo mesoleucus, BAIRD, Proceed. Acad. N. Sc. Phil. Vol. VII, p. 119.

SP. CH.—Upper parts dull brown, darker on upper surface of tail. A patch of dull chestnut on the head. Chin dirty white; throat and breast rusty gray, with brown spots starting from the base of lower mandible on each side of the neck and spreading out over the breast, the central lower spot larger and darker than the others. Lower part of breast, flexure of wing and abdomen, white. Vent and lower tail coverts ferruginous. Sides and flanks dusky. Tail feathers, with the exception of the two central ones, tipped with rust, and in some specimens the outer edge of the two external feathers similarly colored. Length $8\frac{1}{2}$ inches.

I saw this species in the vicinity of Tucson. Its habits appeared, from the limited opportunity I had of observing it, to be the same as those of the preceding species.

CALAMOSPIZA BICOLOR, Bonap.—Prairie Lark Finch.

Fringilla bicolor, Towns. Journ. Ac. Nat. Sc. Phil. vol. VII, p. 189.

Calamospiza bicolor, BAIRD, Gen. Rep. IX, 492.

SP. CH.—*Male*.—In spring plumage, black. A large patch of white on the wing, including some of the smaller coverts, the tips of the first row and the secondary coverts. Primaries edged with white. Tail feathers blackish brown broadly tipped with white with the exception of the two middle feathers. Bill light blue. Feet dusky. Length $6\frac{1}{2}$ inches.

Female.—Upper parts light brown, the feathers being darker towards the quills. Primaries light brown margined with white. Tertiaries with broad cream colored border. Tail light brown above, sooty brown beneath, narrowly bordered with white, each

feather, except the two middle ones, being slightly tipped on the inner margin of the point with white. Lower parts white with longitudinal spots of dark brown covering the sides, flanks, and breast. A moustache of small brown spots from angle of lower mandible, running down the neck and joining in with those of the breast. A line over the eye of rusty white. Auriculars light brown. The young male in the fall resembles the female, but takes on the livery of the adult the following spring.

This bird was first observed on approaching the Pimos villages, associated with large flocks of sparrows, gleaning grain and grass seed from the ground. When started it would fly but a short distance before again resuming its occupation. After crossing the San Pedro river I found it in large flocks, having killed fourteen at one shot. At Fort Fillmore, in Mesilla valley, it is quite common, and associates with the cow-bird and black-bird, searching for grain amongst the stable offals. Again I met it in Texas during the month of April, having seen, however, but one male bird in full spring plumage, the others still retaining their winter coat or only commencing to take on their spring livery. While travelling some years ago towards the Rocky mountains, I found it quite abundant on the Platte river. The male bird is often seen rising in the air with a tremulous fluttering motion of the wings, very much after the manner of our reed bird, (*Dolichonyx oryzivora*,) singing the while, and until again alighting, a disconnected but not unmusical chant. The nest, placed on the ground, is formed of fine grasses lined with hair, and contains four to five pale blue eggs. Although I found many of them, in one instance only were they spotted with faint red dashes.

PYRRHULOXIA SINUATA, Bonap.—Texian Cardinal Bird.

Cardinalis sinuatus, Bon. Proceed. Zool. Sec. of London, 1837, p. 111.—CASSIN'S B. of Cal. and Tex. p. 204, pl. 33.
Pyrrhuloxia sinuata, BAIRD, Gen. Rep. IX, 1858, 508.

SP. CH.—*Male*.—General color of upper parts dark ash. Throat, breast, thighs, under wing coverts, and the centre of abdomen down to vent, light bright carmine, deeper on the throat. Sides of abdomen and flanks slaty gray. An elongated crest front, around, and under the eyes; primaries and upper part of tail bright rich brownish red, the two central tail feathers having a slight green reflection, while the edges and tips of the tertiaries and the tips of the primaries are tinted with brown ash. Under part of tail brighter than upper part, with a reflection of grayish lead and tipped with lead color. Bill yellow, the upper one having a dusky tinge. Feet flesh color. Length 8 inches.

Female.—Chin dusky white. Under parts down to vent rusty ash, darker on flanks and sides. Around the eyes, at base of upper mandible, an indistinct blotch, on upper part of throat and another at middle of abdomen, pale carmine. Crest smaller than the male. In its other markings and colorings like the male.

This species in its form and habits is closely allied to the Cardinals, but the formation of the bill differs so much in the two that Bonaparte has placed it in the sub-genus *Pyrrhuloxia*. Instead of, as in the Cardinal, the nearly equal mandibles, the culmen slightly rounded and arched to the tip, which is acute, we find in this species the lower mandible much broader and larger, the gonys rising very abruptly and the culmen very much rounded and arched as in the genus *Pyrrhula*. We met the first specimen of this bird in a dry cañon a little to the east of the crossing of San Pedro river, perched on a bush, and seeming wearied and lost; probably a wanderer, as no more were observed until we reached El Paso. Here we found it everywhere among the hedges and trees, and continued to see it occasionally on our road until we left civilization behind us. It is said to be quite common on the Rio Grande and in Mexico. Raising its crest erect as it moves actively about in search of food, it emits at intervals a clear plaintive whistle, varied by a few detached notes.

PYRANGA AESTIVA, Vieill.—Summer Red Bird.

Tanagra aestiva, AUD. B. of A., Fol. pl. 44.

Tanagra aestiva, GMEL., Syst. Nat. vol. I, Part II, p. 889.

Pyrrhuloxia aestiva, BAIRD, Gen. Rep. IX, 1858, 301.

SP. CH.—*Male*.—Plumage, vermillion, assuming a brownish or reddish cast on the upper surface. Wings, dusky brown edged with vermillion. Bill, yellowish horn color. Feet, light brown.

Female.—Upper parts, olive, the rump and tail having a yellowish tinge. Under parts, dull orange yellow, wings brown edged with yellowish olive. Bill and legs like the male. At times the plumage of the adult female is mottled with bright reddish brown.

The young resembles the female, but is often mottled with red, yellow and green, before assuming its complete adult plumage.

This bird is quite abundant in Texas, where we frequently heard its loud, melodious whistle while hunting in the oak woods which thickly border the edges of the streams.

XANTHORNIUS AFFINIS, Lawrence.—Lesser Orchard Oriole.

Xanthornus affinis, LAWRENCE, Annals of N. Y. Lyceum, vol. V, p. 113.

Icterus spurius, BAIRD, Gen. Rep. IX, 547.

SP. CH.—*Male*.—Head, throat, and upper part of back, deep black. Lower part of back, tail coverts and all the under parts, deep chesnut, lesser wing coverts being of the same color. Tail and wings, brownish black, the wing feathers being margined with yellowish white. Bill deep blue black, lighter at the base of lower mandible. Legs, blue. Length, 6 inches.

Female.—Upper parts, olive brown, assuming a yellowish green cast on the front and rump. Under parts, greenish yellow. Wings, brown, each feather being margined with ash white. Tail, olive brown above, lighter beneath, the outer webs of the feathers, yellowish green.

This bird in all its changes of plumage is a fac-simile of its closely allied species, *Xanthornus spurius*. They differ only in size. It was observed abundantly about San Antonio, searching on the trees for insects and their larvae, uttering a shrill and lively note much like that of our common orchard oriole. Their nest, composed of flexible grasses, is suspended from the branches of the mezquite tree. Incubation not having commenced while I was in the country, no eggs were procured.

CENTURUS UROPYGIALIS, Baird.—Gila Woodpecker.

Centurus uropygialis, BAIRD, Pr. Acad. Nat. Sc., Phil., vol. VII, p. 120.—IB. Gen. Rep. IX, 1858, 11.

SP. CH.—*Male*.—Head, neck and underparts, brownish ash. An obscure band of yellowish ash on the back of the neck in some specimens. A blood red patch on the head. Back and wings barred transversely with black and white. Abdomen near vent, yellow. Crissum and under tail coverts white barred with black. The central tail feathers black on their outer vane with a strip of white commencing at the base and running to a point at about $\frac{2}{3}$ the length of the feather. The inner vanes barred and their points black. The 2 outer feathers, white barred with black, intermediate ones, black. Bill, black. Feet, dusky. Length, 9 inches.

Female.—Wanting the red patch on the head. Front and top of the head of a lighter ash than the under parts. Length, $9\frac{1}{4}$ inches.

This bird is abundant among the mezquite trees on the borders of Gila river. The giant cactus, (*Cereus giganteus*), often 40 feet high, and which grows abundantly on the arid hill sides throughout this whole section of country, is frequently filled with holes bored out by this bird. The pith of the plant is extracted until a chamber of suitable size is obtained, when the juice exuding from the wounded surface hardens and forms a smooth dry coating to the cavity, thus making a convenient place for the purposes of incubation. At Tucson it frequents the corn fields and is seen alighting on the old hedge posts, in search of insects. Its note resembles very much that of our red-headed woodpecker.

CENTURUS FLAVIVENTRIS, Swains.—Yellow-bellied Woodpecker.

Centurus flaviventris, Sw. Two Cent & a Quart. p. 354.—BAIRD, Gen. Rep. IX, 1858, 110.

SP. CH.—*Male*.—Front and vent, yellow. Collar on back of neck, orange yellow. A blood red patch on top of the head. Feathers between the front and red patch, grey, between red patch and orange collar, grayish slate. Under parts, pale ash. Crissum and under tail coverts, marked with dusky arrow heads. Back and wings barred with white and black; rump and upper tail coverts, white. Tail, black, with the exception of the two outer feathers, which are barred with white on their outer veins. Bill, black. Feet, light blue. Length $9\frac{1}{4}$ inches.

Female.—Like the male, but wanting the red patch on the head. Length, 9 inches.

Not rare in Texas and frequenting abundantly the mezquite woods which cover portions of the prairie in the vicinity of San Antonio.

PICUS SCALARIS, Wagler.—Barred Woodpecker.

Picus scalaris, WAGLER, Isis, 1829, p. 511.—BAIRD, Gen. Rep. IX, 1858, 94.

SP. CH.—*Male*.—Front dusky black. Top of the head black, interspersed with white spots tipped with red, the red tips forming a scarlet patch on the back of the head. A white line over the eye. Another from base of upper mandible running down the cheek. A moustache from base of lower mandible runs down the neck joining the auriculars; both moustache and auriculars black. Back banded with black and white. Wings banded with seven bars formed by white spots on the outer vanes of the feathers. Under parts dirty white, marked with oblong black spots on the sides of the breast, and rounded ones on the sides and crissum. Lower tail coverts barred with black. Four central feathers of the tail black, the two outer ones black banded with white, and the intermediate one having the outer vane and end margined with white. Bill blue black. Feet dusky. Length $6\frac{1}{2}$ inches.

Female.—Like the male, with the exception of the top of the head, which is entirely black. Length $6\frac{1}{2}$ inches.

I observed this small woodpecker in the southernmost portion of California, and found it more and more abundant as we advanced towards Texas, where it is common.

ORTYX TEXANUS, Lawrence.—Texian Partridge or Quail.

Ortyx texanus, LAWRENCE, Ann. Lyc. N. Hist. N. Y. vol. VI, p. 1.—BAIRD, Gen. Rep. IX, 641.

SP. CH.—*Male*.—Lores white. Throat white, encircled by a black band which starts near base of upper mandible and becomes broader in front of the neck. A white line over the eye, commencing at the nostril and running laterally on the neck, bordered above by a narrow line of black. Crown dark brown, margined with gray and tinged with rufous. Feathers on lower part of hind neck dull black, in central parts edged with white and tipped with reddish brown. The shoulders and upper portions of the back chestnut, mottled with deep brown, bordered with ash; the rest of the upper parts light brown, becoming lead color on the tail, the whole being mottled with ash, white, and deep brown. Below the black throat band is one of rufous. Breast and vent dull white, the feathers being crossed by broad curving bars of deep brown, almost black. Feathers of sides and flanks rufous in their centre, margined on their edges with irregular white blotches partially encircled by broad bands of deep brown. Under parts of tail and wings pale lead color slightly mottled with gray. Under tail coverts rufous tipped with dull white, and with central arrow heads of deep brown. Bill black. Legs light brown. Length 8 inches.

Female.—Chin dull white. Lores, throat, and line over the eye pale ochre. The rufous breast band of the male is replaced by a general rufous tinge. The transverse bars on breast and abdomen are less rich and numerous. Bill horn color above, lighter beneath. In all other respects like the male. Length $7\frac{3}{4}$ inches.

This bird bears a close resemblance to the *Ortyx virginianus*, but the following differences may at once be detected on comparing the two species: The *O. texanus* is smaller, the rufous color of the breast is paler, but forms a more perfect band in the male specimen. The transverse bars on abdomen are twice as broad as those of the *O. virginianus*, while the rich chestnut tinge forming the prevalent tint on the back of the latter is replaced in the *O. texanus* by a light brown and a more general ashy hue.

This bird was first observed in numbers on the Pecos river, although seen some days previous to reaching this point. Its numbers increased as we neared civilization, and near San Antonio it became plentiful. The call of the male bird consists of two notes, (repeated at intervals,) which are less loud, clear, and ringing than those of our common quail, (*O. virginianus*.) It feeds on the open prairies upon grass seeds, grains, berries, and insects, and if alarmed takes refuge among the scattered mesquite trees and clumps of bushes. When hunted it lays to the dog like our common species, and if flushed flies in a direct line with a loud whirring noise, caused by the shortness and rapid motion of the wings. I found an egg of this bird, which had been dropped upon the road. In form and color it was like that of our common quail though smaller.

LOPHORTYX GAMBELII, Nutt.—Gambel's Partridge.

Lophortyx gambelii, (NUTTAL.) GAMBEL, Proceed. Ac. N. Sc. Phil. vol. I, p. 260, 1843.—BAIRD, Gen. Rep. IX, 645.

SP. CH.—*Male*.—Crest brownish black, composed of six feathers. Front grayish white, each feather having in its centre a longitudinal line of black. A transverse band of white, dividing the top of the head in about two equal portions, runs down the side of the neck, forming a border to the patch of chestnut covering the top and back of the head; a fine line of black lies between this white line and the chestnut patch. Throat black, encircled by a white band reaching nearly to the eye. Upper parts and breast grayish slate, the feathers of the sides and back of the neck having in their centres a delicate longitudinal brown line. Primaries pale ashy brown, inner vanes of tertiaries bordered with cream color. Middle of breast and abdomen cream color, with a large black spot in the centre of the latter. Sides and flanks deep chestnut, each feather with a longitudinal linear spot of white. Under tail coverts with broad bands of ashy brown running down the centre of the feathers. Bill dusky. Feet light brown. Length $9\frac{1}{2}$ inches.

Female.—Crest smaller than male. Throat dirty gray. Breast and upper parts grayish slate, the head having a brownish tinge. Feathers of the neck and breast with a line of brown in their centre. Inner vanes of tertiaries bordered with cream color. Lower part of breast and abdomen cream color, the centre of each feather being marked with a thin line of dark brown. Vent, crissum, and under tail coverts, longitudinally striped with grayish brown. Sides and flanks chestnut, each feather being marked in its centre with a strip of white. The plumage, where of similar marking, is paler in its coloring than in the male bird. Bill dusky. Feet light brown. Length 9 inches.

From Fort Yuma, on the Colorado, to Eagle Springs, between El Paso and San Antonio, where we last saw a flock of these birds, we found them more or less abundant whenever we followed the course of the Gila or struck water holes or streams of any kind. Although frequenting the most arid portions of the country, where they find but a scanty subsistence of grass seeds, mesquite beans, and insects, still they show a preference for the habitation of man, being much more numerous in the cultivated fields of Tucson, Mesilla valley, and El Paso. Towards evening, in the vicinity of the Mexican villages, the loud call note of the male bird is heard, gathering the scattered members of the flock, previous to issuing from the cover where they have been concealed during the day. Resorting to the trails and roads in search of subsistence, they utter while thus engaged a low soft note which keeps the flock together. They are not of a wild nature, often permitting a near approach, and seldom fly unless suddenly flushed, but prefer to escape from danger by retreating to the dense thickets.

CALLIPEPLA SQUAMATA, Gray.—Scaly Partridge.

Ortyx squamatus, VIG. Zool. Journ. vol. V, 1830, p. 275.

Callipepla squamata, BAIRD, Gen. Rep. IX, 1858, 646.

SP. CH.—*Male*.—Head light rusty ash; feathers of the crown light brown tipped with white. Throat pale cream color. Upper parts bluish ash, assuming a rusty tinge on the rump. Wings light brown; tertiaries margined on their inner vanes with white. Under parts pale bluish ash, becoming pale cream color on lower portions of abdomen and vent, the centre of the abdomen being marked with a pale rust patch. The feathers of the breast and abdomen with a central light brown arrow head and fringed with a narrow border of darker hue, while those of the back of the neck have the outer fringe well marked, though

the arrow heads are much less distinct and numerous. Flanks bluish ash with a tinge of brown, each feather having a longitudinal spot of white in its centre. Under tail coverts pale rusty white, with longitudinal bands of light brown occupying the centre of the feathers. Bill black. Feet lead color. Length nine and a half inches.

Female.—Plumage the same as the male. Crest smaller and delicate longitudinal lines of brown freckling the centres of the feathers of the throat. Length nine and a half inches.

The San Pedro river, a branch of the Gila east of Tucson, was the most western point at which I observed this species; here a flock of these birds ran before us at a quick pace, with outstretched necks, heads elevated, crests erect and expanded, and soon disappeared among the thick bushes which surrounded us on all sides. After this I saw them occasionally until I arrived at Lympia Spring. Lieutenant Barton, United States army, informed me that he had procured it near Fort Clarke, one hundred and twenty miles west of San Antonio, where, however, it is rare. This beautiful partridge is found abundantly on the open plains, often starting up before us when passing over the most arid portions of our route. It also seems partial to the prairie dog villages. These, covering large tracts of ground destitute of vegetation, (everything but a stray cactus here and there being consumed by the prairie dogs,) probably offer the attraction of some favorite insect.

ACTIDURUS NAEVIUS, Heermann.—Mottled Grass Plover.

PLATE VI.

Actidurus naevius, HEERMANN, Proceed. Acad. Nat. Sc. Phil. vol. VII.

Tryngites rufescens, CASSIN, in Gen. Rep. P. R. R. 1858, 739.

SP. CH.—*Form.*—Bill slender, as long as the head; culmen straight; sides compressed towards the tip, which is slightly curved; nostrils linear. Wings pointed, and when closed reaching to the end of the tail, the first primary being the longest. Tail long, broad, and rounded, the central feathers longest. Tarsae and toes long; claws short and acute.

Color.—The feathers of the upper parts black in the centre, with broad margins of yellowish brown; primaries brown, the ends being black narrowly tipped with white. Under surface white, becoming mottled with black two and a half inches from their termini, which there change to a grayish hue. The under wing coverts, irregularly marked and mottled with black, are silver gray, dusky towards the ends, but tipped and bordered with pure white. Under parts pale yellow ochre, the feathers bordered with faint white. Those of the breast near the pinion of the wing having in their centre a linear spot of black. Lower part of abdomen and vent of a much paler hue than the breast. Tail brown on its upper surface, the two middle feathers having a bronze tinge, the others being tipped with yellowish white followed by a black band. Under surface grayish, the inner vanes being mottled with minute brown spots. Bill black. Feet light yellow. Length seven and a half inches.

While riding on the prairies near San Antonio, my attention was called to this bird from its being smaller than Bartram's tatler, (*Actitis bartramius*,) which there abounds. It ran nimbly on the ground among the grass in search of insects, uttering when disturbed a weak tweet, two or three times repeated. The birds of this genus, unlike the *Tringae*, (which congregate in large flocks showing a preference for the seashore,) migrate in small parties, resorting to the fresh water ponds and streams of the interior, or seek their food on the broad grassy plains. They run with great celerity. If alarmed they fly with rapidity, making wide circuitous sweeps before alighting. When wounded they take to the water, swimming with facility and often diving to escape danger. The nest, formed of grasses and containing four eggs, is placed on the ground, which has been previously hollowed out. When disturbed during the breeding season, the female, flying a short distance from her nest, throws herself on the ground, fluttering along as if wounded, and thus decoys the intruder into following her away. Once at a safe distance she takes to wing, returning to her home by a circuitous route.

LIST OF BIRDS

COLLECTED BETWEEN

Fort Yuma and San Antonio, Texas, during the survey of railroad route from the Mississippi to the Pacific ocean, under the command of Lieutenant J. G. Parke, Top. Engs.

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| Pipilo aberti | 2..... | 15 | Callipepla squamata..... | 2..... | 19 |



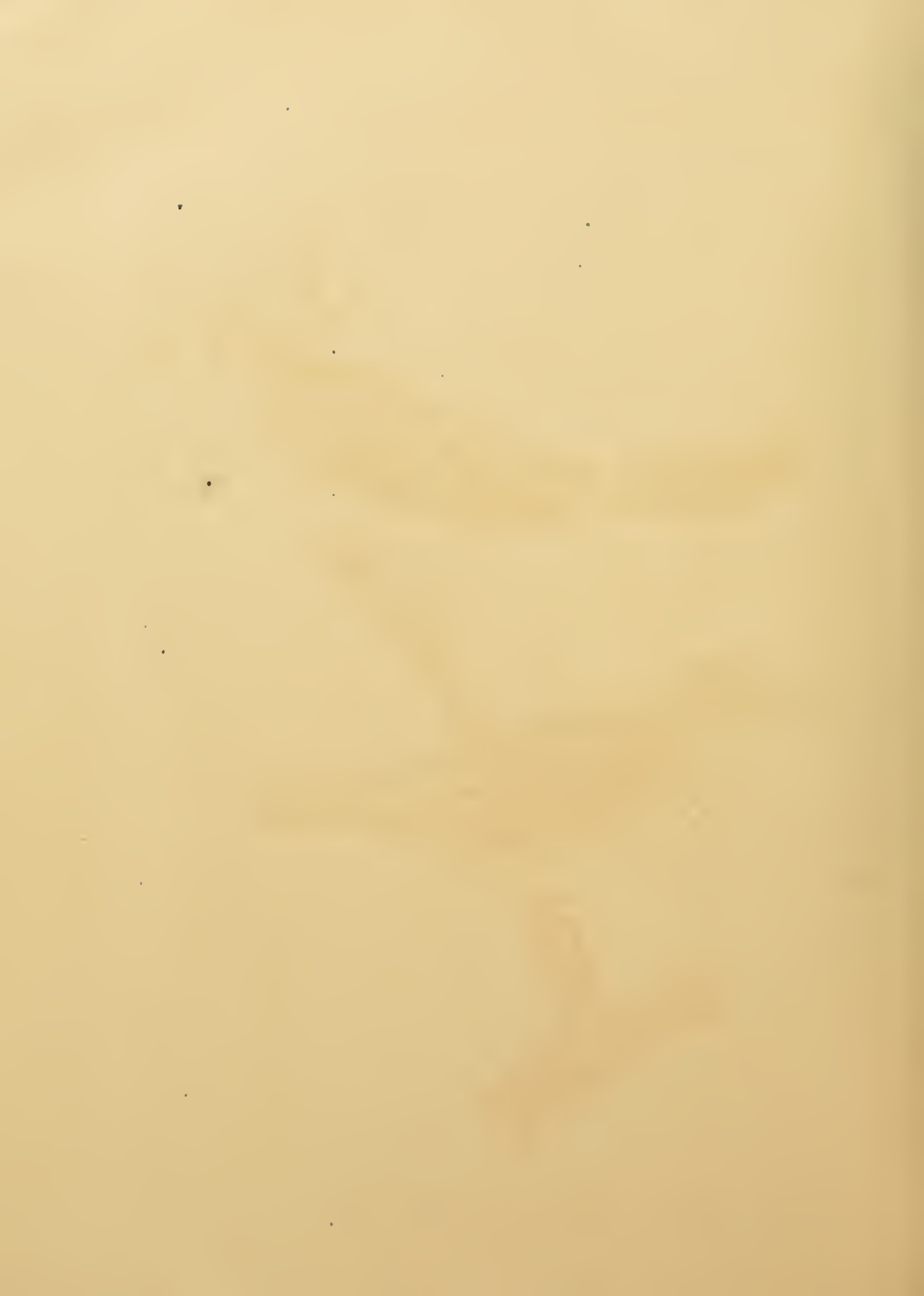




Fig 2

Fig 1



No. 2.

REPORT UPON REPTILES COLLECTED ON THE SURVEY.

BY EDWARD HALLOWELL, M. D

CNEMIDOPHORUS GUTTATUS, Hallowell.

SP. CHAR.—Head olive color, body greenish olive, with eight lines of the same color, interspaces upon sides brown; sides presenting numerous white spots arranged in longitudinal rows; under surface dark blue, marked with white; of anterior extremities deep blue; of posterior and tail white; scales of the body very small; sub-gular fold margined with a row of large smooth scales; several smaller rows anterior to these: eight rows of scales upon the abdomen; sixteen femoral pores on each side very distinct.

Dimensions.—Length of head one inch; greatest breadth five eighths; length of head and body to vent, three and a half inches; length of tail, four inches five-eighths; of anterior extremities, one inch one-eighth; of posterior, two inches two-eighths.

Habitat.—Texas.

GEN. OBS.—From *C. sexlineatus*, *guttatus* may be readily distinguished; the scales upon the upper part of the body are larger; allied to *C. gularis*, but the latter has no spots.

CROTALUS ORNATUS, Hallowell.

PLATE II.

SP. CHAR.—Three large plates in front of upper part of the head, on each side; nasals large; posterior part of head covered with smooth scales; rostral rather large; eighteen supra-labials, the 6th, 7th and 8th the largest; a small plate between the rostral and first supra-labial, and anterior frontal; 27 rows of scales; ground color slate or greyish above with transverse brown lozenge-like bands, their external margins extending to the abdomen with intermediate yellow spots, and yellowish markings enclosed within the brown, sometimes ten in number; the brown lozenge-like spots become indistinct posteriorly, and contain no yellowish spots, giving to this part of the upper portion of the body a sombre appearance, compared with the beautiful variegated robe of the rest; about seventeen of these brown lozenge-like spots may be counted on the back; tail entirely black; throat and chin white; abdomen light straw color without spots, but shaded with greyish. 194 Abdom. scuta; 3 bifid post abdom. scut.; 19 sub-caud. 7 rattles belonging to the present specimen.

Dimensions.—Breadth of head posteriorly 1 to 2½ inches; length of head 1½ inch; of body 3 feet 5 inches; of tail 2 inches; of rattles 1 inch.

Habitat.—Near Pecos river, northwestern Texas.

GEN. OBS.—Differs from *C. lecontei* greatly in the arrangement of the plates upon the head; in the ground color, which is yellow in *lecontei*; in the form of the dorsal spots, which are rhomboid in the latter and all distinct, without prolonged margins; and in the color of the tail, which in *lecontei* is banded, the two animals having no specific resemblance. In some respects it corresponds with the description of *Crotalus molossus*, Baird and Girard, the latter having, according to them, brown lozenge-colored spots, with angles extending to the abdomen, and two yellowish spots in the centre, also in the scales, being each of the same color throughout; but the head is not quadrangular, and the ground color of *molossus* is represented as roll sulphur. In *C. ornatus* the sixth, seventh, and eighth superior labial plates are the largest; in *molossus*, the fifth and sixth.

Besides the reptiles above described there were also in the collection of Dr. Heermann two specimens of *Holbrookia maculata*, which is said to be very abundant in Texas, being often found in the holes of the prairie dog, (*Arctomys ludoviciana*,) and a fine specimen of *Herpetodryas aestivus*. This does not appear to differ essentially from the *H. aestivus* of Pennsylvania. It is somewhat more robust, the scales are broader, and there are some unimportant differences in regard to the smoothness of the external and inferior rows of scales, but these are not of sufficient importance to constitute specific characters. In the genus *Herpetodryas*, the opening of the nostril is in a single plate, or between two plates according to Dumeril and Bibron. In *Leptophis* always between two plates. The *Col. vernalis* of DeKay belongs to the genus *Herpetodryas*, and in our opinion should not be separated from it, because it has smooth scales, those of *aestivus* being carinated. Examples of *Leptophis* may be found in *Leptophis smaragdina*, *Lept. lateralis*, and *Lept. leiocercus*, the scales of the trunk of which are carinated, and those of the tail smooth. Ten species of *Leptophis* are described by Dumeril and Bibron in their *Erpetologie Générale*.

There was also in the collection a full grown specimen of *Rhinocheilus lecontii*, Baird and Girard, caught about one hundred miles from Pecos river, in the open prairie. It corresponds very well with the description in their work on serpents, except that the pre-abdominal scuta is entire and not bifid, as they represent it, and that the sub-caudal scutellae are not all single, nineteen of the latter being bifid.

There is also a small plate behind the occipital, 190 abdominal scutae, 1 bifid pre-abdominal, 28 single sub-caudal towards the anus, then 4 rows of bifid, then 1 single, and lastly 15 bifid, as in *Coluber* and *Tropidonotus*.

Dimensions.—Length of head five-eighths of an inch; breadth $\frac{1}{2}$ an inch; length of body 16 inches; of tail 3 inches.

GEN. OBS.—Future inquiries must determine whether *Rhinocheilus lecontii* should be removed from the genus *Rhinechis* of Michaelles, of which but one species has heretofore been described, viz: the *Rhinechis scalaris*, of which there is a good figure in Bonaparte's *Fauna Italica*. In the genus *Rhinechis*, as characterized by its author, the plates under the tail are all bifid.

Dimensions of the specimen of *aestivus*,* from Texas: Length of head six-eighths of an inch; breadth three-eighths; length of body $16\frac{1}{2}$ inches; of tail 10 inches; circumference of body $1\frac{2}{3}$ inch.

* *Leptophis majalis*, B. & G. Marcy's Report, pl. IX.



EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.
WAR DEPARTMENT.

R E P O R T

OF

EXPLORATIONS IN CALIFORNIA FOR RAILROAD ROUTES

TO CONNECT WITH

THE ROUTES NEAR THE 35TH AND 32D PARALLELS OF NORTH LATITUDE.

BY

LIEUTENANT R. S. WILLIAMSON,

CORPS OF TOPOGRAPHICAL ENGINEERS.

1853.

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PART IV.

EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.
WAR DEPARTMENT.

ROUTES IN CALIFORNIA, TO CONNECT WITH THE ROUTES NEAR THE THIRTY-FIFTH AND THIRTY-SECOND
PARALLELS, EXPLORED BY LIEUT. R. S. WILLIAMSON, CORPS OF TOP. ENG., IN 1853.

ZOOLOGICAL REPORT.

WASHINGTON, D. C.
1859.

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BY S. F. BAIRD.

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REPORT UPON FISHES OF THE ROUTE.

BY CHARLES GIRARD, M. D.

¹ The report to which the present part belongs will be found in volume V.

INTRODUCTORY LETTER.

BY A. L. HEERMANN, M. D.

PHILADELPHIA, *October 6, 1854.*

SIR: I herewith have the honor to submit to you the report on the natural history of that portion of California over which your command passed, during the late survey, from San Francisco to Fort Yuma.

From the limited time within which it was desirable it should be completed, I have only undertaken the detail of the ornithological branch; the others I have placed in the hands of the following gentlemen:

Professor S. F. Baird has classified the mammals. These are necessarily few; the great difficulties which present themselves in their preparation, added to the still greater one of their transportation when prepared, form insuperable obstacles to an extensive collection in this interesting department.

Dr. Edward Hallowell has described the reptiles, among which he has found many new and interesting species.

Mr. E. Durand and Dr. T. Hilgard have classified the collection of plants, consisting of about one hundred species, nearly twenty of which are new.

Professor C. Girard has described many new species of fish, among which are several viviparous ones from the coast of California.

To all of these gentlemen I feel under deep obligations for the zeal with which they have entered upon their various branches of natural history, and the material assistance which they have afforded me in the early rendition of my report.

As the maladies encountered during the course of the expedition, taken in time, were never allowed to assume a serious nature, I have made no medical report. They consisted of diseases incident to the country, and to camp life, such as intermittent fever, diarrhœa, and dysentery, besides some few surgical cases of incised and punctured wounds, all of which, however, terminated favorably.

I remain, sir, your obedient servant,

A. L. HEERMANN, M. D.

Surgeon and naturalist to the command.

Lieutenant R. S. WILLIAMSON,

Topographical Engineers, Washington, D. C.

No. 1.

REPORT UPON THE REPTILES COLLECTED ON THE SURVEY.

BY DR. EDWARD HALLOWELL.

INTRODUCTORY REMARKS.

California is divided into Upper and Lower, the latter a rocky peninsula, the natural history of which has not been explored. The recent acquisition of Upper California by the United States has served to develop its vast mineral treasures; and the various government expeditions have brought to the knowledge of scientific men much of its natural history, so that it may be said its herpetology, and, perhaps, its ornithology, are almost as well known as those of our oldest States. Previous to these but little was known of the herpetology of California.

We shall not, at this time, enter into any remarks upon the distribution of our species of reptiles, but make a few observations upon the genera, some of which appear to belong to the fauna proper of California, and others common to both it and other parts of the Union. Of the former may be enumerated the genera *Anota*, *Uro-saurus*, *Dipso-saurus*, *Aniella*. The genera common to it and other regions more remote are *Sceloporus*, *Phrynosoma*, *Crotaphytus*, *Eumeces*, *Cnemidophorus*, *Homalosaurus*, *Cyclura?*, *Gerrhonotus*, among lizards; *Herpetodryas*, *Coronella*, *Tropidonotus*, *Rhinocheilus*, *Ablates*, *Pityophis*, *Crotalus*, among serpents; and *Hyla*, *Bufo*, and *Ambystoma*, among *Batrachians*. The genera *Dipso-saurus* and *Anota* appear to delight in the sandy, barren parts of California, in its southern portion, much of which is a desert, where are to be seen but a few lizards and horned serpents, and such plants as live only in desolate regions. *Sceloporus* is found in New Jersey, 2,500 miles distant; *Gerrhonotus*, *Cnemidophorus*, *Eumeces*, in Mexico; *Crotaphytus* and *Homalosaurus* in Texas and New Mexico, the former also in Kansas; *Phrynosoma* in Texas, New Mexico, Kansas, and the Creek and Cherokee countries, where it is very abundant; *Tropidonotus* exists in most parts of the Union; *Pityophis* in New Jersey and New Mexico; *Herpetodryas* in South Carolina, Texas, Maryland, Pennsylvania, and New Jersey; *Coronella* in South Carolina, New York, Florida, Louisiana, Alabama, Georgia, and Kansas; *Rana*, *Bufo*, and *Ambystoma* are found in most parts of the United States. Of the genus *Emys*, including the fresh water turtles, so numerous in North America, but one species has been received from California, viz: that described in the following report:

ORDER I.

CHELONII, Brogniart.

SECTION CATAPHRACTA, Gray.

CHAR. 1. The body is protected by a bony covering, formed of the vertebræ of the thorax, back, and loins, and by the ribs, of which there are eight pair, greatly developed and joined to each other by suture. Under this shell or carapace are placed the bones of the shoulder and pelvis; and beneath it can often be retracted the head and anterior extremities in front, and the posterior extremities and tail behind.

CHAR. 2. This bony box is completed below by a broad sternum or plastron, formed of several pieces joined solidly to each other, and most commonly, also, to the carapace or shell.

CHAR. 3. The head, neck, and tail are the only movable parts of the spinal column.

CHAR. 4. The jaws are covered with a horny substance, and are always destitute of teeth, properly speaking, though their cutting margins are often serrated.

CHAR. 5. The nostrils are anterior, approximated, and are simple or tubular.

CHAR. 6. The eyes are always furnished with three lids.

CHAR. 7. The external meatus of the ear is covered with the skin.

CHAR. 8. The tongue is fleshy, short, thick, depressed, and covered with fleshy filaments.

CHAR. 9. The lungs are extensive, and are placed in the same cavity with the other viscera.

CHAR. 10. The heart is composed of two auricles and of one ventricle, subdivided into two unequal cavities that communicate with each other, so that the current of blood from the lungs and that from the body generally are more or less mingled in passing through the ventricle.

CHAR. 11. The stomach is simple and very strong, with thick walls. The intestines are of moderate length, and destitute of a cæcum.

CHAR. 12. The eggs are round or oval and the shell more or less firm.

CHAR. 13. The young undergo no metamorphosis, but resemble the parent in general form from the time they leave the shell.

This order in the twelfth edition of the *Systema Naturæ* of Linnæus comprise donly fourteen species, all united in one genus *Testudo*; it now includes about eighty, distributed in several different families and genera.—(Holbrook.)

FAMILY I.

EMYDIDÆ. Gray.

CHAR. 1. The feet are palmate, with distinct toes, five in front and four posteriorly, each provided with a sharp nail.

CHAR. 2. The head is depressed, covered with horny scutellae; marginal scutes 23–27, those of the sternum 11–12.

CHAR. 3. The skull is generally depressed and solid, with a distinct bony margin, and covered with horny plates; the dorsal plates 13 with twelve pairs of marginal plates, *the caudal pair being separated by a distinct suture*; nuchal plate narrow. The sterno-costal commissure is generally long, and usually furnished with a distinct and rather large axillary and inguinal plate. The sternum has 11 or 12 shields, the gular pair being sometimes united, but never having an extra plate between them as in *Chelydae*.

CHAR. 4. Live in ponds and ditches; only take their food when in water; eggs oval and white; motions rapid; living on mollusca, worms, insects, and carrion; inhabit warm and temperate climates.—(Gray.)

EMYS, Brogniart

EMYS NIGRA, Nob.

SP. CHAR.—Shell oblong-ovate, slightly compressed at the sides, and emarginate, but not distinctly serrated posteriorly; latero-posterior margins of carapax everted; nuchal plate narrow, truncate anteriorly, broader posteriorly; 24 marginal plates, the two posterior more or less quadrilateral, the two adjoining pentagonal; color blackish above, the upper part of head and neck presenting numerous very small yellow spots upon a black ground; anterior extremities with a tinge of yellow; under jaw and throat yellow, with dark colored markings; plastron yellow in the middle, with large blotches of black or dark brown at the sides, and anteriorly and posteriorly; under surface of tail and extremities blackish; tail of moderate length.

DIMENSIONS.—Length of head, 1 inch; breadth, $\frac{7}{8}$; length of carapax, $6\frac{1}{2}$ inches, measured along curvature superiorly; breadth at middle, $5\frac{1}{2}$ inches; of tail, $2\frac{3}{8}$.

HABITAT.—Posa creek, southern part of Upper California, where it is very abundant.

GEN. OBS.—This species resembles none of the North American *Emydes* with which I am acquainted. Its dark color puts one in mind of, but is not so jet a black as that of *Sternothaerus niger* of Madagascar.

ORDER II.

S A U R I I .

FAMILY II.

IGUANIDAE.

CHAR. 1. The body is covered above with horny plates or scales, which are without knobs or tubercles; most commonly, however, there is either a dorsal or caudal crest. The abdomen is covered with small plates.

CHAR. 2. The head is destitute of large plates.

CHAR. 3. The eyes are furnished with two moveable lids.

CHAR. 4. The teeth are placed sometimes in a common socket or groove; at others they are not set in the bone, but only united firmly to its free border.

CHAR. 5. The tongue is thick, fleshy, flattened, and covered with papillæ; is destitute of a sheath at its root, and is only movable at its tip.

CHAR. 6. The fingers and toes are free, distinct, of unequal length, and are all furnished with nails.

The family *Iguanidae*, according to Dumeril and Bibron, includes about forty six genera arranged in two sub-families or sections:

I. Teeth mostly conical, and received in a cylindrical groove of the jaws.

II. Teeth solidly united to the most prominent part of the jaws, which offer no groove. Four genera only of this family are found within the limits of the United States, viz: *Anolius*, *Tropidolepis*, *Crotaphytus*, and *Phrynosoma*.—(Holbrook, 1842.)*

Gen. URO-SAURUS, Hallowell.

GEN. CHAR.—Body very slender, which, as well as the head, is much depressed; tongue triangular, slightly nicked in front, deeply notched behind, free anteriorly, not enclosed in a sheath; teeth sharp pointed, conical, the posterior ones tricuspid, situated on the inner side of the jaw; scales upon the back large, hexagonal, strongly carinated, much larger than those upon the sides, which are granular; scales of abdomen smooth; nostrils superior, in a single scale; head covered with polygonal plates of unequal size; aural apertures very distinct; a transverse gular fold; extremities slender; toes, 5-5; tail very long and tapering, verticillate; femoral pores, but no anal ones.

URO-SAURUS GRATIOSUS, Nob.

Syn. *Uta ornata*, BAIRD & GIRARD, Proceed. A. N. S. vol. VI, p. 126.

SP. CHAR.—Head yellow, with a few brownish marks; seven longitudinal rows of hexagonal

* Others have since been added, as *Uro-saurus*, *Dipso-saurus*, *Anota*, &c.

scales upon the back, very distinctly carinated; several rows of large scales beneath the infra-labials, the two anterior of the inferior rows much the largest; collar scaly; aural apertures strongly denticulated anteriorly; sides of neck folded; a fold over the shoulder; occipital scale large, in contact on each side with the supra-orbital ridge; scales upon muzzle for the most part narrow; behind them two transverse rows, the first containing three, the second but two plates; two single plates upon the vertex, the anterior the largest; six narrow pentagonal plates upon each orbit, bordered internally with a row of small scales; 46 teeth in upper jaw, 44 in lower; color of body yellowish, mixed with brownish and black spots; extremities yellowish, with dark colored transverse bands; tail of same color above as body, under surface silvery white, with blackish spots; eleven femoral pores.

DIMENSIONS.—Length of head, $\frac{5}{8}$ inch; greatest breadth, $\frac{3}{8}$ inch; length of head, neck, and body to vent, $1\frac{7}{8}$ inch; of anterior extremities to extremity of longest toe, $\frac{3}{4}$ inch; of posterior to extremity of longest toe, $1\frac{3}{8}$ inch; of tail, $4\frac{1}{8}$ inches; total length, $6\frac{5}{8}$ inches.

HABITAT.—Southern part of Upper California.

GENERAL REMARKS.—The contrast between the large carinated scales upon the back and the small ones upon the sides, resembling granulations, is striking; the long and slender tail is also remarkable. In these respects, *Uro-saurus* is allied to *Tachydromus*, but the plates upon the head are very different.

SCOLOPORUS, Wiegmann.¹

SCOLOPORUS MAGISTER, Nob.

SP. CHAR.—Larger than any known species of *Sceloporus*, and remarkable for its large and strongly carinated scales, which are very much denticulated posteriorly; anterior margin of aural apertures strongly denticulated; upper part of head, body and extremities, and tail straw color, without spots or blotches; a black triangular blotch upon each side of the neck, in front of the shoulder, the base below; two large bluish green blotches upon the abdomen, one on each side and one upon the neck; the rest of the under surface light straw color; tail long, very thick at base, tapering near the point; twelve femoral pores on each side.

DIMENSIONS.—Length of head, neck, and body to vent, $4\frac{3}{4}$ inches; greatest breadth of head, $1\frac{1}{8}$ inch; length of head, $1\frac{1}{4}$ inch; of tail, 5 inches; of anterior extremities, $1\frac{1}{2}$ inch; of anterior foot to extremity of longest toe, 1 inch; of posterior extremities, $1\frac{3}{4}$ inch; of foot to extremity of longest toe, $1\frac{3}{8}$ inch; total length $9\frac{3}{4}$ inches.

HABITAT.—Near Fort Yuma, at junction of Colorado and Gila, also near Tucson, in Sonora, upon a rocky soil.

GEN. OBS.—This species is remarkable for its large size and greatly developed spines. It is a much larger animal than *S. spinosus* of Wiegmann, and wants the quadruple series of dark colored spots that exist in that animal. The posterior margins of the scales are strongly denticulated, which is not the case in *S. spinosus*, one of the characters of which is “*squamis paucidentatis*.” From *S. horridus* Wieg. it differs in coloration, arrangement of plates upon the head, and in the number of femoral pores, which in the latter are 4–5.

(1) *Tropidolepis*, Cuvier.

SCELOPORUS BISERIATUS, Nob.

SP. CHAR.—Scales of the back much larger than those upon the sides. Five frontal plates in two rows, sometimes a small one intercalated between the two outer of the second row; the middle of the anterior row largest; four internasals; four small plates immediately behind the rostral; two vertical plates; one large plate on each side of the occipital, and two in front of them; posterior border of scales not denticulated. A narrow brownish vitta across the head near the middle of the supraciliary plates; coloration of head resembling that of *S. undulatus*; light ash gray above, with a double row of dark colored spots upon the back, on each side of the dorsal line, extending a short distance upon the tail; extremities ash colored above, banded with black; under surface silvery gray, with two blue blotches, one on each side of the abdomen, and a blue blotch upon the chin; 20 femoral pores.

DIMENSIONS.—Length of head, neck, and body to vent, 3 inches; of tail, $4\frac{1}{2}$ inches; length of anterior extremities, $\frac{5}{8}$ inch; of foot anteriorly to extremity of longest toe, $\frac{5}{8}$ inch; of posterior extremity, 1 inch; of foot, posteriorly, to extremity of longest toe, 1 inch; total length, $7\frac{1}{2}$ inches.

HABITAT.—Borders of El Paso creek and in Tejon Valley. Constantly climbing up trees, when scared, to a distance of twenty or thirty feet, running along the ground and up the trees very quickly.

GEN. OBS.—Wants the undulating lines or bars of *S. undulatus*, these being replaced by the spots above described; the scales upon the sides are also much smaller than those of *S. undulatus*. This species resembles very closely *S. variabilis* of Wiegmann, and is probably the same, notwithstanding certain differences in the description. In the absence of a good drawing, or authenticated specimen, we cannot pronounce, positively, whether they be the same or not, although inclined to the former opinion. Thus the head, according to Wiegmann, is unicolor; and the plates upon the head cannot be said to be *ruguloso-carinatis*, for they are, for the most part smooth in *S. biseriatus*. It wants the white lateral line beneath the spots which is observed in *S. scalaris* Wiegmann. The arrangement of the plates upon the head appears to characterize this species very well, being uniform, with unimportant exceptions, in all the specimens brought by Dr. Heermann.

VAR. A. S. AZUREUS.—Body uniformly blue above, mingled with brown, the blue color predominating; on the sides greenish, with a metallic lustre; head brownish above; two large blue blotches upon abdomen, one on each side; rest of under surface silvery white with bluish tints, especially about the chin; scales large and strongly carinated, not denticulated posteriorly; tail stout at the base, much less tapering than in *S. biseriatus*; the plates of the head correspond precisely with those of the latter animal.

DIMENSIONS.—Length of head, neck, and body to vent, $3\frac{1}{4}$ inches; of tail, $3\frac{5}{8}$ inches; of anterior extremities, 1 inch; of anterior foot to extremity of longest toe, $\frac{3}{4}$ inch; of posterior foot to extremity of longest toe, $1\frac{1}{4}$ inch; total length, $6\frac{7}{8}$ inches.

HABITAT.—Associated with *biseriatus*.

VAR. B. VARIEGATUS.—Body light ash color, with transverse brownish bands and markings coalescing with each other, so as to give the whole a marbled appearance; head above, ash color mingled with brown; extremities ash color with transverse bands of brown; under surface silvery gray without bluish spots or blotches; 17 femoral pores, remarkably large; tail stout, thick at the base.

DIMENSIONS.—Length of head, neck, and body, $4\frac{1}{2}$ inches; greatest breadth of head, 1 inch; length, 1 inch; tail mutilated, circumference at base $1\frac{2}{3}$ inch; length of anterior extremities, $1\frac{3}{8}$ inch; of foot to extremity of longest toe, $\frac{5}{8}$ inch; of posterior extremity, $2\frac{1}{2}$ inches; of foot, posteriorly, to extremity of longest toe, 1 inch.

HABITAT.—Same.

DIPSOSAURUS, Hallowell.

GEN. CHAR.—Head triangular, small, covered above and in front with tubercles, those upon the front the largest; gape of the mouth moderate, its posterior extremity on a line with the posterior margin of the orbit; eyelids covered with granulations, their edges with scales presenting a denticulated margin; a row of narrow, oblique, imbricate scales over the orbit; scales upon orbit polygonal, unequal, the four or five inner rows the largest; temples covered with smooth polygonal tubercles, of unequal size; teeth tricuspid, closely set on the inner side of the jaw, the posterior largely developed; no palatine teeth; tongue arrow-shaped, slightly notched in front, deeply cleft posteriorly; nostrils latero-superior, opening in a single scale; rostral plate vertical, triangular; jaws margined each with a series of smooth, quadrilateral plates; tympanum visibly depressed; anterior margin of auricular opening denticulated; upper part of body covered with carinated scales, more or less rounded posteriorly, arranged in oblique rows; a row of scales much larger than the rest, along the dorsal line and much more strongly carinated, forming a slight dorsal crest; a gular fold; scales of abdomen, quadrangular, smooth; femoral pores, but no anal ones; tail long, cyclo-tetragonal at base, tapering gradually to a point, covered with transverse rows of verticillate and carinated scales.

DIPSOSAURUS DORSALIS.

SYN.—*Crotaphytus dorsalis*, Baird and Girard. *Proceed. Acad. Nat. Sc.* 1852, p. 126.

SP. CHAR. One hundred and nine scales may be counted in one of the transverse rows running round the body near its middle, and terminating at the larger dorsal row; scales upon throat much smaller than those upon chin and abdomen; scales upon upper part of anterior and posterior extremities carinated; posterior surface of thighs granulated; the granulations surrounded with minute granules; third and fourth finger of nearly equal length; fourth toe much the longest; margins of fingers and toes denticulated, inferior surface presenting transverse rows of carinated scales; posterior extremities much stouter than the anterior; sides of neck folded.

COLORATION.—Body presenting numerous lines of red upon the sides, with blotches of the same color over the shoulders, the intervening spaces numerous white spots; upper surface and sides of tail marked with red spots arranged in transverse rows; upper surface of extremities with red; throat, abdomen, under surface of extremities, and tail white. The coloration, as described by Professors Baird and Girard, appears to be taken from young specimens, one such before me corresponding with it precisely.

DIMENSIONS.—Length of head, 7 lines; breadth, 7; length of head, neck, and body, to vent, 8 inches, (Fr. ;) of tail, $7\frac{1}{2}$ inches; anterior extremities, $1\frac{1}{2}$ inch; posterior, 3 inches, to extremity of nail of longest toe.

HABITAT.—Desert of the Colorado, to which it appears to be confined. The smaller specimen

from near Fort Yuma, the large one found in the desert between Kern river and the Tejon Pass, (pro-nounced Tahon;) a country without water, not sandy, but arid, bearing artemisia, &c.

GEN. OBS.—This animal differs from *Crotaphytus*, (Holbrook,) in having the upper part of the body covered with quadrangular scales, instead of granulations, and the larger row of carinated dorsal scales giving rise to a slight crest, no trace of which exists in *Crotaphytus*; and from *Homalo-saurus*, in the form of the marginal plates of the upper jaw. Several other genera of *Iguanida* present a larger row of scales along the middle line of the back, viz: *Enyalius*, *Microlophus*, and *Brachysaurus*, but these all differ greatly from *Dipsosaurus*; neither *Enyalius* nor *Microlophus* have femoral pores, and the scaling of the orbit in the latter is quite different, presenting a longitudinal row of large transverse plates; the scales upon the body both in *Enyalius* and *Microlophus* are much smaller, and the shape of the head is not the same.

FAMILY III.

LACERTIDÆ.

CHAR.—“Saurians with an elongated body, tetrapod, with four or five free toes unequal; tail, long verticillate, conical; cranium protected by horny polygonal plates; a distinct tympanum; large scales beneath the abdomen; tongue free, flattened protractile, rarely sheathed at the base, notched or deeply slit at the point.”—(*Dum. et Bib.*, vol. V, p. 5.)

For further details in regard to the characters of this family, see *Dum. et Bib.*, vol. V., p. 425.

CNEMIDOHORUS, Dum. et Bib.

CHAR.—Nostrils in the nasal plate near its posterior border; two supero-nasals; palate without teeth, with a shallow triangular notch posteriorly; scales smooth.—(*Dum. et Bib.*)

CNEMIDOPHORUS UNDULATUS, Nob.

SP. CHAR.—Of moderate size; tail very long; nostril in the naso-rostral plate near its inferior and posterior margin, just above the first supra-labial; head, brownish above; upper part of body with three or four longitudinal bands of black, with irregular margins; interspaces, yellowish, with a tinge of red in some specimens; sides margined with black and white or light-yellow; tail, black and light-yellow, presenting numerous transverse rows of rhomboidal carinated scales; upper part of extremities same color as sides of body; under surface, silvery gray, with a number of minute black spots upon the abdomen, throat and chin; tail round, moderately thick at base, tapering to a point; twenty pores very distinct; eight rows of scales upon the abdomen.

DIMENSIONS.—Length of head, one inch; greatest breadth posteriorly, half an inch; of head, neck, and body, $3\frac{1}{2}$ inches; of anterior extremities, $\frac{3}{4}$ inch; of foot to extremity of longest toe, half an inch; of posterior extremities, $1\frac{1}{2}$ inch; of foot to extremity of longest toe, 1 inch; of tail, $7\frac{1}{2}$ inches; total length $11\frac{1}{2}$ inches.

HABITAT.—Near Fort Yuma, in San Joachim Valley.

GENERAL OBSERVATIONS.—*Cnemidophorus perplexus*, according to Professors Baird and Girard, has seven longitudinal yellowish lines along the back; in all the specimens submitted to our

observation, five in number, there are but four. Professors Baird and Girard state that in some specimens of *Cnemidophorus tigris* "four longitudinal yellow stripes may be seen extending from the occiput to the tail, and occasionally a little distance on the latter. In the young state, the black patches predominate, unite and form, as it were, the ground color, and the yellow constitutes irregular small spots."—(*Vide* Stansbury's Report, Appendix C, page 339.)

The total length of Say's *Ameiva tessellata* is 1 foot, tail, $8\frac{1}{2}$ inches—in this respect corresponding with the above, but none of the specimens present the tessellated appearance described by Say, the "transverse lines dividing the whole surface in a tessellated manner."

FAMILY IV.

CHALCIDIDÆ.

CHAR.—"Body usually cylindrical, much elongated or serpentiform, with feet sometimes wanting, or generally little developed; trunk almost always confounded with the head and tail, presenting the traces of circular rings or verticillæ, and, for the most part, longitudinally, a rainure or fold of the skin between the abdomen and flanks; head covered with shields or polygonal plates; teeth not implanted in the maxillary bones, but applied against their internal edge; tongue free, but little extensible, broad, furnished with squamiform or filiform papillæ, notched at its point, and not enclosed in a sheath."—(*Dum. et Bib.*)

GERRHONOTUS, Wiegmann.

CHAR.—Tongue, arrow-shaped, its anterior half free, slightly emarginate anteriorly, surface velvety. Palatine teeth. Intermaxillary teeth, simple, conical. Maxillary teeth, cylindrical, obtuse. Nostrils, lateral, each in a single plate, the naso-rostral; eyelids. Membrane of the tympanum below the edge of the meatus externus. Posterior supracranial plates not distinct from the scales of the nucha. No spines upon the back. Four feet, each with five unequal fingers; smooth below. No femoral pores. A furrow the entire length of each side of the body.—(*Dum. et Bib.*)

GERRHONOTUS MULTICARINATUS.

Blainville. Nouvelles Annales du Museum d'Histoire Naturelle, tom. 4, p. 289, pl. 25, fig. 2.

FAMILY V.

SCINCIDÆ.

CHAR. 1. The head is covered above with large, thin, angular, corneous plates.

CHAR. 2. The jaws are furnished with closely set teeth.

CHAR. 3. The tongue is flat, free, and notched in front; not retractile in a sheath; and is covered entirely, or in part, with squamous or filiform papillæ.

CHAR. 4. The neck is of the same size and form as the thorax.

CHAR. 5. The body is cylindrical, without spines, or crest, or lateral groove, and covered with smooth scales, variable in form and size, and disposed in a quincunx.

CHAR. 6. The extremities and tail are covered like the body.

This family includes a great number of genera, differing from each other in the form and disposition of the teeth; in the form and number of the cephalic plates; in the mode of opening of the nostrils, whether in one or more plates; in the presence or absence of eyelids, whether single or not; in the presence or absence of extremities, their number, &c., &c. Of this extensive family, only three genera have as yet been observed in the United States, viz: *Plestiodon*, *Scincus*,* and *Lygosoma*, (Holbrook,) to which we add the following:

Gen. EUMECES. Wiegmann.

EUMECES QUADRILINEATUS. Nob.

SP. CHAR.—Two superno-nasals contiguous; internasal much more extended in the lateral than antero-posterior direction, its internal margins in contact with the anterior frenal; two fronto-nasal contiguous, lateral border in contact with the posterior frenal; frontal hexagonal, elongated broader anteriorly; fronto-parietal rhomboidal, placed obliquely; inter-parietal broad, with an acute angle in front, passing in between the fronto-parietals; parietals oblong, quadrilateral; four supra-orbitars; a small naso-frenal; an anterior and posterior frenal, the latter much larger; twelve rows of smooth hexagonal scales upon the back, beginning with those marked by the lateral vitta; lower eyelid covered with scales.

COLOR.—Shining black or brown above, with four blueish vittæ, the two internal broader than the others, commencing about midway upon the sides of the head immediately over the eyes, and extending along the back and terminating upon the tail; the lateral ones commence at the anterior margin of the orbit, and, passing beneath it, extend upon the sides and are lost upon the tail; chin and throat whitish; abdomen and under part of tail slate color; under surface of extremities whitish.

DIMENSIONS.—Length of head, $\frac{3}{8}$ inch; breadth, $\frac{1}{4}$ inch; length of body and tail, $4\frac{1}{4}$ inches; of tail, $2\frac{3}{8}$ inches; of anterior extremities, $\frac{1}{2}$ inch; of posterior, $\frac{5}{8}$ inch.

HABITAT.—Southern part of Upper California, near Mohave river, and in San Bernardino valley.

* The genus *Scincus* does not exist in the United States, the only species, viz: *S. officinalis*, being found, according to Dumeril & Bibon, in N. and W. Africa, Egypt, Abyssinia, and also Syria.

ORDER III.

OPHIDI.

CHAR. 1. The head varies in form ; the branches (rami) of the lower jaw-bone are not firmly united to each other at their anterior extremities, but are joined by an extensible ligament which allows of their being drawn apart laterally ; the bones of the upper jaw are also connected in the same way to the intermaxillary, and allow the same sort of motion. Even the palatine bones participate in the general mobility and dilatibility, which is still further increased by the tympanal bone or pedicle of the lower jaw, which is always suspended to another bone analagous to the mastoid process of the temporal, and is attached to the cranium by muscles and ligaments. From this structure, and from the mobility and distensibility of each of these bones, it results that the mouth may be so widely opened as to receive an object of greater dimensions than the animal itself.

CHAR. 2. The mouth is of variable size and furnished with lips ; and the upper and lower jaws, as well as the palatine arches in all, with only one exception, (*Oligodon*,) are armed with teeth. These teeth are solid, of simple construction, and are always situated on the margins of the maxillary bones, and not on the inner margin as in some of the lizards. As the serpents do not masticate their food, their teeth are organized for seizing and killing their prey or for retaining it ; they are accordingly pointed and smooth, and curved or arched backward to prevent its escape.

CHAR. 3. The tongue is very long, slender, extensible, retractile, within a sheath placed at the root, with the apex bifid and terminating in two slender semi-cartilaginous filaments.

CHAR. 4. There are no moveable eyelids, nor is there a tympanal membrane.

CHAR. 5. The body is exceedingly elongated—destitute of a sternum or of any external organs of locomotion—though in some genera (*Boa*) there are concealed rudiments of posterior limbs near the vent. The ribs and vertebræ make up nearly the whole skeleton ; the former surround a great portion of the circumference of the body, and are only wanting at the tail ; the latter are curiously arranged ; the body of one is articulated by a convex surface to a cavity in front of the succeeding vertebra. The structure of ball and socket allows of free lateral motion, but the spinous processes of the back prevent motion up and down to any great extent. The whole body is covered above with scales, mostly small and imbricated, and below with large quadrangular plates.

CHAR. 6. The trachea is very long, and surrounded by simple, complete cartilaginous rings only at its anterior half ; the lung is single and extends nearly the whole length of the body. In some is found a rudiment of a second lung.

CHAR. 7. The heart is placed far back, and is provided with two auricles and a single ventricle.

CHAR. 8. Serpents are, for the most part, oviparous ; the eggs are covered with a calcareous

flexible shell; the young burst from them into life with the same form they are permanently to retain. There are some, however, among the poisonous serpents that are viviparous. So far the true serpents agree in general in their characters and organization, but in some is developed an entirely new set of organs, which invest their possessors with singular and noxious properties. This peculiarity of structure leads to a very natural division of the serpent tribe into two great sections, venomous and non-venomous serpents.

Venomous serpents are again distributed into different families, according to the arrangement of their fangs, dilatibility of jaws, pits about the head, &c., &c.—(Holbrook.)

INNOCUI.

FAMILY I.

COLUBRIDÆ.

“CHAR. 1. The head is covered with plates.

“CHAR. 2. The body is much elongated, covered above with scales, and with plates below.

“CHAR. 3. The tail is in general long, with bifid plates below, or scutellæ, as they are frequently termed.

“CHAR. 4. There is no hook near the vent, nor any rudiment of posterior extremities, as in *Boa* and other non-venomous serpents.”

HERPETODRYAS, Boie.

HERPETODRYAS FLAVIGULARIS, Nob.

SYN.—*Psammodphis flavigularis*, Hallowell. Proceed. Acad. Nat. Sciences, Oct., 1852. Report of an Expedition down the Zuñi and Colorado rivers, p. 131.

Masticophis flavigularis, Baird and Girard. Catalogue of reptiles in Smithsonian institution, p. 98.

Chin and throat spotted with black; a black band upon the occiput, and two or three upon the neck, the intervening spaces white; body yellow with intervening whitish spaces presenting the appearance of fasciæ; 17 rows of scales; inferior rows larger than the others.

DIMENSIONS.—Length of head, $1\frac{6}{8}$ inch; breadth, $\frac{7}{8}$; length of body, 2 feet $7\frac{1}{2}$ inches; of tail, 12 inches.

HABITAT.—California, near the Mohave Desert.

GEN. OBS.—The coloration of this animal is somewhat different from that of *Psammodphis flavigularis*, described in Setgreaves' Report, but I do not consider this sufficient to make of it a distinct species. The *flagelliformis*, according to Bartram, varies much in color, and may possibly be but a variety of this species. The system of dentition differs greatly from that of *Psammodphis*, the teeth being all of equal length, whereas, in *Psammodphis*, those near the middle and at the posterior part of the superior maxilla are much longer than the others. The characters of the genus *masticophis* of Professors Baird and Girard are based chiefly upon the form and arrangement of the plates about the head, and are too indefinite, the same arrangement nearly

existing in *Psammophis moniliger*. The true place for this serpent appears to be where Dumeril and Bibon have placed the *flagelliformis*, viz: in the genus *Herpetodryas*. No true *Psammophis* exists in the United States.

LEPTOPHIS, Bell.

LEPTOPHIS LATERALIS, Nob.

CHAR.—Head small, rather long and slender, covered above with nine plates; the posterior frontals are larger than the anterior, passing down upon the sides of the head; vertical, very long and narrow, broader in front; nostrils between two nasal plates; a small quadrilateral frenal; a large antocular, its upper portion forming part of the lateral surface of the head; below it, a minute supplementary plate intercalated between the third and fourth labials; two posterior oculars; eye large and projecting, space between it and the nostrils grooved; eight superior labials, the fourth and fifth forming the inferior margin of the orbit; body long and slender; tail rather long; color brown above, with two narrow yellow vittæ, one on each side, extending from the head to the root of the tail; abdomen and under surface of tail straw color, immaculate; a considerable number of very minute black points upon the chin and throat. Abdom. scuta, 196; sub caud., 122.

DIMENSIONS.—Length of head, 8 lines; greatest breadth, 3 lines; length of body, 1 foot 5 lines; of tail, 5 inches 1 line; total length, 1 foot 6 inches 2 lines; circumference, 9 lines. 17 rows of smooth scales.

GEN. OBS.—Abundant in the neighborhood of ponds, lakes, and banks of rivers; very timid, escaping to the water for protection the moment it is approached.

HABITAT.—California.

The first description of this serpent was published in the Proceed. of the Acad. of Nat. Sciences for January, 1853. Messrs. Dumeril and son have since given the same name to a species of *Leptophis*, from Madagascar.

TROPIDONOTUS, Kuhl.

TROPIDONOTUS TRI-VITTATUS.

CHAR.—Head rather small, outline above triangular; depressed posteriorly, cheeks tumid, eyes slightly projecting, nostrils between two plates; a quadrilateral frenal plate; one large antorbital, two posterior orbitals; eight superior labials on each side, the sixth the largest; neck slightly contracted, abdomen flattened, body of moderate size, covered above with nineteen rows of carinated scales; tail of moderate length, tapering to a point; body jet black above, with three narrow vittæ extending from the head to the extremity of the tail; the lateral ones become indistinct; the dorsal vitta is orange-colored and occupies one row and a half of each of the adjoining rows of scales; abdomen and under part of tail olive-colored, immaculate; upper surface of head black.

Abdom. scuta, 146; sub caud., 72.

DIMENSIONS.—Length of head, 9 lines; greatest breadth, 6 lines; length of body about 1 foot 7 inches; of tail, 5 inches 7 lines. (Body broken.)

GEN. OBS.—Resembles *Tropidonotus concinnus* but wants the orange-colored spots and the lateral vittæ. Very abundant about ponds, and on the banks of the Cosumnes and other rivers in California. On being approached, quickly dives to the bottom of the stream, or makes its appearance on the opposite side, keeping its head above water. One of the most common snakes in California.

CORONELLA, Laurenti.

CORONELLA BALTEATA.

CHAR.—Head small and stout, outline ovoid, depressed above, covered with nine plates; eyes projecting, internasals smaller than prefrontals; nostrils between two plates; a small frenal; one large antocular, two posterior oculars, seven superior labials on each side, the eye resting on the third and fourth; neck contracted, body slender, cylindrical, thicker near the middle; tail rather short, and tapering gradually to a point; twenty-three rows of smooth hexagonal scales; a series of about thirty narrow yellowish white fasciæ, alternating with as many dark colored blotches, which are continuous with similarly colored markings upon the abdomen; the dark colored blotches occupy from five to seven rows of scales, the transverse yellow fasciæ one and a half rows; a dark colored blotch upon the head and anterior part of the neck, commencing at the posterior margin of the prefrontals; three small yellow spots, one at the posterior margin of each occipital, the third larger and about a line apart from the others; the plates which cover the muzzle, anterior and posterior oculars, and labials, yellow, margined with black; chin, throat, and interspaces upon abdomen and under part of tail between the dark colored markings, yellowish; the markings of the tail resemble those upon the body, but have the form of bands, the black spots being somewhat more regularly disposed.

Abdom. scuta, 234; sub caud., 51.

DIMENSIONS.—Length of head, 9 lines; greatest breadth, $5\frac{1}{2}$; length of body, 1 foot 7 inches 3 lines; length of tail, 2 inches 9 lines; total length, 1 foot 10 inches 9 lines; greatest circumference, 1 inch 6 lines.

DIMENSIONS OF A LARGER SPECIMEN.—Length of head, 8 lines; greatest breadth, $6\frac{1}{2}$; length of body, 2 feet 4 inches; of tail, 4 inches $4\frac{1}{2}$ lines; total length, 2 feet 9 inches; circumference, 2 inches 3 lines.

Abdom. scuta, 225; sub caud., 57.

GEN. OBS.—Found in valleys and open prairies; grows to a much larger size than either of the specimens, (4 feet in length;) very abundant, often killed by travellers, and found lying on the roadside; disposition timid, always endeavoring to escape its pursuers.

PITYOPHIS, Holbrook.

PITYOPHIS VERTEBRALIS.

SYN.—*Coluber vertebralis*, Blainville. Nouvelles Annales du Musée, T. IV, p. 293, (pl. 27, fig. 2.)

Coluber catenifer? Blainville. Nouvelles Annales du Musée, T. IV, p. 290, (pl. 26, fig. 2.)

Pityophis Heermanni.—Proceed. Acad. Nat. Sciences, January, 1853, p. 236.

Pityophis annectens.—Catalogue of serpents in Smithsonian Institution, p. 72. Report of Mexican Boundary Commission.

CHAR. Head small; the two middle of the four posterior frontals much broader in front than behind; yellow above; a narrow black band between the orbits; occipital plates marked with black; a narrow oblique band of black passing from the posterior margin of the orbit to the angle of the jaw; body yellowish, with about fifty distinct subquadrate black spots; emarginate in front and posteriorly; emarginations less distinct toward tail; interspaces between these large spots presenting smaller ones, forming a continuous row on each side of the back; about sixteen transverse black spots upon the tail; intermediate spaces yellowish; chin and throat straw color; the lateral extremities of many of the scuta with black spots; thirty rows of scales; those upon the back small, and distinctly carinated; the four or five inferior rows on each side much larger than the others, and smooth; tail short.

DIMENSIONS. Length of head 8 lines; greatest breadth 5 lines; length of body 1 foot; of tail 2 inches 3 lines; total length 1 foot 2 inches 11 lines; circumference 14 lines.

GEN. OBS. Abundant in California; grows to a much larger size. The specimen in the museum of the Academy came from the mines, in the vicinity of the Cosumnes river; one specimen was found under a log, and Dr. Heermann found several basking in the sun during the middle of the day, on the banks of streams, in sandy and gravelly places.

LAMPROSOMA.

CHAR.—Head small; snout rounded; internasals somewhat smaller than prefrontals; frontal short and broad; nostril in a single plate; a long and narrow frenal; one antocular, two postoculars; body long and slender, depressed; scales smooth, quadrangular, brilliant; tail short, obtuse; subcaudal scutes bifid; teeth of equal length, posterior ones not channelled.

LAMPROSOMA OCCIPITALE, Nob.

SYN.—*Rhinostoma occipitale*. Proceed. Acad. N. S., vol. vii, 1854, p. 95.

DESCRIPTION.—Head small, of same breadth posteriorly as neck, depressed in front; snout rounded; rostral plate large, excavated below, presenting a triangular shape above and in front where it forms the extremity of the muzzle; internasals smaller than the prefrontals, their inner margins much shorter than their external, which are in contact with the upper margins of the nasal plates; the prefrontals are more or less pentangular in shape, the posterior margin of each in contact with the anterior margin of the antocular, the supraocular, and the half of the frontal plate, its external margin with the upper margin of the frenal; the frontal plate is about as broad as long, narrower posteriorly, but less so than in *Simotes coccineus*; supraoculars broader posteriorly; occipitals of moderate size, pentangular; nostril large, deeply excavated, in nearly the centre of a large and conspicuous nasal plate, somewhat pyriform; a long and very narrow frenal, lying between the second and third supralabials, and the prefrontal; but one preocular, which is quadrangular, resting on the third supralabial; two postoculars, the upper much larger than the lower; there are seven supralabials, the three anterior smaller considerably than those which follow; the eye in contact inferiorly with the third and fourth; body long and slender, depressed; scales, of which there are fifteen rows, quadrangular, smooth

and shining, their posterior margins rounded, the three inferior rows larger than the others; gastrostiga appearing to a slight extent upon the flanks; tail short, with a somewhat blunt extremity.

COLORATION.—Milk white above, with thirty-four transverse black bands, including one upon the posterior part of the head; six complete rings of black upon the tail, and one incomplete just behind the anus; jaws, chin, throat and abdomen white; interspaces between rings upon under part of tail white.—Abdom. Scuta. 158, Sub. Caud. 34.

DIMENSIONS.—Length of head, 4 lines; breadth, $2\frac{1}{2}$ lines; length of body, 9 inch 9 lines; of tail, 1 inch 7 lines; total length, 9 inches.

HABITAT.—Mohave Desert.

GEN. OBS.—This serpent resembles no other figured in North America, and is therefore easily recognised. In the genus *Sonora* of Professors Baird and Girard, there are, according to them, three postoculars, and two nasal plates on each side with the nostril between them. In *Sonora semiannulata* there are twenty-five transverse black bands upon the body, and six complete rings upon the tail. The rings in *Col. (Zacholus) zonatus* of Blainville, completely surround the body. The nostrils, according to Blainville, open between two plates, but Wagler has them each in a single plate, “in medio scutelli sitis,” in his definition of *Zacholus*. Wagler, however, cites *Col. Riccioli*, Metaxa. Serp. Rom. as appearing to belong to this genus, “scheint als Gattung zu gehören,” but C. Bonaparte represents the nostrils as placed in the commissure between two scuta “gli narici sono situate alla commissura di duo scutelli nasali.”* Blainville represents two half rings upon the head. *Zacholus zonatus* is probably allied to *Coronella balteata*.

The animal above described approaches very much *Simotes* in the configuration of the plates upon the head; but in *Simotes* the nostrils open between two plates, and the frenal is quite different in shape, being much higher, and not long and slender. The head is also much more robust in *Simotes*, the body rounded and not flattened, and the tail pointed. The posterior teeth are also longer. The plates upon the upper part of the head are very different from those of *Homalosoma*, an African genus. The rostral is remarkable, from the fact that so much of it occupies the anterior portion of the upper part of the snout, where, as before remarked, it is triangular in shape, the apex of the triangle passing deeply backward between the internasals. This is also the case in *Simotes*, and to a greater extent in *Rhinostoma*; but in *Simotes* the snout is conical; the frontal plate resembles both that of *Simotes* and *Rhinostoma*, but is less broad; the prefrontals and rostral are very different in *Rhinostoma*, as is also the shape of the body, and the scales in the latter are longer and more hexagonal. *Rhinostoma nasicum* is a much larger animal. In the specimen in our museum, from Venezuela, which appears to belong to this genus, the nostrils are between two plates, the frenal is more or less quadrangular; there are two antocular and three postoculars, and the rostral plate is rounded, *retroussi*, with a sharp and well defined edge.

* In *Zamenis Ricciola* and *Zacholus Austriacus* of which there are numerous specimens in the Bonaparte collection belonging to the Academy, the nostrils open between two plates.

VENENOSI.

FAMILY II.

CROTALIDÆ.

CHAR. 1. The head is generally large ; the superior maxillary bones are small, and attached to ligaments to a long pedicle, analogous to the external pterygoid apophysis.

CHAR. 2. The upper jawbones are destitute of teeth, but are armed with sharp pointed, pervious, moveable fangs, through which the poisonous fluid flows. These fangs are sometimes only grooved, at others there is a complete canal opening near their extremity, but in all instances these channels communicate with the excretory ducts of the gland. The fangs, when not erect, are concealed by a fold in the gum, from which they can be raised at the will of the animal. Behind these are the germs or rudiments of several other fangs, destined to become developed and to replace the original, should these be destroyed by accident, as not unfrequently happens.

CHAR. 3. The palate bones are armed with two rows of small, hard, solid and fixed teeth.

CHAR. 4. The gland that secretes the poison is situated near the eye, under the temporal muscle, so as to be compressed by its contraction. The poison varies in intensity, perhaps in the different genera, but more so according to the state of the animal. It is most active in the healthy snake in the summer season, when it has been long retained, when the animal is greatly irritated, &c., &c. To be deadly, however, it must be introduced into the circulation, for it can be taken into the stomach with impunity.

CHAR. 5. These serpents are all viviparous ; or the egg is retained in the female until it is hatched, and the young animal is then expelled alive.—(*Holbrook.*)

CROTALUS, Linnæus.

CROTALUS CERASTES, Nob.

CHAR.—Head covered with polygonal tubercles, larger in front, the latter in three rows ; two small quadrangular plates, (anterior nasals,) one on each side, between the nostril and the vertical rostral ; two quadrangular supero-nasals ; external border of supraciliary plates developed, so as to present two horn-like, or, rather, triangular, processes, one on each side of the head ; they measure, each, one line in height by two in breadth at the base ; from twelve to fourteen supralabials on each side, the fifth the largest ; twelve inferior labials ; three rows of scales between the eye and upper labials ; pits between the eyes and nostrils large ; twenty rows of carinated scales, the inferior rows, near the abdomen, smooth ; body slender, much compressed ; tail very short, with three or four rattles.

COLORATION.—Head, ash color above, a black irregularly margined band extending from the posterior border of the orbit to within a line of the occiput ; a series of 41 transverse brownish bands, yellow in the centre, along the back ; general color of animal above, light-yellow ; several transverse bands upon the tail ; under surface, light-yellow, slightly clouded with spots near the external margin of the abdomen ; abdominal scuta 146 ; two rows of post-abdominal scutell. ; 14 single caudal scuta ; three inferior rows bifid.

DIMENSIONS.—Length of head, 5 lines; greatest breadth, 4 lines; length of body $8\frac{3}{4}$ inches; of tail, $\frac{3}{4}$ inch; total length, $9\frac{3}{4}$ inches. (Larger specimens have since been discovered.)

HABITAT.—Borders of the Mohave river, and in the desert of the Mohave. Always in the dry sandy soil, with no vegetation whatever. Maximum size, one foot and a half; occurs in large numbers, and is also seen in the desert of the Colorado, but is much less abundant, Dr. Heermann not having observed it there. The river Mohave spreads itself out in the desert, and there loses itself; and upon the floating sand hills near it these animals are found. The *Crotalus Lecontei* is never seen with them. The Mohave empties into a salt lake about 15 miles in extent.

GEN. OBS.—I supposed that this animal might be the young of *Crotalus Lecontei*, but Dr. Heermann informs me that the *Lecontei* is never found with it, and that it never attains to more than a foot and a half in length, and always presents the horn-like processes above described. It appears to be the representative of the *Vipera cerastes*, of Africa, and is found, like that serpent, in desert and sandy regions, and is also slow and sluggish in its movements. The genus *Cerastes*, proposed by Wagler and adopted by Dumeril and Bibron, it would appear, should be dropped, and *Vipera* substituted.

CROTALUS LECONTEI.

CHAR.—Sulphur-yellow beneath, inclining to olive, dark spotted above, with thirty-four sub-hexagonal blotches, margined with orange, the lower portion having more the form of bands; total length, 3 feet $1\frac{1}{2}$ inches.

DESCRIPTION.—The head is large, depressed, the rostral plate hexagonal, high; immediately behind it, on either side, above the anterior nasal, which is very large and subquadrate, are two small quadrangular plates; posterior to these are four large plates in a single row; a large tectiform plate in front of the supraocular situated obliquely; at its inner and posterior extremity a smaller quadrangular one on each side, (the first of the supraorbital row in some specimens larger than in others;) scales constituting the supraorbital row rather small; scales upon the head subequal, triangular, much striated, those upon the sides much larger; two plates above the pit between the eye and nostril, and one larger one, the antocular; two rows of scales between the seventh supralabial and the scales which margin the eye inferiorly; fourteen supralabials—the first large, the three next small, the rest larger than the latter; fifteen infralabials, the three first much extended inferiorly, the one most so about $2\frac{1}{2}$ lines in extent; body robust; scales narrow posteriorly, not very deeply striated, strongly carinated, twenty-six rows; ground color, olive or yellow above, with thirty-four to thirty-six subhexagonal brownish blotches margined with orange, the last seven or eight having more the form of bands; four or five black bands upon the tail; beneath, sulphur-yellow, darkly maculated; maculations most conspicuous posteriorly, neck and anterior part of abdomen comparatively free from them; chin and throat white, on either side a row of obscure spots occupying the middle of the interspace between the lateral extremities of the dorsal blotches; besides these, are other spots of a similar color extending over three or four of the inferior rows of scales, and confluent with the maculations upon the abdomen.

Abdom. scuta, 170-173; sub caud., 24-22; all single.

DIMENSIONS.—Length of head, $1\frac{1}{2}$ inch; greatest breadth, $1\frac{2}{3}$ inch; length of body, 2 feet;

of tail, exclusive of rattles, $2\frac{1}{2}$ inches ; total length, 2 feet 4 inches. Of a larger specimen : length of head, $1\frac{1}{2}$ inch ; greatest breadth, $1\frac{1}{2}$ inch ; length of body, 2 feet 9 inches ; of tail, exclusive of rattle, 3 inches ; total length, 3 feet $1\frac{1}{2}$ inch.

HABITAT.—Country intermediate between Run river and Tahon ; also, borders of El Paso creek.

GENERAL REMARKS.—The smaller specimen described and figured in Sitgreaves' report appears to be identical with the *confluentus* of Say. *C. Lecontei* differs from the *confluentus* of Say, as characterized by Professors Baird and Girard, in having but two rows of scales between the suborbital series and the supralabials instead of four ; in the fewer number of scales between the nostrils, (4 instead of 6) ; in the less number of dorsal rows ; in the rostral plate being without a margin of white, &c. The stripe from the superciliaries, which is not very distinct, appears to pass over the third and fourth rows of scales above the supralabials in *confluentus* the second.

ORDER IV.

BATRACHIA.

CHAR. 1. The body is depressed, round or elongated, and with or without a tail ; the skin is soft, naked, or without a shell, and most commonly without apparent scales, (*Cæcilia*.)

CHAR. 2. The extremities vary in number and proportion, or are entirely wanting. The fingers and toes are destitute of nails, and are rarely provided with a horny sheath, (*Dactylethra*.)

CHAR. 3. There is no neck distinct from the body, and the head is joined to the vertebra by two condyles.

CHAR. 4. There are, in general, three movable eyelids, and no visible external meatus of the ear, though the tympanum is often very distinct.

CHAR. 5. The sternum is distinct in most species, but is here joined to the ribs, which are either very short or entirely wanting.

CHAR. 6. The heart has a single ventricle, and apparently a single auricle, which is, however, subdivided into two chambers.

FAMILY I.

RANIDÆ.

CHAR. 1. There are always teeth in the upper jaw and palate, between the posterior nares ; the latter are minute and variously grouped.

CHAR. 2. The extremities of the fingers and toes are free, and never dilated into a disk.

CHAR. 3. The tympanum is always visible.

CHAR. 4. The males are provided with vocal vesicles at the throat, communicating internally with the mouth, and in some they pass out of openings at the sides of the jaws when distended, but not in others.

RANA LONGIPES, Nob.

SYN.—*Rana nigricans*, Hallowell. Proceed. Acad. Nat. Sciences, vol. vii, p. 96.

CHAR.—Remarkable for its size ; much smaller, however, than *R. pipiens* ; color uniform dark brown, with numerous small black spots, and large blotches interspersed over the surface ; sides somewhat lighter, marked with black ; anterior extremities dark brown, or ash color above, blotched with black ; posterior of same color, with numerous transverse black bands ; chin, throat, and abdomen, straw color, shaded with brown ; under surface of extremities yellowish, marked with black ; vomerine teeth in two oblique patches.

DIMENSIONS.—Length of head, neck, and body, $4\frac{1}{2}$ inches; greatest breadth of head, $1\frac{3}{4}$ inch; length of anterior extremities, $1\frac{3}{4}$ inch; of foot, anteriorly, to extremity of longest toe, 1 inch; of posterior extremity, 5 inches; length of hind foot, $1\frac{5}{8}$ inch; of foot, posteriorly, to distal end of longest toe, $2\frac{3}{8}$ inches.

HABITAT.—El Paso Creek.

GEN. OBS.—This species is remarkable for the great length of its posterior extremities; allied to *Rana Draytoni*, Baird and Girard, but the posterior extremities appear to be longer.

FAMILY II.

HYLIDÆ.

CHAR. 1. Extremities of toes and fingers enlarged into a disk or viscous pellet, by means of which they sustain themselves on smooth surfaces, as leaves, glass, &c.; always found on trees, or shrubs, or plants, except in the breeding season.

CHAR. 2. Abdomen, in general, covered with small granulations, with glandular openings; teeth, tongue, &c., same as in *Ranidae*.

HYLA NEBULOSA, Nob.

CHAR.—Uniform light gray upon the upper part of the body and sides; a considerable number of dark colored subcircular spots, about a line in diameter, scattered over the upper part of the body, and upon the sides, in some specimens mingled with irregular blotches upon the back; extremities, ash color above, with grayish spots; abdomen, greenish yellow; chin light yellow; under surface of extremities orange colored; abdomen and under surface of extremities granulated, terminal disks much flattened; vomerine teeth in two oblique patches, their anterior and posterior extremities on a line with the corresponding margins of the internal nares.

DIMENSIONS.—Length of head, neck, and body, $1\frac{7}{8}$ inch; greatest breadth of head, $\frac{3}{4}$ inch; length of anterior extremities, $1\frac{1}{2}$ inch; of posterior extremities, $2\frac{3}{8}$ inches to extremity of longest toe.

HABITAT.—Tejon Pass.

GEN. OBS.—Is a much smaller animal than *Hyla versicolor*, and the markings are very different. The back is much less abundantly covered with warts, and the supraciliary ridges, which are so much developed in *versicolor*, are but slightly so in this species. The extremities are much more slender in the latter, and the tibia is of nearly equal length with the thigh, but in *versicolor* it is about a line shorter. This animal resembles *Hyla delitescens*, but the skin of *H. delitescens* is smooth; in both the specimens of *nebulosa*, the back is covered with very minute pustulations. From the other North American *Hylæ* it may be readily distinguished.

HYLA SCAPULARIS, Nob.¹

Var. HYPOCHONDRIACA.

CHAR.—Of a uniform pale olive color, above, without spots, paler toward the sides; numerous small, elevated, smooth points upon the surface, resembling tubercles; upper surface of extremi-

¹ The specimens of *scapularis* are much smaller than these received from Oregon, but I cannot make out that they are distinct species.

ties pale olive ; a narrow, dark colored vitta extending from the anterior margin of the eye to the snout, another much broader from the posterior margin of the eye to the shoulder ; margin of upper jaw of same color as the vitta ; posterior part of abdomen and under surface of extremities orange colored ; chin and throat, whitish ; abdomen thickly granulated.

DIMENSIONS.—Length of head and body $1\frac{1}{2}$ inch ; of head, $\frac{5}{8}$; breadth, $\frac{5}{8}$; length of anterior extremities, $\frac{7}{8}$; of posterior, $1\frac{7}{8}$.

HABITAT.—Tejon Pass.

GEN. OBS.—It will be observed that it wants the squalus tooth-like mark upon the head, and the markings upon the back, which belong to *scapularis*.

FAMILY III.

SALAMANDRIDÆ.

CHAR. 1. The presence of a tail at all periods of their existence readily distinguishes the animals of this family from those of the last, though it varies in length and form.

CHAR. 2. The body is elongated, round, and covered with a skin adherent to the muscles beneath.

CHAR. 3. The tongue varies in shape, size, and mode of attachment. The teeth also vary greatly in the different genera.

CHAR. 4. The tympanum is not visible.

MUTABILIA, Fitz.

CHAR.—The animals of this tribe undergo a complete metamorphosis; the young breathe only in water, and with gills, like fishes, but in their adult state respiration is performed with lungs. (Holbrook.)

Sub-Family PLETHODONTIDÆ.

ANEIDES, Baird

CHAR.—Head large, swollen at the temples, snout angular, eyes very prominent ; tongue obcordate, more or less truncate posteriorly, attached in front, and along the middle, sides quite free, quite free posteriorly, but less so than at the sides ; maxillary teeth greatly developed, especially those of the lower jaw, which are spear-shaped, sharp-pointed, more or less convex anteriorly, concave posteriorly, with a ridge in the middle, about $\frac{3}{4}$ of a line in length ; vomerine teeth in two convergent rows, behind the internal nares meeting posteriorly, their convex surfaces presenting inward ; sphenoidal teeth very numerous, sharp pointed, thickly set like a brush in two rows, closely in contact in the anterior third, posteriorly a very narrow linear interspace, not enlarged behind ; in the *original* specimen, this narrow interspace is not so distinct, so that they might almost with propriety be described as a single row ; extremities slender ; fingers and toes slightly compressed, free ; 1st finger much shorter than 4th ; 2d shorter than 3d ; 1st toe much shorter than 5th ; 2d than 3d ; 3d and 4th of equal length ; skin smooth, costal grooves well marked, twelve or thirteen in number, tail round, tapering to a point, very slightly compressed at tip, about same length as head, neck, and body.

ANEIDES LUGUBRIS.

SYN.—*Sal. lugubris*, Hallowell. Proceed. Acad. Nat. Sci., vol. iv, p. 126. *Aneides lugubris*, Baird. Iconographie Encyclopædia, vol. ii, 1856, 1st edition, p. 256. *Taricha lugubris*? Gray, Cat. Br. Amph., p. 26, No. 2.

COLOR.—(From a specimen in spirits.)—The animal above is of an uniform dark olive color; an irregular row of small yellowish spots are observed upon the sides of the body near the dorsum; several are also seen upon the neck, the upper part of the tail, and also the posterior extremities, in the specimen examined. The under part of the animal is light olive.

DIMENSIONS.—Length of head, $6\frac{1}{2}$ lines; greatest breadth, 6 lines; length of neck and body, to vent, 1 inch 11 lines; length of tail 2 inches 1 line; total length, 4 inches 7 lines.

HABITAT.—Monterey, Upper California. It is said to be abundant in that region.

LIST OF REPTILES COLLECTED.

BY DR. A. L. HEERMANN,
NATURALIST TO THE EXPEDITION.

CHELONIANS.

Emys nigra.—Posa Creek, south part of Upper California, abundant..... 1

SAURIANS.

Sceloporus magister.—Fort Yuma, junction of Colorado and Gila, also near Tucson, in Sonora ; arid, rocky soil..... 1

Sceloporus biseriatus.—Borders of El Paso Creek, and in Tejon valley..... 2

Sceloporus var. *marmoratus*.—El Paso Creek, with *biseriatus*..... 1

Sceloporus var. *azureus*.—El Paso Creek, with *biseriatus*..... 2

Phrynosoma coronatum.—San Joachin valley..... 3

Crotaphytus fasciatus.—Between Kern River and Tejon Pass... 2

Utah, *stansburyiana*. B. & G..... 5

Homalosaurus ventralis.—Mohave desert 2

Dipsosaurus dorsalis.—Fort Yuma, and between Kern River and Tejon Pass. Country arid, without water, bearing artemisia, &c..... 2

Urosaurus graciosus.—(*Utah ornata* ? B. & G.) 2

Cnemidophorus undulatus.—Fort Miller and Joachin valley..... 2

Cnemidophorus quadrilineatus..... 1

Gerrhonotus multicarinatus.—El Paso creek and San Bernardino valley, near Mohave desert 2

Eumeces quadrilineatus.—Near Mohave river, and in San Bernardino valley..... 1

OPHIDIANS.

Herpetodryas flavigularis.—Edge of Mohave desert; found also in the valley of Los Angeles..... 1

Pityophis vertebralis.—San Bernardino valley..... 1

Pityophis catenifer..... 1

Ablabes punctatus, (*pulchellus*, B. & G.)—Tejon Pass 1

Tropidonotus parietalis.—Posa creek ; south part of Upper California 4

Tropidonotus ordinatus, (*ordinoides*, B. & G.)—Posa 2

Coronella balteata.—El Paso creek and Benicia; also intermediate places, extending over a great distance..... 2

Lamprosoma occipitale.—Mohave desert..... 1

Rhinocheilus Lecontei.—El Paso creek..... 1

Crotalus cerastes.—Borders of Mohave river, and in the Mohave desert 2

| | |
|---|---|
| <i>Crotalus Lecontei</i> .—(<i>Crot. confluentus</i> , ¹ B. & G., Marcy's Rep. Pl. 1.)—Kern river, and Tejon ; found in all the countries intermediate between these places, also in a woody soil on the edge of El Paso creek..... | 2 |
|---|---|

BATRACHIANS.

| | |
|---|---|
| <i>Rana longipes</i> .—El Paso creek..... | 2 |
| <i>Hyla nebulosa</i> .—Tejon Pass..... | 2 |
| <i>Hyla scapularis</i> .—San Francisco,..... | 6 |
| <i>Hyla</i> var. <i>hypocondriaca</i> .—Tejon Pass..... | 1 |
| <i>Bufo halophyla</i> .—Benicia..... | 1 |
| <i>Bufo punctatus</i> , B. & G... .. | 1 |

All the species described in this Report were found in middle and southern California.

¹ Much larger than the *Crotalus* brought by Dr. Woodhouse, and figured in Sitgreaves' Report.

EXPLANATION OF THE PLATES.

PLATE I.

Emys nigra, Hallow.—Half natural size.

PLATE II.

Crotalus ornatus, Hallow.

a. Side view of head.

PLATE III.

Crotalus lecontei, Hallow.

a. Head from above.

PLATE IV.

Figure 1. *Crotalus cerastes*, Hallow.

b. Side.—c. Upper view of head, magnified.

Figure 2. *Rhinostoma occipitale*, Hallow.

b. Side.—c. Upper view of head, magnified.

Figure 3. *Leptophis lateralis*, Hallow.

b. Side.—c. Upper view of head, magnified.

PLATE V.

Coronella balteata, Hallow.

b. Side, and c, upper view of head.

PLATE VI.

Figure 1. *Dipsosaurus dorsalis*, Hallow.

a. Full view.—b. Portion of under surface.—c. Top of head.—d. Anterior toe and claw.—e. Posterior toe and claw.—f. Portion of side.—(The figures 1 c to 1 f magnified twice.)

Figure 2. *Sceloporus biscriptus*, Hallow.

a. Full view.—b. Side of head.—c. Upper, and d, lower surface of head.—e. Fore toe.—f. Hind toe. All magnified twice but the first.

PLATE VII.

Figure 1. *Urosaurus graciosus*, Hallow.

a. Full view.—b. Under surface.—c. Top of head.—d. Side of head.—e. Femoral pore.—(All magnified three diameters, but the first, which is natural size.)

Figure 2. *Ancides lugubris*, Bd.

a. Lateral.—*b.* Under view.—*c.* Open mouth.

PLATE VIII.

Figure 1. *Sceloporus biseriatus*, var. *azureus*, Hall.

1 *a.* View from the side.—*b.* Side view of head.—*c.* Under view of head.—*d.* Scales of belly.—*e.* Femoral pores.

Figure 2. *Sceloporus biseriatus*, var. *marmoratus*.

a. View from above.—*b.* Head from above, magnified.—*c.* Scales of belly.—*d.* Femoral pore, magnified.

PLATE IX.

Figure 1. *Gerrhonotus mullicarinatus*, Blainv.

a. Full view.—*b.* Outline view from beneath.

Figure 2. *Cnemidophorus undulatus*, Hallowell.

a. Full view.—*b.* Upper.—*c.* Side.—*d.* Under view of head, magnified.—*e.* Scales of side magnified.—*f.* Inguinal region, magnified.—*g.* Fore toe.—*h.* Hind toe, magnified.

Figure 3. *Eumeces quadrilineatus*, Hallowell.

3 *a.* View from above.—*b.* Side.—*c.* Top.—*d.* Under surface of the head.

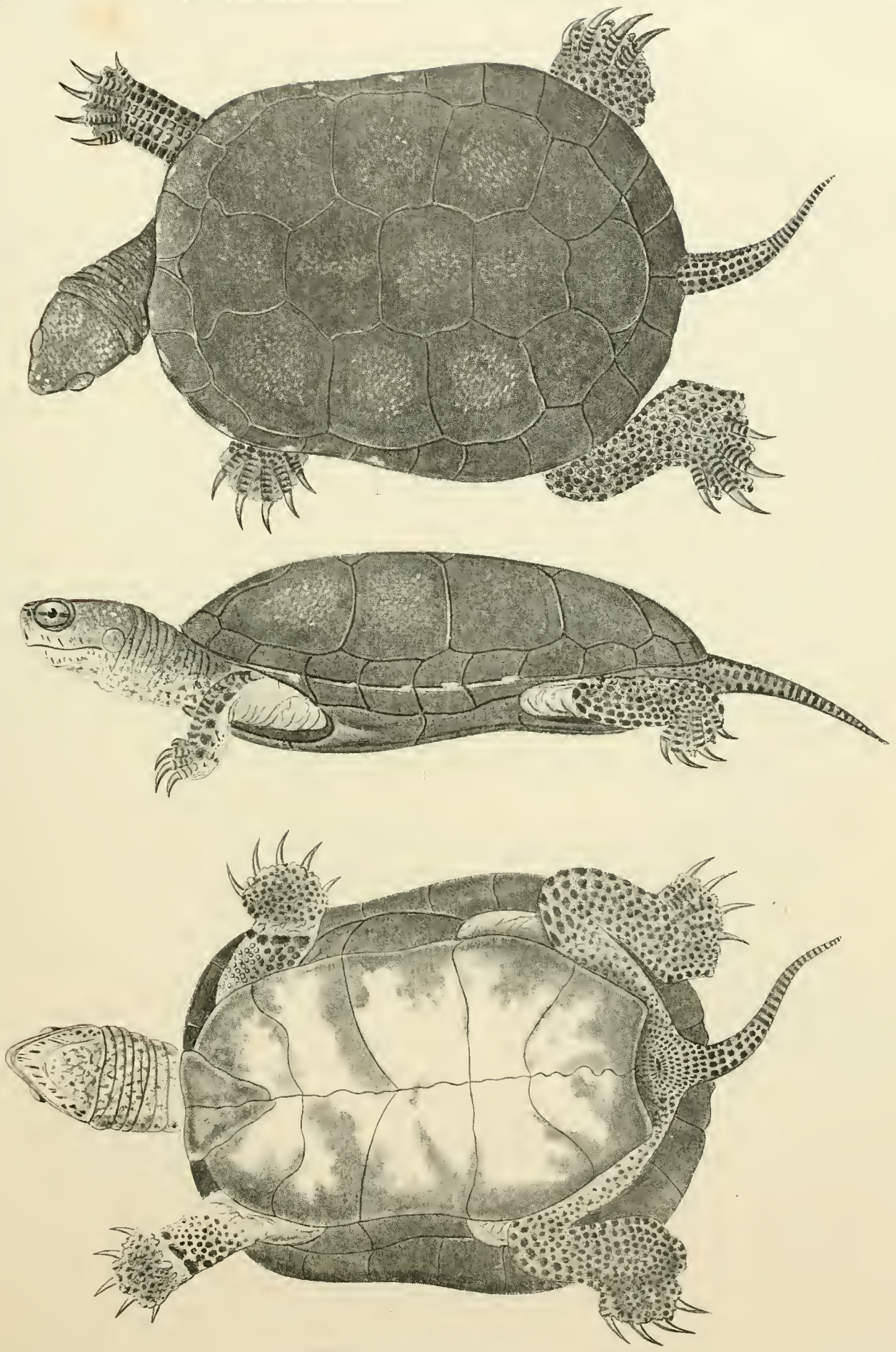
PLATE X.

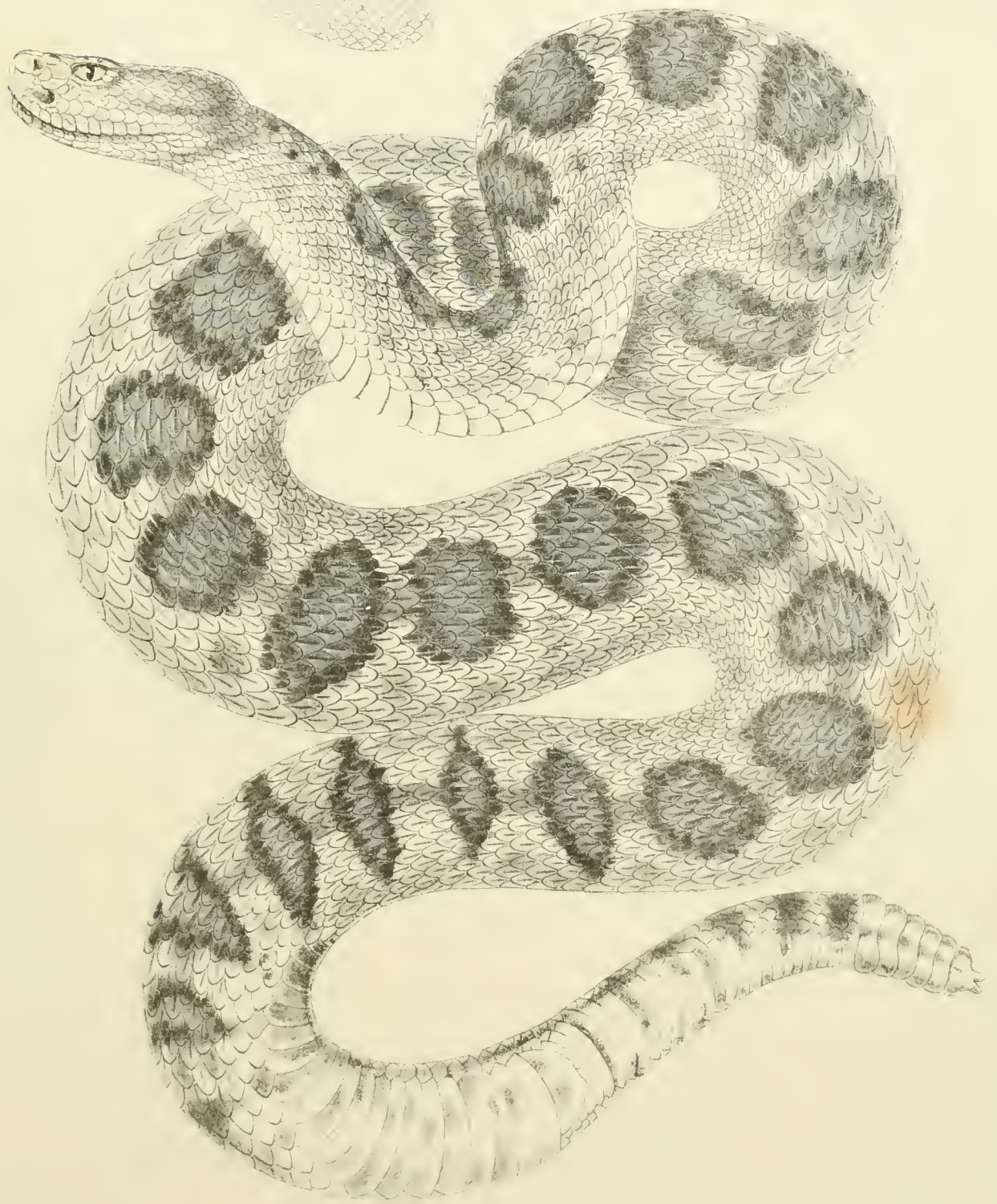
Figure 1. *Rana longipes*, Hallowell.

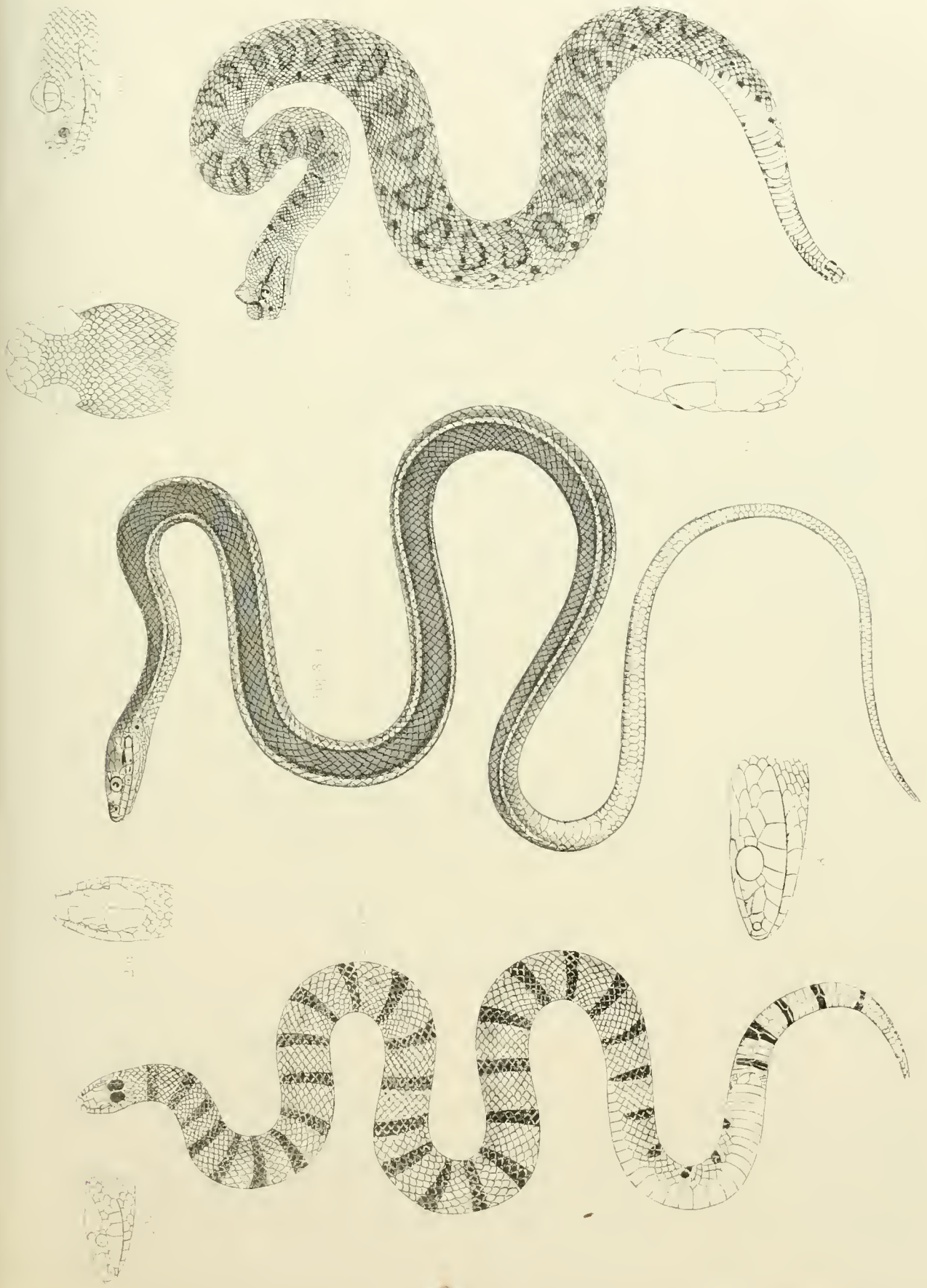
a. Full view.—*b.* View from below.—*c.* Tongue.

Figure 2. *Hyla nebulosa*, Hallowell.

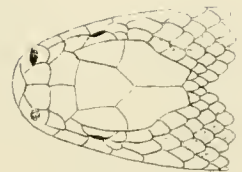
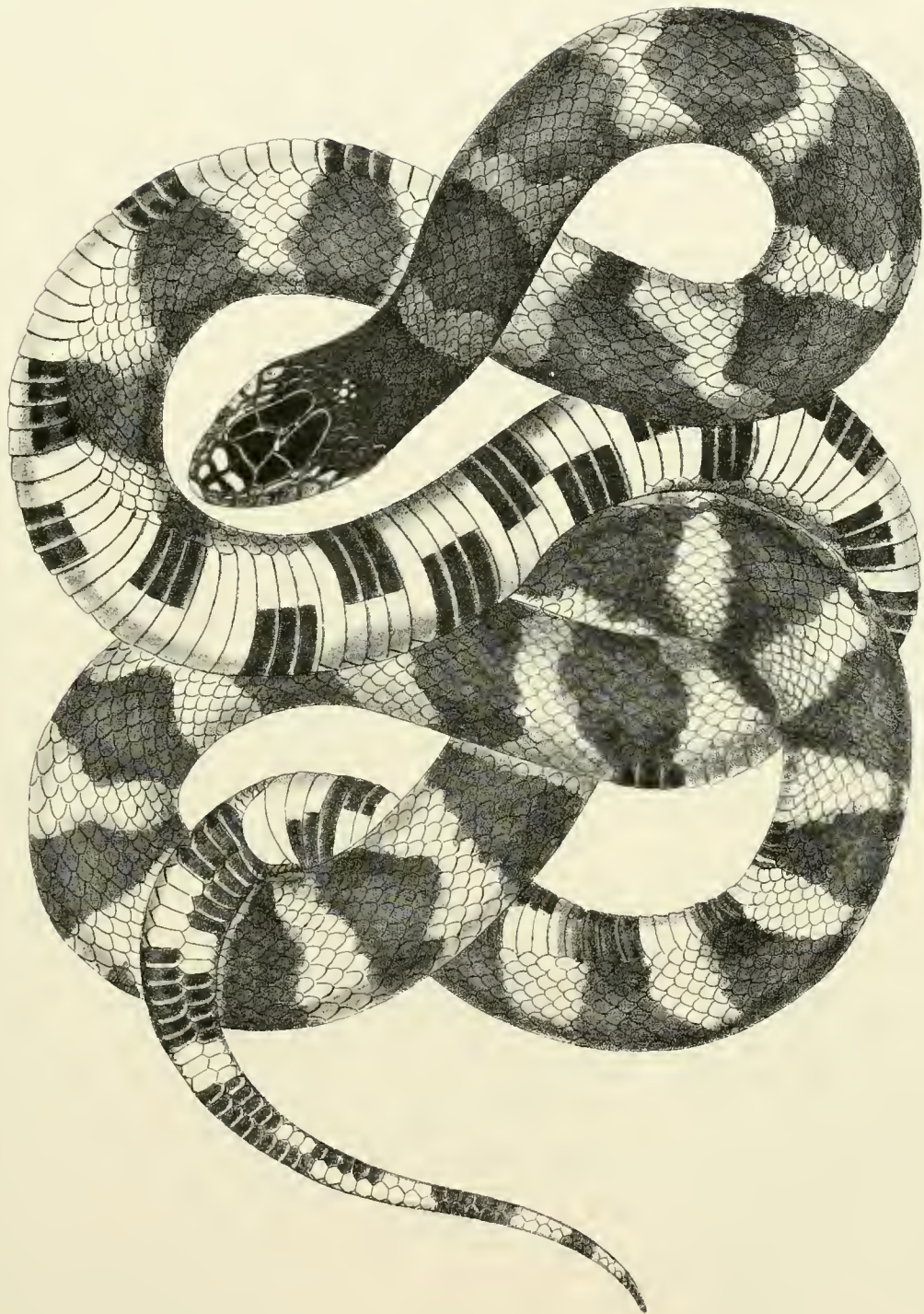
a. Full view.—*b.* View from below.—*c.* Tongue.













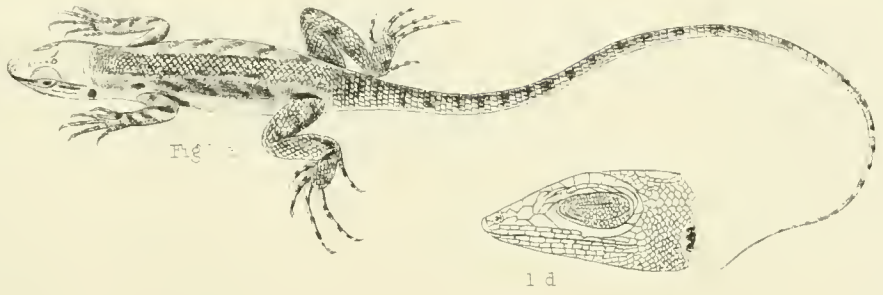
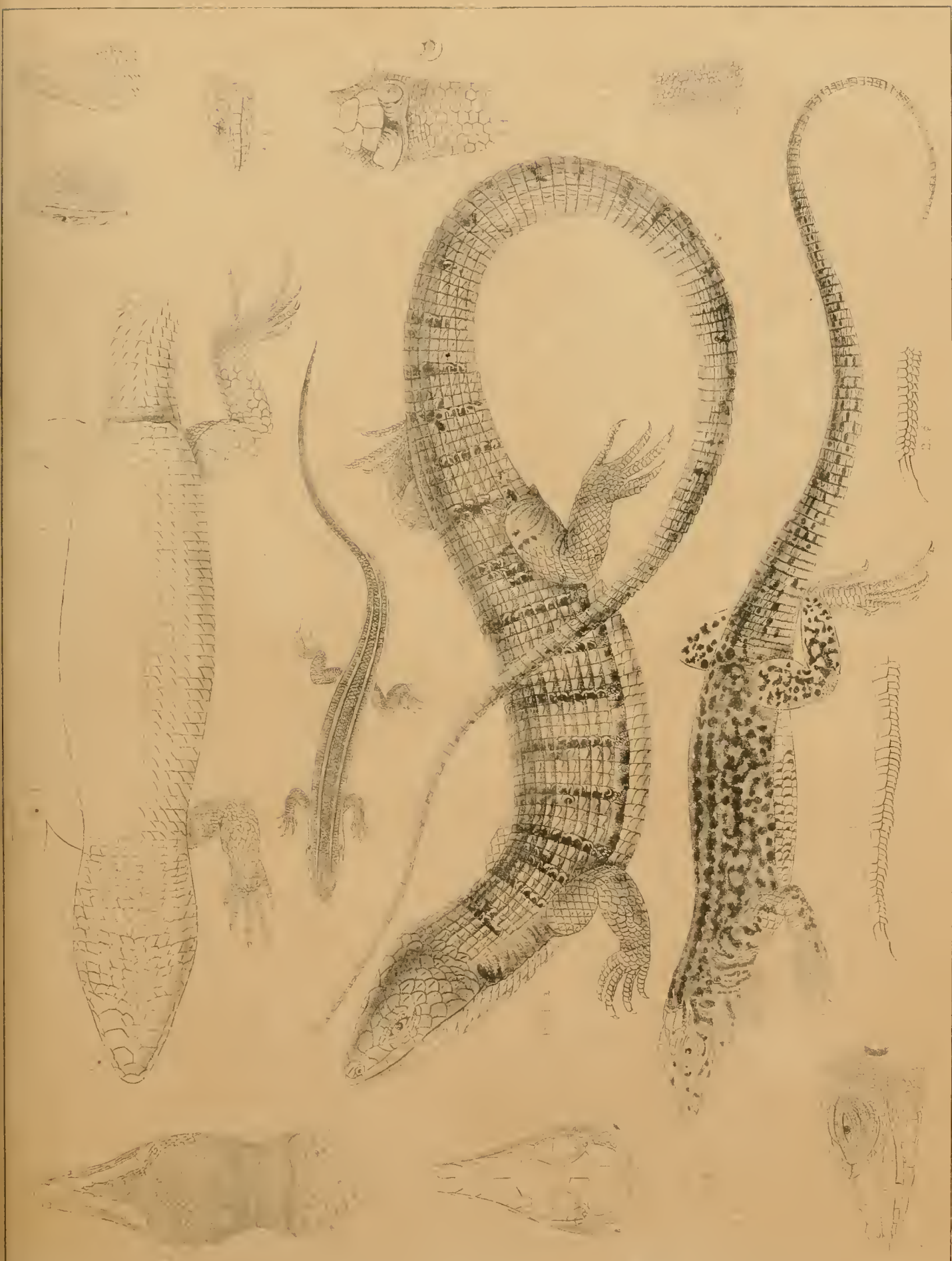


Fig. 4 a







No. 2.

REPORT UPON BIRDS COLLECTED ON THE SURVEY.

BY A. L. HEERMANN, M. D.

CATHARTES CALIFORNIANUS, S h a w.—The California Vulture.

Cathartes californianus, NUTTALL'S Ornithology, vol. I, p. 39.

AUDUBON, Birds of America, Fol. pl. 426.—CASSIN, Gen. Rep. P. R. R. IX, 1858, 5.

Cathartes californicus, AUD. Birds of America, Oct. vol. I, p. 12, pl. 1.

Vultur californianus, SHAW, Nat. Misc., vol. IX, pl. 301.

This species, the largest which our western fauna possesses, was observed occasionally during our survey sailing majestically in wide circles at a great height and ranging by its powers of flight over an immense space of country in search of food. Whilst unsuccessfully hunting in the Tejon valley, we have often passed several hours without a single one of this species being in sight, but on bringing down any large game, ere the body had grown cold, these birds might be seen rising above the horizon and slowly sweeping towards us, intent upon their share of the prey. Nor in the absence of the hunter will his game be exempt from their ravenous appetite, though it be carefully hidden and covered by shrubbery and heavy branches; as I have known these marauders to drag forth from its concealment and devour a deer within an hour. Any article of clothing thrown over a carcass will shield it from the vulture, though not from the grizzly bear, who little respects such flimsy protection. My coat, used on one occasion to cover a deer, was found, on our return, torn by Bruin to shreds and the game destroyed. The California vulture joins to his rapacity an immense muscular power, as a sample of which it will suffice to state that I have known four of them, jointly, to drag off, over the space of two hundred yards, the body of a young grizzly bear weighing upwards of a hundred pounds. A nest of this bird with young was discovered on the Tuolumnes river in a thicket, by some Indians who were there sent in search of a horse thief. It was about eight feet back from the entrance of a crevice in the rocks, completely surrounded and masked by thick under brush and trees and composed of a few loose sticks thrown negligently together. The effluvium arising from the vicinity was overpowering. We found two other nests of a like construction and similarly situated; one at the head of the Merced river and the other in the mountains near Warner's ranche. From the latter nest the Indians yearly rob the young, and having duly prepared them by long feeding, kill them at one of their great festivals.

CATHARTES AURA, L i n n.—The Red-headed Turkey Vulture.

Cathartes aura, RICH. and SWAIN, Faun. Bor. Amer. vol. II, p. 4.—NUTTALL'S Ornith. vol. I, p. 43.—AUDUBON, Birds of Amer. Oct. vol. I, p. 15; pl. 2.—CASSIN, Gen. Rep. IX, 6.

This bird ranges over the whole extent of California, being met in great numbers in the vicinity of Fort Yuma, at the junction of the Colorado and Gila rivers, and more especially on

the desert between the Colorado and Carissa creek. It here finds an ample supply of food from the carcasses of the numerous animals perishing from fatigue or the want of grass and water, and whose whitened bones, strewn over the ground, mark both the road and the hardships of the western pioneer. They seem to be on terms of amity with both the raven and California vulture whilst feeding, but upon the approach of the coyote or prairie wolf they all retire to a respectful distance until he has gorged himself on the dainty fare. The eyes of a carcass first extracted, they invariably begin their assault at the anus, this being the most practicable place to effectuate a breach, whence to deal havoc on the internal parts. An entrance once made, a scene of plunder, noise, confusion, and dispute ensues, baffling all description. Each one striving, as best he may, to bolt the morsel he has seized, or to rob his neighbor glutton, whose booty is too voluminous for him to despatch at once. When, however, in very large numbers, they will attack a carcass indiscriminately at several points, wrenching off the skin and flesh with their powerful beaks, whilst they brace themselves with their feet as they pull.

POLYBORUS THARUS, Molina.—The Caracara Eagle.

Polyborus tharus, CASSIN, Gen. Rep. IX, 45.

Polyborus vulgaris, VIEILL. Gal. vol. I, p. 23; pl. 7.—AUD. Birds of Amer. Fol. pl. 161.

Polyborus brazilensis, AUD. Oct. vol. I, p. 21; pl. 4

I am happy to be able to add this interesting species to the fauna of California, having seen it on the Colorado river, near Fort Yuma, in company with the preceding species. The carrion of an ox was covered with turkey buzzards, and one specimen of the Caracara eagle was amongst them, but proved so shy that I could not shoot it, although waiting in ambush full two hours in hopes it would return. We followed this species on our survey down the Gila until we left that river, seeing one or more every day, and found it again in Texas on striking the settlements. At San Antonio, in the vicinity of slaughter-houses, it is met with in great numbers, twenty or thirty often having been seen at one time. We found its nest on the Medina river, built in an oak, and constructed of coarse twigs and lined with leaves and roots, but being quite recently finished contained no eggs. Although so closely allied to the vulture by its habits, we find its nidification quite different; as all the birds of that family, without exception, so far as known, lay either on the rocks or on the ground.

AQUILA CANADENSIS, Linn.—The Golden Eagle.

Aquila chrysaetos, RICH. and SWAIN, Faun. Bor. Amer. vol. II, p. 12.—AUD. Birds of Amer. Fol. pl. 181.—IB. Birds of Amer. Oct. vol. I, p. 50; pl. 12.

Aquila canadensis, CASSIN, Gen. Rep. IX, 41.

A specimen of this bird was seen whilst we were crossing over Livermore's Pass. It flew from a rock not twenty yards distant, thereby rendering it impossible to mistake the species. I also met with two others in northern California, and obtained the tarsae and feet of a specimen killed in the mountains bordering the Mokelumne river. It is there, as elsewhere, a wild and scarce bird, rarely seen save by the naturalist who is on the alert.

HALIAETUS LEUCOCEPHALUS, Linn.—The Bald Eagle.

Haliaetus leucocephalus, AUD. B. of A. Oct. vol. I, p. 57; pl. 14.

Falco leucocephalus, AUD. B. of A. Fol. pl. 31 and 126.

Common in northern California, and more especially so about the falls of the Columbia river, (Oregon,) the salmon of which, thrown up dead on the shores at certain periods of the year,

form a great attraction to this bird, the California vulture, the turkey buzzard, and the ravens, which there abound. We found this species in the Tulare valley, on the borders of large lakes, and in one place counted three nests within sight of each other. In 1849, there was an eyrie of these birds about four miles from Sacramento City, which they have since forsaken, on account of the continual passage to and fro of steamers and vessels on the river, or they have been shot by some wanton gunner, too ready to make trial of his skill upon them.

PANDION CAROLINENSIS, Gmel.—The Fish Hawk; The Osprey.

Pandion carolinensis, DeKAY, Nat. Hist. N. Y. Birds, part I, p. 6; pl. 8, fig. 18.—CASSIN, IX, 44.

Pandion haliaetus, AUD. B. of A. Oct. vol. I, p. 64; pl. 15.

Aquila haliaetus, RICH & SWAINS. Faun. Bor. Amer. vol. II, p. 20.

Falco haliaetus, AUD. B. of A. Fol. pl. 81.—WILSON, Amer. Ornith. vol. V, p. 13, pl. 37, fig. 1.

Abundant, being met with throughout the whole extent of California. In the fall it migrates south.

FALCO POLYAGRUS, Cassin.—The American Lanier Falcon.

Falco polyagrus, CASSIN, Birds of Texas and California, p. 88 and 121, pl. 16.—IB. Gen. Rep. IX, 12.

Occasionally specimens of this bird were seen during our expedition, but of so wild a nature as to baffle all attempts to procure it. It frequents the rocky and wooded portions of the country or the broad open plains. Perched on some prominent rock whence it can survey a large extent of country, it will suddenly, with almost unerring aim, dart through the air with the swiftness of an arrow to seize upon its prey. On one occasion I saw this bird pursuing a large hare, (*Lepus townsendii*.) at which it stooped several times, the hare barely escaping from the falcon's talons by extraordinary exertions and bounds as the bird gained upon him. Pursuer and pursued soon disappeared over the rolling ground, thus hiding from my sight the final result of this exciting chase. On a previous visit to California, I obtained, near Sacramento, three specimens, and saw a young unfledged one in San Francisco. I also procured one of these birds on the Farrallone islands, where probably it had been wafted by the high winds prevalent during winter. It cannot be considered a rare bird, although but few specimens as yet enrich the naturalist's collection.

HYPOTRIORCHIS COLUMBARIUS, Linn.—The Pigeon Hawk.

Falco columbarius, WILSON, Amer. Ornith. vol. II, p. 107, pl. 15, fig. 3.—AUD. B. of A. Oct. vol. I, p. 88, pl. 21.—

IB. B. of A. Fol. pl. 92.—DEKAY, Nat. Hist. N. Y. part I, p. 15, pl. 4, fig. 9.—RICH & SWAINS. Fau.

Bor. Amer. vol. II, p. 35.—CASSIN, Gen. Rep. IX, 9.

This species, not very common, is most generally met with on the wooded hill sides, from whence they start in search of their prey. On one occasion, perceiving one of these birds apparently about to begin his repast on some luckless fowl held in his talons, I pursued him so closely and with such success that, fatigued and terrified, he dropped his prey, which, proving to be a very plump California partridge, I gratefully bagged.

TINNUNCULUS SPARVERIUS, Linn.—The Sparrow Hawk.

Tinnunculus sparverius, VIEILL. Ois. Am. Sept. p. 40, pl. 12 and 13.

Falco sparverius, AUD. B. of A. Oct. vol. I, p. 90, pl. 22.—IB. B. of A. Fol. pl. 142.—WILSON, A. Ornith. vol. II, p. 117,

pl. 16, fig. 1.—IB. vol. IV, p. 57, pl. 32, fig. 2.—CASSIN, Gen. Rep. IX, 13.

Abundant throughout the whole of California.

BUTEO INSIGNATUS, Cassin.—Brown Hawk.

Buteo insignatus, CASSIN'S Birds of Texas and California, p. 102.—*Id.* p. 198, pl. 31.—*Id.* Gen. Rep. IX, 23.

I first remarked this species at the crossing of Graysonville ferry on the San Joaquin river and continued to meet with it occasionally, until we had crossed Kern river. Owing to the lateness of the season, I was able to ascertain but little regarding its propagation, the only nests which were found having been forsaken for some time previously by the young. These nests, composed externally of coarse sticks and lined with roots, were built in the topmost branches of oaks, which grow abundantly on the banks of the large water courses. This bird, like the rest of its genus, appears sluggish in its habits, perching for hours in a quiescent state on some tall tree and permitting the hunter to approach without any signs of fear. This apparent stolidity, however, may be owing to the fact that it is seldom molested and has not yet learned to mistrust a gun, as do the birds of prey in more settled portions of the country.

BUTEO ELEGANS, Cassin.—Western Red-shouldered Hawk.

Buteo elegans, CASSIN, Pr. A. N. Sc. VII, 281.—*Id.* Gen. Rep. IX, 23.

Abundant, and extending from northern California to the edge of the Colorado desert.

BUTEO MONTANUS, Nutt.—Western Red Tail.

Buteo montanus, NUTT. Man. I, 1840, 112.—*Id.* CASSIN, Gen. Rep. IX, 26.

Abundant in northern California, and rare in no part of the country. I met with this bird likewise in New Mexico and Texas.

ARCHIBUTEO FERRUGINEUS, Licht.—The Western Rough-legged Buzzard.

Buteo ferrugineus, LIGHT. Trans. Berlin Acad. 1833, p. 423.

Archibuteo ferrugineus, CASSIN'S B. of Tex. and Cal. p. 159, pl. 26.—*Id.* Gen. Rep. IX, 34.

Archibuteo regalis, GRAY, Genera of Birds, vol. I, pl. 6.

During a previous visit to California I found this species in the valley of the Sacramento, and had considered it rare in that section of country; but during the recent survey in the southern part of the State I found it very abundant, having seen on one occasion in the mountains, about sixty miles from San Diego, five or six of these birds at the same moment. It is there much more numerous than the *Buteo borealis*. Large tracts of land in the southern portion of the State being totally destitute of trees, this bird alights on the ground, or, taking a position on some slightly elevated tuft of grass or stone, will sit patiently for hours watching for its prey. Its food, on dissection, proved to consist of mice, ground squirrels, and other small animals. In plumage it appears to vary as much as its closely allied species, *Archibuteo sancti-johannis*, (Gmelin;) and in a specimen shot by one of the men, but so badly mutilated that it could not be prepared, the tail was strongly tinged with the red color peculiar to the *Buteo borealis*. I several times noticed a bird sailing over the prairies, of about the same size as this species, but entirely black and of heavy continuous flight. It was, I think, of this genus; but never having procured one, I am undecided whether it be the adult bird of the species under consideration (the *A. sancti-johannis*) or a new bird to be added to this group. I discovered in 1851, on the Cosumnes river, the eggs and nest of this bird. While climbing a tree to examine some magpies' nests, the hawk in flying from her own betrayed her retreat. It was placed in the

centre of a bunch of mistletoe springing from the forks of the oak, and was composed of coarse twigs lined with grasses and moss; the eggs, two in number, being white, marked with faint brown dashes, differing greatly from those of the European species, *A. lagopus*, (Gmel.) With those of the *A. sancti-johannis*, I have never had the opportunity of comparing them.

ELANUS LEUCURUS, Vieill.—The Black-shouldered Hawk.

Elanus dispar, AUD. B. of A. Oct. vol. I, p. 70, pl. 16.

Falco dispar, AUD. B. of A. Fol. pl. 352.—NUTTALL. Ornith. vol. I, p. 93.—TEMM. Pl. Col. vol. I, pl. 319, (young plumage.)—CH. BONAPARTE, Am. Orn. vol. II, p. 18, pl. 11, fig. 1.

Falco melanopterus, BON. Journ. Acad. Nat. Sc. of Phil. vol. V, p. 28, 1825.

Elanus leucurus, CASSIN, Gen. Rep. IX, 37.

The extensive marshes of Suisun, Napa, and Sacramento valleys are the favorite resorts of these birds, more especially during the winter season, as they there find a plentiful supply of insects and mice, their principal nourishment. They generally range over their feeding grounds in small flocks, from a single pair up to six or seven pairs together. I fell in with an isolated pair in the mountains between Elizabeth lake and Williamson's Pass, hovering over a small fresh water marsh; this being the only instance observed by me of their travelling so far inland, or away from large bodies of water or marsh. In July and August the young of this species are found quite abundant in the country, thereby proving that it does not migrate for the purposes of incubation.

ACCIPITER COOPERI, Bonaparte.—Cooper's Hawk.

Falco cooperi, BON. Syn. App. p. 432.—NUTT. Orn. vol. I, p. 90.

Falco stanleyi, NUTT. Orn. vol. I, p. 91.—AUD. B. of A. Fol. pl. 36.

Astur cooperi, AUD. Oct. vol. I, p. 98, pl. 24.—DEKAY, Nat. Hist. of N. Y. Part I, p. 18, pl. 4, fig. 5.

Not rare.

ACCIPITER FUSCUS, Gmelin.—The Sharp-shinned Hawk.

Frequenting in great abundance the woodland country throughout California.

CIRCUS HUDSONIUS, Linn.—The Marsh Hawk.

Circus cyaneus, AUD. B. of A. Oct. vol. I, p. 105, pl. 26.

Falco cyaneus, AUD. B. of A. Fol. pl. 356.—BONAP. A. Orn. vol. II, p. 30, pl. 12.

Falco uliginosus, WILS. Am. Orn. vol. VI, p. 67, pl. 51, fig. 1.

Abundant in California; I also met with this species in New Mexico and Texas, and its range therefore extends over our entire country.

ATHENE CUNICULARIA, Molina.—The Burrowing Owl.

Strix cunicularia, MOLINA, Saggio, 1786.

Athene cunicularia, CASSIN, Gen. Rep. IX, 60.

Common on the extensive open prairies, where, associated with the ground squirrel, they often form a large community, though not as great as prairie-dog villages, which latter often cover a mile or more of ground. The sight of this bird is very clear by day, nor will he allow the hunter on foot to approach within fair shooting distance. When approached, however, on a horse or mule, from which animals he apprehends no danger, his confidence renders him a certain

victim to the sportsman. If not killed outright, however severe the wound, he at once beats a retreat, disappearing in his burrow, whence he can be dragged forth only with considerable labor and difficulty. When suddenly alarmed, he flies some distance, then alighting on the ground, jerks his body three or four times successively in an upright position, as if to take an extended view and measure or avoid whatever danger threatens. The nest, formed of a few straws carelessly thrown together at the bottom of a tortuous burrow from 6 to 8 feet in length, contains four nearly spherical eggs, of a pure white.

GLAUCIDIUM GNOMA, Wagler.—Little Western Owl.

Strix passerinoides, AUD. B. of A. Fol. pl. 432, figs. 4 & 5.

Surnia passerinoides, AUD. B. of A. Oct. vol. I, p. 117, pl. 30.

Glaucidium gnoma, CASSIN, Gen. Rep. IX, 62.

This beautiful little species is found among the mountainous districts of the mining regions of California, where it cannot be considered a rare bird. It is, however, seldom captured, as it flies generally at night, though sometimes it may be caught perched on the branch of a tree, napping, during the day. In 1852, I shot three of these birds on the borders of the Calaveras river, a friend of mine, Mr. McMullin, procured another on the Cosumnes, and Mr. Bell, of New York, saw it in 1849, on the American river, thereby showing that it extends over a large portion of California.

STRIX PRATINCOLA, Bonap.—The American Barn Owl.

Strix pratincola, DEKAY'S N. His. of N. Y. part 1, p. 31, pl. 13, fig. 28.—CASSIN, Gen. Rep. IX, 47.

Strix flamma, NUTT. Orn. vol. I, p. 139.—WILS. Am. Orn. vol. VI, p. 57, pl. 50, fig. 2.—AUD. B. of A. Fol. pl. 171.

Strix americana, AUD. Oct. vol. I, p. 127, pl. 34.

Quite a common bird in all parts of California. At one time they frequented the old hollow trees of Sacramento City, but have gradually disappeared, as their old haunts have been destroyed to make way for the march of improvement and civilization. I found large numbers in winter ensconced and sheltered during the day among the reeds of Suisun valley. I obtained a living specimen, self-captured, he having entangled himself in the bushes. It is abundant in the old Catholic missions of California, where it frequents the ruined walls and towers, constructing its nest in the crevices and nooks of these once stately buildings, now fast falling to decay, and which form not only a shelter for birds, but also for innumerable bats, reptiles, and vermin of various kinds.

BRACHYOTUS CASSINII, Brewer.—Short-eared Owl.

Otus brachyotus, AUD. B. of A. Oct. vol. I, p. 140, pl. 38.

Strix brachyotus, AUD. Fol. pl. 432, fig. 6.—NUTT. Orn. vol. I, p. 132.—WILS. Am. Orn. vol. IV, p. 64, pl. 33, fig. 3.—

RICH. and SW. F. Bor. Am. vol. II, p. 75.

Brachyotus cassinii, (BREWER,) CASSIN, Gen. Rep. IX, 53.

Abundant in Suisun and Napa valleys, being found in equal numbers with the preceding species. When started from the ground or reeds, where it seeks shelter during the day, it flies a few yards and alights again on the ground, not appearing wild or shy in its nature, or perhaps so blinded by the brightness of the sun as to ill distinguish surrounding objects. I started from the bushes a specimen of this bird on the desert extending between the Tejon Pass and the Mohave river, on the borders of which I also met another.

BUBO VIRGINIANUS, Gmel.—Great Horned Owl.

Bubo virginianus, NUTT. Orn. vol. I, p. 124.—DEKAY, N. Hist. N. Y. part I, p. 24, pl. 10, fig. 22.—AUD. B. of A. Oct. vol. I, p. 143, pl. 39.—CASSIN, Gen. Rep. IX, 49.

Strix virginiana, AUD. Fol. pl. 61.—WILS. Am. Ornith. vol. VI, p. 52, pl. 50, fig. 1.

While encamped in the mountains bordering the Tejon valley, I occasionally heard the cry of this species at dusk and during the night. In 1849 it was very abundant around Sacramento City, but is now rare in that locality, from the same causes which have also driven almost entirely away the *Strix pratincola*.

SCOPS ASIO, Linn.—The Little Screech Owl.

Strix asio, NUTT. Orn. vol. I, p. 120.—AUD. B. of A. Fol. pl. 97.—WILS. Am. Orn. vol. V, p. 83, pl. 42, fig. 1.

Strix naxvia, WILS. vol. III, p. 17, pl. 19, fig. 1.

Bubo asio, AUD. B. of A. Oct. vol. I, p. 147, pl. 40.—DEKAY, N. Hist. N. Y. part I, p. 25, pl. 12, figs. 25 & 26.

This species is not rare though not easily procured, inasmuch as it leaves its covert only at night in search of prey.

ANTROSTOMUS NUTTALLI, Aud.—Nuttall's Whip-poor-will.

Caprimulgus nuttallii, AUD. B. of A. Oct. vol. VII, p. 350, pl. 495.

Antrostomus nuttalli, BAIRD, Gen. Rep. IX, 149.

I saw two specimens of this bird in the mountains bordering the Tejon valley. They started from the ground, flew a few yards, and alighted almost immediately, as if blinded by the too glaring light of the sun. I shot one to assure myself of the species, but being on a grizzly bear hunt, with only my rifle in hand, it was so mutilated as to be worthless as a specimen. Dr. Milhau, U. S. A, at Fort Yuma, informed me of a small species of *Caprimulgus* very abundant around the fort during the spring and summer seasons. I procured none, being there during the winter, and am unable to say if it be the present species or not.

CHORDEILES POPETUE, Vieillot.—Night Hawk.

Chordeiles virginianus, AUD. B. of A. Oct. vol. I, p. 159, pl. 43.

Caprimulgus virginianus, NUTT. Orn. vol. I, p. 619.—AUD. B. of A. Fol. pl. 147.

Caprimulgus americanus, WILS. Am. Orn. vol. V, p. 65, pl. 40, fig. 1—2.

Caprimulgus popetue, VIEILL. Ois. Am. Sept. vol. I, p. 56, pl. 24.

Chordeiles popetue, BAIRD, Gen. Rep. IX, 151.

Not rare during the spring and summer seasons. I met with this species quite abundantly in Texas.

PANYPTILA MELANOLEUCA, Baird.—White-bellied Swift.

Cypselus melanoleucus, BAIRD, Proceed. Ac. N. Sc. Phil. vol. VII, p. 118.—IB. Gen. Rep. IX, 141.

I saw this bird on several occasions, but always flying so high as to be beyond or on the extreme limit of gun-shot range, and was not fortunate enough to procure one.

PROGNE PURPUREA, Linn.—The Purple Martin.

Hirundo purpurea, AUD. B. of A. Oct. vol. I, p. 170, pl. 45.—IB. Fol. pl. 22.—NUTT. Orn. vol. I, p. 598.—WILS. Am. Orn. vol. V, p. 58, pl. 39, fig. 1—2.

Very abundant, breeding in large numbers in the hollow trees which are still left standing in the city of Sacramento.

HIRUNDO RUF A, Vieill.—The Barn Swallow.

Hirundo rufa, Nutt. Orn. vol. I, p. 601.

Hirundo americana, Wils. Am. Orn. vol. V, pl. 38, figs. 1—2.—Aud. B. of A. Fol. pl. 173.

Hirundo rustica, Aud. Oct. vol. I, p. 181, pl. 43.

Abundant throughout California, New Mexico, and Texas.

HIRUNDO BICOLOR, Vieill.—The White-bellied Swallow.

Hirundo bicolor, Vieill. Ois. Am. Sept. vol. 1, p. 61, pl. 31.

Abundant.

HIRUNDO LUNIFRONS, Say.—The Cliff Swallow.

Hirundo fulva, Bonap. Am. Orn. vol. I, p. 63, pl. 7, fig. 1.—Aud. B. of A. Oct. vol. I, p. 177, pl. 47.—Ib. Fol. pl. 63.

Abundant, building its nest in the cities under the eaves of houses, and in the mountains under the shelving rocks. I found it abundant, also, in New Mexico and Texas. This species, formerly considered as one of our western birds, has within a few years commenced its migrations to our northern States, gradually extending them year after year further south, until it has become in Pennsylvania a regular visitor, like the other common species of the same genus, arriving in spring, incubating, and taking its departure in the fall for more genial climes.

HIRUNDO THALASSINA, Swains.—Violet Green Swallow.

Hirundo thalassina, Sw. Philos. Mag. 1827, p. 366.—Aud. B. of A. Oct. vol. I, p. 186, pl. 49.—Ib. Fol. pl. 335.
BAIRD, Gen. Rep. IX.

I met with this beautiful little species occasionally during our survey, but always on its migrations southward, it being the fall of the year. On the summit of the Tejon Pass I shot several towards dusk as they flew circling in the air in pursuit of insects, a manœuvre which they are in the habit of performing at this season every evening before retiring to rest. Among these large flocks of swallows I remarked a small black swift, (*Acanthylis*,) but was unable to procure it. While visiting Dr. T. C. Henry, U. S. A., at Fort Thorne, New Mexico, we observed many of these swallows flying over a pond on the edge of the Rio Grande river. Its migrations extend over California, and it is one of the most abundant species in Oregon.

COTYLE RIPARIA, Linn.—The Bank Swallow.

Hirundo riparia, Wils. Am. Orn. vol. V, p. 46, pl. 38, fig. 4.—Aud. B. of A. Oct. vol. I, p. 187, pl. 50.

Abundant.

COTYLE SERRIPENNIS, Aud.—Rough-winged Swallow.

Hirundo serripennis, Aud. Synopsis, p. 37.—Ib. B. of A. Oct. vol. I, p. 193, pl. 51.—Ib. Orn. Biog. vol. IV, p. 593.—
BAIRD, Gen. Rep. IX.

Abundant. I observed while in Texas, in this species, a curious instance of the manner in which birds accommodate themselves to the localities in which they sojourn. The river banks, a favorite resort with them around San Antonio, possess in few spots only the conditions requisite for their nidification, being either insufficiently steep to afford them opportunities of sinking their holes, or being in their more abrupt parts composed of a hard rocky earth, into which they

are unable to penetrate. Hence they seek out the holes and crevices in the dwelling-houses of the town, there to build their nests and raise their young. Somewhat puzzled to comprehend why these birds frequented and flew so constantly in the back court of the Plaza House, as they generally wander over the prairies and in the vicinity of water in search of their food, I watched them and perceived several dart between the curtains enclosing a piazza, and disappear in large cracks of the wall, where the twittering of their nestlings welcoming their return at once explained the mystery.

TYRANNUS VERTICALIS, Say.—Arkansas Fly-catcher.

Tyrannus verticalis, SAY, Long's Exped. vol. II, p. 60.—BAIRD, Gen. Rep. IX.

Muscicapa verticalis, BONAP. Am. Orn. vol. I, p. 18, pl. 2, fig. 2.—AUD. B. of A. Oct. vol. I, p. 199, pl. 54.—NUTT. Orn. vol. I, p. 273.

Very abundant, replacing in California the *Tyrannus intrepidus*, Vieill., or king-bird of our eastern States, as he unrelentingly pursues and drives away all hawks and crows that encroach on his domain. The nest is the counterpart of that of the king-bird, being constructed of the same material, while the eggs so resemble those of that species that, placed side by side, it is impossible to distinguish between the two unless previously marked.

SAYORNIS SAYUS, Rich.—Say's Fly-catcher.

Tyrannula saya, RICH. & SW. F. Bor. Am. vol. II, p. 142, pl. 45.

Muscicapa saya, BONAP. Am. Orn. vol. I, p. 20, pl. 2, fig. 3.—AUD. B. of A. Oct. vol. I, p. 217, pl. 59.—NUTT. Orn. vol. I, p. 277.

Sayornis sayus, BAIRD, Gen. Rep. IX, 185.

We met this bird abundantly in southern California, where, in the course of a day's hunt, I have killed five or six of them. It is more especially plentiful in the fall, at the time of its migration southward. I found this species in New Mexico, in the northern part of Texas, near El Paso, and, though somewhat rare in Sacramento valley, I there procured two specimens. In migrating it prefers the deep valleys bordered by high hills, but is found also on the open plains, where, perched on the stalk of some dead weed or on a prominent rock, it darts forth in pursuit of its prey, to return again to its point of observation.

CONTOPUS BOREALIS, Rich.—Cooper's Fly-catcher.

Tyrannus borealis, RICH. & SW. F. Bor. Am. vol. II, p. 141, pl. 35.

Muscicapa cooperii, AUD. B. of A. Oct. vol. I, p. 212, pl. 58.—NUTT. Orn. vol. I, p. 282.

Contopus cooperi, BAIRD, Gen. Rep. IX, 188.

Although I have not myself seen this species in California, a friend of mine procured two specimens on the Cosumnes river, one of which he presented to me. Both proved to be females.

MYIARCHUS MEXICANUS, Kaup.—Ash-colored Fly-catcher.

Tyrannula cinerascens, LAWRENCE, Annals of N. Y. Lyceum, Sept. 1851, p. 121.

Tyrannula mexicana, KAUP.

Myiarchus mexicanus, BAIRD, Gen. Rep. IX, 179.

Abundant. The individuals obtained for the collection were shot near Posa creek. Of shy and retiring habits, it prefers the deep shady forests, where its insect food abounds. The nest, found in the hollow of a tree or in a deserted squirrel or woodpecker's hole, is composed of grasses lined with feathers. The eggs, five in number, are cream color, marked and speckled with purplish red dashes and faint neutral tint blotches.

SAYORNIS NIGRICANS, Swains.—Rocky Mountain Fly-catcher.

Tyrannula nigricans, SWAINS. Synop. Mex. Birds, Phil. Mag. N. S. vol. I, p. 357.

Muscicapa nigricans, AUD. B. of A. Oct. vol. I, p. 218, pl. 60.

Sayornis nigricans, BAIRD, Gen. Rep. IX, 183.

Abundant throughout all California, constructing its nest in like situations as our *Tyrannula nunciola*, Wils. It seems to have a marked predilection for the vicinity of streams or lakes, where it is nearly always to be seen, perched upon a stake or branch, occasionally darting in the air for an insect, then returning to the same place to renew its watch and repeat its manoeuvres. The nest, composed of mud and mosses, lined with hair, is placed against the rocks, the rafters of a house or bridge, or against the inside of a large hollow tree, and the eggs, four or five in number, are pure white, speckled with red.

TYRANNULA TRAILLII, Aud.—Traill's Fly-catcher.

Muscicapa trilli, AUD. B. of A. Oct. vol. I, p. 234, pl. 65.

Muscicapa trilli, AUD. B. of A. Fol. pl. 45.

Abundant.

PYROCEPHALUS RUBINEUS, Boddart.—Scarlet-crowned Fly-catcher.

Pyrocephalus rubineus, CASSIN'S Illust. B. of Tex. & Cal. p. 127, pl. 18.—BAIRD, Gen. Rep. IX, 201.

Muscicapa rubineus, BODD. Tab. des Pl. Enl. Buff p. 42.

I had the good fortune to procure at Fort Yuma a specimen of this brilliantly plumaged but small fly-catcher, which Dr. Milhau, United States army, informed me is there quite common in spring. The plumage of the specimen procured is not brilliant, owing probably to a deformity in its bill, which is crossed as in the cross-bill, thereby preventing the bird from obtaining a sufficient supply of food for its proper nutriment. I saw another specimen in Tucson, Sonora, Mexico, but did not obtain it. It stations itself upon the topmost branches of trees, and when pursued, appears wild, flying to a considerable distance before again alighting. This bird forms an interesting item for our list, as it proves to be a new species to add to the ornithological fauna of California.

MYIADESTES TOWNSENDII, Aud.—Townsend's Ptilogonys.

Ptilogonys townsendii, AUD. B. of A. Oct. vol. I, p. 243, pl. 69.—AUD. B. of A. Fol. pl. 419.

Myiadestes townsendii, BAIRD, Gen. Rep. IX, 321.

Although I procured several specimens during my previous stay in California, still I did not find it common there. Dr. T. C. Henry, United States army, assures me, however, that in the environs of Fort Webster, New Mexico, now abandoned, large numbers of this species may be obtained in the course of a single day's hunt during the fall and winter months. Its flight appears feeble, and when about alighting it expands its tail several times before becoming quietly fixed on its perch. On dissecting the specimens which I procured in northern California, the stomach was filled with a red berry, growing at that season on bushes which cover the mountain sides in great profusion.

PTILOGONYS NITENS, Swains.—Black Crested Fly-catcher.

Ptilogonys nitens, SW. Cab. Cyclo. Animals in Menageries, p. 285.—CASSIN'S B. of Tex. and Cal. p. 169, pl. 29.

Cichlopsis nitens, BAIRD, Gen. Rep. IX, 320.

This bird is seldom found in the northern parts of California, although I obtained both old and young on the Cosumnes river in 1851. Since then a naturalist and friend of mine residing

there has not seen one, though giving much of his attention to the migratory habits of such birds as pass through that section of country. I was therefore surprised on meeting this species after sixty miles of travel through the Colorado desert in the vicinity of the Little Lagoon. On nearing the Colorado river they increased greatly in numbers, twenty or thirty being often seen on the wing at a time. In November, the period of their migration southward, they are very abundant in this section of country. They usually perch on the mesquite trees, jerking their tails almost incessantly, as do some species of fly-catchers, emitting, the while, a low plaintive whistle, and dashing occasionally in irregular curves and angles high in the air in pursuit of insects.

POLIOPTILA CAERULEA, G m e l.—Blue-gray Gnat-catcher.

Culicivora caerulea, DEKAY, N. Hist. N. Y. Part I, p. 109, pl. 56, fig. 126.

Muscicapa caerulea, AUD. Fol. pl. 84.—WILS. Am. Orn. vol. II, p. 164, pl. 18, fig. 5.—NUTT. Orn. vol. I, p. 297.

Abundant.

POLIOPTILA MELANURA, L a w r.—Black-headed Gnat-catcher.

Culicivora mexicana, (BONAP.) CASSIN'S B. of Texas and California, p. 163, pl. 27.

Polioptila melanura, BAIRD, Gen. Rep. IX.

I first came across this species near San Diego, in 1851, and found it abundant during the recent survey in the vicinity of Fort Yuma. The last specimen I obtained was from a hedge surrounding the cultivated fields of the Pimos Indians, whose villages are situated about two hundred miles above the junction of the Gila and Colorado rivers. Its habits resemble those of the preceding species, quick and restless in its movements, searching actively for its food, and darting occasionally in the air in pursuit of small insects. Its note is of so feeble a tone as to be heard only at the distance of a few yards. In searching its food it resorts, from preference, to low trees and weeds, where it finds the most copious harvest.

MYIODIOCTES PUSILLUS, W i l s o n.—Green Black-capped Fly-catching Warbler.

Muscicapa pusilla, WILS. Am. Orn. vol. III, p. 163, pl. 26, fig. 4.—AUD. B. of A. Fol. pl. 124.

Myiodioides wilsonii, AUD. B. of A. Oct. vol. II, p. 21, pl. 75.

Myiodioides pusillus, BAIRD, Gen. Rep. IX, 293.

During our expedition this species proved abundant, being found wherever the wood or heavy brush and thickets afforded it a sufficient shelter.

DENDROICA AUDUBONII, T o w n s.—Audubon's Warbler.

Sylvicola audubonii, TOWNS. Audubon, B. of A, Oct. vol. II, p. 26, pl. 77.

Sylvia audubonii, TOWNS. Jour. Acad. N. Sci. Phil. vol. VII, p. 191.—AUD. B. of A. Fol. pl. 395.

Dendroica audubonii, BAIRD, Gen. Rep. IX, 273.

Abundant, replacing in California the *Sylvicola coronata* of our eastern States. It assembles in the fall and spring in small flocks, often associated during their migrations with the titmouse (*Parus*) and ruby-crowned wren, (*Regulus calendula*,) skipping about in the tree tops, actively searching for insects, oftentimes flying in the air in their pursuit. Some few of these birds spend the whole winter in California, as I have seen them in Sacramento valley throughout all the inclement season.

DENDROICA AESTIVA, G m e l i n .—Yellow-Poll Wood Warbler.

Sylvicola aestiva, RICH. & SW. F. Bor. Am. vol. II, p. 211.—AUD. B. of A. Oct. vol. II, p. 50, pl. 83.

Dendroica aestiva, BAIRD, Gen. Rep. IX, 232.

Abundant over the entire country.

DENDROICA NIGRESCENS, T o w n s .—Black-throated Gray Warbler.

Sylvicola nigrescens, AUD. B. of A. Oct. Vol. II, p. 62, pl. 114.

Sylvia nigrescens, AUD. Fol. pl. 395.—TOWNSEND, Jour. Acad. N. Scien. Phil. vol. VII, p. 191.

Sylvia halseyii, G. P. GIRAUD, 16 New Species of N. A. Birds, fig. 1.

Dendroica nigrescens, BAIRD, Gen. Rep. IX, 270.

I obtained, in 1852, a few specimens of this species near Sacramento City and also on the range of mountains which divide the Calaveras and Mokelumne rivers. During this expedition, in the month of October, I met with but a single individual in the mountains adjoining the summit of the Tejon Pass. It was then migrating southward with several other small species of birds and gleaning its insectivorous food from the topmost branches of some tall oaks. The notes of this bird closely resemble those of a locust.

TRICHAS TOLMIEII, T o w n s .—Tolmie's Warbler.

Trichas macgillivrayii, AUD. B. of A. Oct. vol. II p. 74, pl. 100.

Sylvia tolmiei, TOWNS. Jour. Acad. N. Scien. Phil. vol. VIII, p. 149.—IB. Townsend's Narrative, p. 343.

Geothlypis macgillivrayi, BAIRD, Gen. Rep. IX, 244.

A beautiful and somewhat rare species, affording but few opportunities for the study of its habits, as it retires amidst the deep shady swamps and brushwood, from whence it seldom makes its appearance.

TRICHAS DELAFIELDII, A u d .—Delafield's Yellow-throat.

Trichas delafieldii, AUD. B. of A. Oct. vol. II, p. 81, pl. 103.—IB. Synop. p. 65.

Sylvia delafieldii, AUD. ORN. Biog. vol. V, p. 307.

Geothlypis trichas, BAIRD, Gen. Rep. IX, 241.

Abundant and like its closely allied species, the *Trichas marilandicus*, haunts the low thickets in the vicinity of water, in which localities it seeks its food on the ground, seldom appearing above the tops of the bushes. It incubates in the country, for though I was not fortunate enough to discover its nest, I shot on several occasions the bird in its young plumage.

HELMINTHOPHAGA CELATA, S a y .—Orange-crowned Warbler.

Helinaia celata, AUD. B. of A. Oct. vol. II, p. 100, pl. 112.

Sylvia celata, AUD. B. A. Fol. pl. 178.—BONAP. Am. ORN. vol. I, p. 45, pl. 5, fig. 2.—SAY, Long's Exped. to Rocky Mts. vol. I, p. 169.—NUTT. ORN. vol. I, p. 413.

Helminthophaga celata, BAIRD, Gen. Report IX, 257.

This bird is plentiful all over the country, having procured it in northern California, in the Tejon valley, and on the Colorado river, near Fort Yuma. It is migratory in its habits, but some few pairs incubate near the summits of the highest mountains in the mining regions.

CERTHIA AMERICANA, B o n .—Brown Tree Creeper.

Certhia familiaris, WILS. Am. ORN. vol. I, p. 122, pl. 8, fig. 1.—AUD. B. of A. Oct. vol. II, p. 109, pl. 115.—IB. Fol. pl. 415.

Certhia americana, BONAP. Compar. List. p. II.—BAIRD, Gen. Rep. IX, 372.

Abundant in California, especially in the mountainous districts.

TROGLODYTES OBSOLETUS, S a y .—Rock Wren.

Troglodytes obsoleta, NUTT. ORN. vol. I, p. 435.—AUD. B. of A. Oct. vol. II, p. 113, pl. 116.—IB. Fol. pl. 360.—SAY, Long's Exp. to the Rocky Mts. vol. II, p. 4.
Salpinctes obsoletus, BAIRD, Gen. Rep. IX, 357.

I have met with this bird not only throughout the whole extent of California, but also in New Mexico and Texas, and while encamped in the Tejon valley have often, in the course of the day, obtained from five to six specimens. It frequents the rocky portions of the country, passing in the crevices and under the boulders which lie profusely scattered over the mountains. It lives upon spiders, worms, and small insects, and while in pursuit of them it utters, at intervals, a loud, quick note, of a peculiarly thrilling character.

TROGLODYTES MEXICANUS, S w a i n s .—Mexican Wren.

Troglodytes mexicanus, Sw. Zool. Illus. 2d series, vol. I, pl. 11.
Catherpes mexicanus, BAIRD, Gen. Rep. IX, 356.

On a previous visit to California, I procured this species on the Calaveras and Cosumnes rivers. Its habits and resorts are the same as the *Trog. obsoletus*.

TROGLODYTES BEWICKII, A u d .—Bewick's Wren.

Troglodytes bewickii, AUD. B. of A. Oct. vol. II, p. 120, pl. 118.—IB. Fol. pl. 18.—NUTT. ORN. vol. I, p. 434.
Thryothorus bewickii, BAIRD, Gen. Rep. IX, 363.

Abundant. Near Fort Clark, Texas, I found a nest of this species constructed in an old Comanche Indian shield. The target, formed of two thicknesses of hide, had been hung on a bush as a mark to fire at; from exposure to the weather, the two sides, having separated, formed a pocket, in which this bird had domiciliated itself. It is like the rest of the genus, very querulous in its notes, repeating, when disturbed, its alarm cries with great vehemence.

TROGLODYTES AMERICANUS, A u d .—Wood Wren.

Troglodytes americanus, AUD. B. of A. Oct. vol. II, p. 123, pl. 119.—IB. Fol. pl. 179.—DEKAY, N. Hist. N. Y. part I, p. 54.—BAIRD, Gen. Rep. IX, 368.

Abundant in the wooded portions of the country.

TROGLODYTES AEDON, Vieill.—House Wren.

Troglodytes aedon, VIEILL. Ois. Am. Sep. vol. II, p. 52, pl. 107.—AUD. B. of A. Oct. vol. II, p. 125, pl. 120.—IB. Fol. pl. 83.

Abundant.

TROGLODYTES PALUSTRIS, Wils.—Marsh Wren.

Troglodytes palustris, AUD. B. of A. Oct. vol. II, p. 135, pl. 123.—IB. Fol. pl. 100.—NUTT. ORN. vol. I, p. 439.
Certhia palustris, WILS. Am. Orn. vol. II, p. 58, pl. 12, fig. 4.

Abundant throughout all the marshy districts of the country.

CAMPYLORHYNCHUS BRUNNEICAPILLUS, L a f r e s n a y e .—Brown-headed Wren.

Picolaptes brunneicapillus, LAF. Guerin's Mag. de Zoolog. p. 61.—CASSIN, B. of Tex. and Cal. p. 156, pl. 25
Campylorhynchus brunneicapillus, BAIRD, Gen. Rep. IX, 355.

This bird, though well known as a Mexican species, is now for the first time added to the fauna of California. I first discovered it on the desert extending between the Tejon pass and the Mohave river, where its purse-shaped nest, placed on the branches of the cactus, at no great height from the ground, is frequently to be met with. The nest, composed of grasses and lined with feathers, has an entrance in the form of a covered passage, varying from six to ten inches in length. The eggs, six in number, are of a delicate salmon color, very pale, and often so thickly speckled with ash and darker salmon colored spots as to give a rich cast to the whole surface of the egg. I sometimes stopped to open these nests, as the feathers with which they were lined often indicated that certain species of birds were to be found in their neighborhood. The naturalist, thus put on the alert, will more readily obtain such of those species as may have escaped his eye. In this manner I discovered the uttermost western range of the blue partridge, (*Callipepla squamata*, Vigors.) I obtained, at a later period, other specimens of this wren in the valley of the San Fernando Mission, in San Bernardino valley, in the vicinity of Fort Yuma, and finally in Texas, in certain portions of which it is by no means rare. Its habits are like those of the wrens, creeping into holes and under the leaves and grass in search of insects. If wounded only it is easily lost, running or fluttering to a ground squirrel's hole, or any other cavity, where it takes refuge. On the Mohave desert, having winged one of these birds, it was discovered only on lifting a hollow log in which it had taken shelter and throwing it several times violently on the ground, when it struggled out in vain endeavors to escape.

LOPHOPHANES INORNATUS, G a m b e l.—Plain Chickadee.

Parus inornatus, GAMBEL, Proceed. Acad. N. Scien. Phil. vol. II, p. 265.—IB. Journal Ac. N. S. Phil. 2d series, vol. I, p. 35, pl. 8, fig. 2.

Lophophanes inornatus, BAIRD, Gen. Rep. IX, 386.

Abundant throughout the country, and possessing an almost endless variety of notes.

PARUS RUFESCENS, T o w n s.—Chestnut-backed Titmouse or Chickadee.

Parus rufescens, TOWNS, Journ. Acad. N. Scien. Phil. vol. VII, p. 190.—AUD. B. of A. Oct. vol. II, p. 158, pl. 129.—IB. Fol. pl. 353, figs. 1 and 2.

This bird and its nestlings I found in the month of July frequenting the stunted oaks and bushes covering the sand hills around San Francisco, where it appears not to be rare. I never saw it in any other part of California, though said by Mr. Audubon to be an abundant species in Oregon and on the Columbia river.

PARUS MONTANUS, G a m b e l.—Rocky Mountain Chickadee.

Parus montanus, GAMBEL, Proceed. Acad. N. Scien. Phil. vol. I, p. 259.—IB. Journal Ac. N. S. Phil. 2d series, vol. I, p. 35, pl. 8, fig. 1.

Dr. Gambel first brought from California a single specimen of this bird, which he presented to the Philadelphia Academy of Natural Sciences, but which by some mishap was lost soon after the figure had been drawn for the journal of that institution. In 1851 I met with two small flocks of these birds in company with the *Psaltria minima*, on the mountains surrounding the volcano, in the southern mines, and again during the late survey on the summit of the Tejon Pass, associated with several species of *Sylvicola*, which were then migrating south. In its movements it is restless, diligently gleaning its food, consisting of insects, in the moss and

interstices of the bark of trees, often suspended back downwards as it clings to the under side of a branch. Its note very much resembles that of our black-capped chickadee, (*Parus atricapillus*, Linn.)

PSALTRIA MINIMA, Towns.—Least Chickadee.

Parus minimus, Towns. Journ. Acad. N. Scien. Phil. vol. VII, p. 190.—Aud. B. of A. Oct. vol. II, p. 160, pl. 130.—
Ib. Fol. pl. 353, figs. 5 and 6.

Abundant, and found in the fall in flocks of from twenty to thirty individuals, following each other from tree to tree, travelling thus in a single day over a large tract of country. It incubates in California, as I have found there its pendulous nest, containing from six to eight pure white eggs.

AEGITHALUS FLAVICEPS, Sundevall.

Conirostrum ornatum, Lawrence, Annals N. Y. Lyceum, vol. V, p. 112, pl. 5, fig. 1.
Aegithalus flaviceps, Sundevall, Oversigt, VII, 129.
Paroides flaviceps, Baird, Gen. Rep. IX, 400.

I first discovered in California this beautiful little species at the terminus of the Mohave river, where I pursued them among the mezquite trees, but owing to their wildness I procured none. I remarked that in searching their food they often remain suspended with their back downwards as do the chickadees or titmice. I found their nests abundant near Fort Yuma, though from the lateness of the season few of the birds remained. The nest is spherical, formed of twigs, and having an entrance on the side; the interior being lined with down and feathers, and containing from four to six eggs of a pale blue color, and dashed with small black spots. This species is new to the fauna of California, though well known as a Mexican and Texian bird.

CHAMAEA FASCIATA, Gambel.—Ground Wren.

Chamaea fasciata, Gambel, Proceed. A. N. Sc. Phil. vol. III, p. 154.—Ib. Journ. A. N. Sc. Phil. 2d series, vol. I, p. 34, pl. 8, fig. 3.
Parus fasciatus, Gamb. Proceed. A. N. Sc. Phil. vol. II, p. 265.

Abundant. This bird frequents the low brush and thickets, and while creeping actively and restlessly through the undergrowth in search of food utters a low plaintive note or whistle, holding its tail erect over its back after the manner of the wren. It incubates in the country, though I have never discovered its nest.

REGULUS CALENDULA, Linn.—Ruby-crowned Wren.

Regulus calendula, Aud. B. of A. Oct. vol. II, p. 168, pl. 133.—Ib. B. of A. Fol. pl. 195.
Sylvia calendula, Wils. Am. Orn. vol. I, p. 83, pl. 5, fig. 3.

Abundant throughout California. I procured specimens at the Little Lagoon (Colorado desert) and as far south as the villages of the Pimos Indians.

SIALIA MEXICANA, Swainson.—Western Blue Bird.

Sialia occidentalis, Towns. Journ. Acad. N. Scien. Phila. vol. VII, p. 188.—Aud. B. of A. Oct. vol. II, p. 176, pl. 135.—
Ib. Fol. pl. 393, figs. 4 and 5.
Sialia mexicana, Baird, Gen. Report IX, 223.

As plentiful in California as is our *Sialia wilsonii* in this section of the country, and having

the same habits. The nest, built in the hollow of a tree, is composed of grasses, and contains four to six eggs of a pale blue color.

SIALIA ARCTICA, Swains.—Arctic Blue Bird.

Sialia arctica, AUD. B. of A. Oct. vol. II, p. 178, pl. 136.—IB. Fol. pl. 393, figs. 2 and 3.—NUTT. Orn. vol. II, p. 573.

Met with occasionally in small flocks during the winter season. I saw it in New Mexico, and Colonel M'Call, U. S. A., informed me that in Santa Fé it breeds like our common blue bird, in boxes put up for that purpose by the inhabitants of the city.

CINCLUS AMERICANUS, Swains.—American Dipper.

Cinclus americanus, RICH. and SW. F. Bor. Am. vol. II, p. 173.—AUD. B. of A. Oct. vol. II, p. 182, pl. 137.

Cinclus mertonii & townsendii, AUD. B. A. Fol. pl. 435.

Hydrobata mexicana, BAIRD, Gen. Rep. IX, 229.

This interesting species I found in abundance on the mountain rivulets of northern California, preferring the clear limpid streams, and often forsaking a locality when the water is made turbid by miners washing the earth in search of gold. Alighting on the edge of the water it patiently awaits the passage of its prey, uttering at intervals a low buzzing whistle which is repeated at short intervals. Quite unsuspecting, it is easily approached and killed, but if wounded only, it dives with great celerity, using its wings under water to propel itself forward. During the late survey I met with and procured but one single specimen, on the small stream which takes its rise near the summit of the Tejon Pass.

MIMUS POLYGLOTTUS, Linn.—Common Mocking Bird.

Orpheus polyglottus, DEKAY, N. Hist. N. Y. part I, p. 67, pl. 39, fig. 84.—AUD. B. of A. Oct. vol. II, p. 187, pl. 138.

Turdus polyglottus, AUD. Fol. pl. 21.—WILS. Am. Orn. vol. II, p. 13, pl. 10, fig. 1.—NUTT. Orn. vol. I, p. 320.

Mimus polyglottus, var. *caudatus*, BAIRD, Gen. Rep. IX, 344.

This bird was first observed on Posa creek, and was found abundant in the valley of Los Angeles, where they frequented the low bushes and hedges of prickly pear, still growing around the fields of the abandoned missions, and forming an impenetrable barrier. The fruit of this plant was at the time ripe, and the throats of several of the birds killed were tinged a deep carmine from its juice. We met occasionally with this species during the second survey, under Lieutenant Parke, and when passing through western Texas it proved to be one of the most common birds of the country.

MIMUS MONTANUS, Towns.—Rocky Mountain Mocking Bird.

Orpheus montanus, TOWNS, Journ. Acad. N. S. Phil. vol. VII, p. 192.—AUD. B. of A. Oct. vol. II, p. 194, pl. 139.—

IB. Fol. pl. 369, fig. 1.

Oreoscoptes montanus, BAIRD, Gen. Rep. IX, 347.

This species is often met with in southern California, having remarked it on several occasions in the environs of San Diego, and from thence to Fort Yuma. In New Mexico and Texas we found it, seeing one or more individuals daily for over three hundred miles after leaving El Paso. On being flushed it flies but a short distance, and generally alights on the ground, running some way before it stops. When in the arid regions where the cactus abounds, the ripe fruit of which affords its favorite food, it alights on the branches of that plant, and although I have closely examined the feet of several individuals, it would appear that it suffers no inconvenience from the needle like points projecting from all parts of these plants.

HARPORHYNCHUS REDIVIVUS, G a m b e l.—California Mocking Bird.

Toxostoma rediviva, GAMBEL, Journ. Acad. N. S. Phil. 2d series, vol. I, p. 42.

Harpes redivivus, GAME. Proceed. Acad. N. S. Phil. vol. II, p. 264

Harporhynchus redivivus, BAIRD, Gen. Rep. IX, 349.

Abundant, not only having procured it in northern California, but also as far south as Texas, on the borders of the Rio Grande. Shy and wild in its habits, when startled it flies low some distance, and plunging into a thicket alights, runs on the ground, and so conceals itself that it is not again easily found. Its notes are equal in harmony to those of our mocking bird, and among the miners it is well known as the California mocking bird. It incubates in the country, but the only nest I found, composed externally of coarse twigs and lined with fine roots, contained young, it then being the month of July.

TURDUS MIGRATORIUS, L i n n.—The Robin.

Turdus migratorius, AUD. B. of A. Oct. vol. III, p. 14, pl. 142.—NUTT. Orn. vol. I, p. 339.—WILS. Am. Orn. vol. I, p. 35, pl. 2, fig. 1.

Abundant, but only appearing in the mining regions of California during the winter season. Several flocks of these birds were observed at Fort Yuma in the month of December.

TURDUS NAEVIUS, G m e l.—The Varied Thrush.

Turdus naevius, AUD. B. of A. Oct. vol. III, p. 22, pl. 143.

Orpheus meruloides, RICH. & SW. F. Bor. Am. part II, p. 187, pl. 33.

Abundant, being found in the mountainous districts in large flocks, frequenting the moist hill sides in search of food. It does not incubate in the country, but migrates north in early spring.

TURDUS NANUS, A u d.—Dwarf Thrush.

Turdus nanus, AUD. B. of A. Oct. vol. III, p. 32, pl. 147.

Abundant. I found this species breeding in the stunted oaks covering the sand hills around San Francisco.

ANTHUS LUDOVICIANUS, L i c h t.—American Pipit.

Anthus ludovicianus, DEKAY, N. Hist. N. Y. part I, p. 76, pl. 64, fig. 99.—AUD. B. of A. Oct. vol. III, p. 40, pl. 150.

Anthus spinoletta, NUTT. Orn. vol. I, p. 450.

Alauda rufa, WILS. Am. Orn. vol. V, p. 89, pl. 42, fig. 4.

Abundant.

OTOCORIS ALPESTRIS, L i n n.—Shore Lark.

Alauda cornuta, DEKAY'S N. Hist. of N. Y. part I, p. 179, pl. 73, fig. 165.—RICH. & SW. F. Bor. Am. vol. II, p. 245.

Alauda alpestris, WILS. Am. Orn. vol. I, p. 85, pl. 5, fig. 4.—AUD. B. of A. Oct. vol. III, p. 44, pl. 151.—NUTT. Orn. vol. I, p. 455.

Eremophila cornuta, BAIRD, Gen. Report, IX, 403.

Abundant.

OTOCORIS RUFA, A u d.—Western Shore Lark.

Alauda rufa, AUD. B. of A. Oct. vol. VII, p. 353, pl. 497.

Abundant. Congregating with the two preceding species, they form together large flocks, covering the plains during the fall season, engaged in gleaning the seeds of grasses and small

insects, which form their principal nourishment. At this period they are easily approached, and large numbers may be killed at a single shot. During summer, they are seen frequenting the roads and flying a few paces before the traveller as he advances. The nest, sunk in a slight hollow in the ground, is composed of grasses lined with fine hair. The eggs, four to five in number, are light green ash, covered thickly with minute light umber brown spots, sometimes forming a crown at the larger end of the egg.

EMBERNAGRA CHLORURA, Towns.—Blanding's Finch.

Embernagra blandingiana, GAMBEL.—CASSIN'S B of Tex. & Cal., p. 70, pl. 12.

Fringilla blandingiana, GAMBEL, Proceed. Ac. N. S. Phil. vol. I, p. 260.

Fringilla chlorura, AUD. Orn. Biog. vol. V, p. 336.

Zonotrichia chlorura, HEERMANN, Jour. Ac. N. S. Phil. 2d series, vol. I, p. 51, pl. 9, fig. 1.

Pipilo chlorura, BAIRD, Gen. Rep. IX, 519.

I met with a single specimen of this bird in the Tejon valley, where I discovered it among a flock of sparrows consisting of several varieties. On a former occasion I procured a single bird of this species in Sacramento valley, and consider it as accidental in California, or at least in the northern part of it.

POOSPIZA BELLII, Cassin.—Bell's Bunting.

Emberiza bellii, CASSIN, Proceed. Ac. N. S. Phil. vol. V, p. 105, pl. 4.

Poospiza bellii, BAIRD, Gen. Rep. IX, 470.

In the fall of 1851 I first noticed this species in the mountains bordering the Cosumnes river, and on the late expedition we found it in great numbers on the broad tract of arid land lying between Kern river and the Tejon Pass, and again on the desert between this latter and the Mohave river, often wandering at a great distance from water. The *Picolaptes brunneicapillus*, two kinds of woodpecker, an occasional raven, and this species, appear to be the only birds inhabiting these large and desolate plains, where the artemisia (*Larrea mexicana*) alone flourishes amid the surrounding weak and scanty vegetation. When undisturbed, it chants merrily its ditty from some bush top, but upon the appearance of danger drops at once to the ground and disappears in the shrubbery or grass. The nest, built in a bush, is composed of twigs and grasses, lined with hair. The eggs, four in number, are light greenish blue, marked with reddish purple spots differing in intensity of shade.

PASSERCULUS ROSTRATUS, Cassin.—Large-billed Sparrow.

Emberiza rostrata, CASSIN, Proceed. Ac. Nat. S. Phil. vol. VI, p. 184.

In 1851 I procured this bird on the shores of the Bay of San Diego, and also, during the late survey, in considerable numbers at Santa Barbara and San Pedro. It frequents the low sandy beach and the heavy sedge grass which fringes the shores, where it feeds upon the marine insects and seeds thrown up by the tides and in which it finds quick and easy concealment when closely pursued.

SPIZA AMOENA, Say.—Lazuli Painted Finch.

Spiza amoena, AUD. B of A. Oct. Vol. III, p. 100, pl. 171.

Fringilla amoena, AUD. B. A. Fol. pl. 398.—BONAP. Ann. Orn. vol. I, p. 61, pl. 6, fig. 5 —NUTT, Orn. vol. I, p. 473.

Emberiza amoena, SAY, Long's Exped. to Rocky mts. vol. II, p. 47.

This beautiful little species teems over the whole surface of California during the summer months; having been observed in the mountains near Shasta City, in the Sacramento valley,

and the intermediate country down to the southern part of California. Its chant, shrill and musical, repeated at intervals, resembles in sweetness and tone that of our Indigo bird (*Spiza cyanea*.) Its nest, attached to the upright branches of bushes or the stalks of strong weeds, is built of grasses lined with the inner bark of the oak, and contains four eggs of a faint blue tinge.

JUNCO OREGONUS, Towns.—Oregon Snow Finch.

Fringilla oregona, Towns. Jour. Ac. N. S. Phil. vol. VII, p. 188.—Aud. B. of A. Fol. pl. 398.

Niphoeca oregona, Aud. Oct. vol. III, p. 91, pl. 163.

Junco oregona, Baird, Gen. Rep. IX, 467.

We met with this bird near Fort Yuma in December, having previously remarked it during the fall, in large flocks, migrating from the north, where it spends the summer in the duties of incubation. Its habits are similar to those of our common snow bird, (*Junco hyemalis*,) and like that species it prefers the grass fields, hedges and woods, actively employed in seeking its food on the ground and emitting at intervals a sharp chirp. The nest of this bird, built in a low cedar bush, was composed of grasses and lined with fine roots and hair. The eggs, four in number, were light greenish and roseate white with spots of faint neutral tint and larger ones varying in hue, from a reddish to a dark sepia.

PASSE'ELLA TOWNSENDII, Aud.—Townsend's Finch.

Plectrophanes townsendii, Aud. B. of A. Fol. pl. 424.

Fringilla cinerea, Aud. B. of A. Oct. vol. III, p. 145, pl. 187.

Passerella townsendii, Baird, Gen. Rep. IX, p. 439.

Abundant and migratory, visiting California only during the winter. Of a solitary and quiet nature, it resorts to the thickets and underwood in quest of food, scratching up and turning over the leaves and ground, making occasionally a hop backwards to ascertain the result of its labors. Its habits are the same as those of our fox sparrow, (*Z. iliaca*.) In the octavo edition of Mr. Audubon's work on the Birds of America, the name of brown finch has been given to the figure of this bird, while to the figure of the *Z. guttata* the name of Townsend's finch has been applied. This is evidently a mistake on the part of the engraver of the plates.

ZONOTRICHIA GRAMINEA, Gmel.—Bay-winged Finch.

Emberiza graminea, Wils. Am. Orn. vol. IV, p. 51, pl. 31, fig. 5.—Aud. B. of A. Oct. vol. III, p. 65, pl. 159.

Fringilla graminea, Aud. Fol. pl. 94.—Nutt. Orn. vol. I, p. 482.

Poocetes gramineus, Baird, Gen. Rep. IX, 447.

A very abundant species, being found not only in California but also in New Mexico and Texas.

ZONOTRICHIA GUTTATA, Nutt.—Brown Song Sparrow.

Fringilla guttata, Nutt. Orn. 2d edit. vol. I, p. 581.

Fringilla townsendii, Aud. B. of A. Oct. vol. III, p. 143, pl. 188.

Fringilla cinerea, Aud. B. of A. Fol. pl. 390, fig. 4.

Abundant throughout the whole country, but more especially so in the bushes bordering the streams, ponds, or marshes. Its notes are sweet but few in number, resembling those of our common song sparrow, (*Zonotrichia melodia*.) Its nest, usually built in a thick tuft of bushes, is composed externally of grasses and lined with hair, containing four eggs of a pale blue ash color, very thickly covered with dashes of burnt umber.

ZONOTRICHIA GAMBELII, Nutt.—Gambel's Finch.

Fringilla gambelii, Nuttall, Man. I, 2d ed. 556.

Zonotrichia gambelii, Baird, Gen. Rep. IX, 460.

Abundant, being found in the most arid parts of the country during the fall, at which time they are migrating southward. I have procured this bird in very young plumage in the month of July near San Francisco, showing thereby that it sometimes breeds in California. It was our almost constant companion during the survey under Lieutenant Parke, through Mexico, New Mexico, and in Texas.

ZONOTRICHIA CORONATA, Pallas.—Black and Yellow-crowned Finch.

Fringilla atricapilla, Aud. B. of A. Oct. vol. III, p. 162, pl. 193.

Emberiza atricapilla, Aud. B. of A. Fol. pl. 394, fig. 3.—Gmel. Syst. Nat. vol. I, part II, p. 875.

Zonotrichia coronata, Baird, Gen. Rep. IX, 461.

This species appears abundant in the fall season, being generally associated with the white-crowned finch and the California song sparrow. Resorting to the deep shady thickets and woods, where it passes the greater part of the time, and in the mountainous districts, it prefers the hill sides covered with dense undergrowth. It occasionally breeds in California. I found its nest in a bush near Sacramento City. It was composed of coarse stalks of weeds, and lined internally with fine roots. The eggs, four in number, are ashy white, marked with lines of brown umber, sometimes appearing black from the depth of their shades, and covered also with a few neutral tint spots.

CHONDESTES GRAMMACA, Say.—Prairie Lark Finch.

Emberiza grammaca, Aud. B. of A. Oct. vol. III, p. 63, pl. 158.

Fringilla grammaca, Bonap. Am. Orn. vol. I, p. 47, pl. V, fig. 3.—Long's Exp. to Rocky Mts. vol. I, p. 139.

This species is numerous in California, in New Mexico, and in Texas. Arriving in this latter country in May, I found this bird mated and about to commence the duties of incubation.

SPIZELLA SOCIALIS, Wilson.—Chipping Sparrow.

Fringilla socialis, Wils. Am. Orn. vol. II, p. 127, pl. 16, fig. 3.—Nutt. Orn. vol. I, p. 497.—Aud. B. of A. Fol. pl. 104.

Emberiza socialis, Aud. Oct. vol. III, p. 80, pl. 165.

Abundant.

SPIZELLA PALLIDA, Swains.—Clay-colored Sparrow.

Emberiza pallida, Rich. & Sw. Fau. Bor. Am. vol. II, p. 251.—Aud. B. of A. Oct. vol. III, p. 71, pl. 161.—Fol. pl. 398, fig. 2.

These birds we met with throughout our entire route in California and Texas. On the passage from the Pimos villages to Tucson, we noticed large flocks gleaning their food among the bushes, as they travelled south. In Tejon valley, during the fall season, we constantly saw them associated with large flocks of sparrows, congregated about the Indian cultivated fields, where they find a bountiful supply of seed and grain, passing, like the rest of the *Fringillidae*, the greater portion of their time on the ground for this purpose.

PASSERCULUS SAVANNA, Wils.—Savanna Finch.

Fringilla savana, WILS. Am. Orn. vol. IV, p. 72, pl. 34, fig. 4.—NUTT. Orn. vol. I, p. 489.—AUD. B. of A. Fol. pl. 109.
Emberiza savana, AUD. Oet. vol. III, p. 63, pl. 160.

Abundant.

PASSERCULUS ALAUDINUS, Bonap.

Passerculus alaudinus, BONAP. Comptes Rend. vol. XXXVII, p. 918, Dec. 1853.

This bird I shot on the swampy borders of a pond near the barracks at Benicia. Its habits, from the limited observations afforded me, I deem the same as those of our sea side finch, (*Ammodramus maritimus*.) When flushed from its covert of rushes and rank grass it flew but a short distance and settled down, concealing itself so quickly that unless promptly shot while on the wing it could not be captured.

PEUCAEA LINCOLNII, Aud.—Lincoln's Finch.

Peucea lincolnii, AUD. B. of A. Oct. vol. III, p. 116, pl. 177.
Fringilla lincolnii, AUD. Fol. pl. 193.
Melospiza lincolnii, BAIRD, Gen. Rep. IX, 482.

I have obtained this species not unfrequently both in northern California and the Tejon valley, and on all occasions found it in company with flocks of sparrows, composed of several different varieties.

COTURNICULUS PASSERINUS, Wils.—Yellow-winged Finch.

Emberiza passerina, AUD. B. of A. Oct. vol. III, p. 73, pl. 162.
Fringilla passerina, AUD. B. of A. Fol. pl. 130.—WILS. Am. Orn. vol. III, p. 76, pl. 24, fig. 5.

Abundant.

AMMODRAMUS RUFICEPS, Cassin.—Brown-headed Finch.

Ammodramus ruficeps, CASSIN, Ill. B. of Tex. and Cal. p. 135, pl. 20.—IB. Proceed. Ac. Nat. Sc. Phil. vol. VI, p. 184.
Peucea ruficeps, BAIRD, Gen. Rep. IX, 486.

In the fall of 1851 I shot, on the Cosumnes river, but one specimen of this bird, from among a large flock of sparrows, but in 1852, during the spring, in the mountains near the Calaveras river, I found it quite abundant. It flew then in pairs, picking grass seeds from the ground, and when started never extended its flight beyond a few yards. Its notes in character resemble the ditty of our chipping sparrow, (*Spizella socialis*.)

LINARIA PINUS, Wilson.—Pine Linnet.

Linaria pinus, AUD. B. of A. Oct. vol. III, p. 125, pl. 180.
Fringilla pinus, AUD. Fol. pl. 180.—WILS. Am. Orn. vol. II, p. 133, pl. 17, fig. 1.—NUTT. Orn. vol. I, p. 511.
Carduelis pinus, DEKAY'S N. II. of N. Y. vol. I, p. 167, pl. 59, fig. 136.
Chrysomitris pinus, BAIRD, Gen. Rep. IX, 425.

Found in the mountainous districts during the winter season, feeding on the young buds of plants or extracting the seeds from the pine cone, to which it often hangs with its back downwards while thus occupied.

CARDUELIS TRISTIS, L i n n .—American Goldfinch.

Carduelis tristis, DEKAY'S N. Hist. N. Y. vol. I, p. 166, pl. 66, fig. 151.—AUD. B. of A. Oct. vol. III, p. 129, pl. 181.

Fringilla tristis, NUTT. Orn. vol. I, p. 507.

Chrysomitris tristis, BAIRD, Gen. Rep. IX, 421.

Abundant.

CARDUELIS LAWRENCII, C a s s i n .—Lawrence's Goldfinch.

Carduelis lawrencii, CASSIN, Proc. Ac. N. Sc. Phil. vol. V, p. 105, pl. 5.

These birds are very abundant throughout the northern mining regions of California, frequenting the hill sides covered with brush, the seeds and buds of which they seek with great avidity. Later in the season I found them near San Diego, in quest of grass seeds on the level plains, in large flocks and so closely packed that I have shot thirteen at one discharge of my gun as they were about alighting on the ground. Their nest, built in the forks of a bush or stunted oak, is composed of fine grasses lined with hair and feathers, and contains four or five pure white eggs.

CARDUELIS PSALTRIA, S a y .—Arkansas Goldfinch.

Carduelis psaltria, AUD. B. of A. Oct. vol. III, p. 134, pl. 183.

Fringilla psaltria, AUD. Fol. pl. 400, fig. 1.—SAY, Long's Ex. to Rky. Mts. vol. II, p. 40.—NUTT. Orn. vol. I, p. 510.—

BONAP. Am. Orn. vol. I, p. 54, pl. 6, fig. 3.

Chrysomitris psaltria, BAIRD, Gen. Rep. IX, 422.

Abundant, frequenting and feeding in the same localities as the preceding species, and often associated with the pine finch, (*Linaria pinus*.) While thus associated, I shot, on one occasion, some sixty or seventy of both species, which appeared at the time to be picking the fine gravel mixed in with the mud used as mortar in a chimney recently constructed by a party of miners. At each discharge of the gun they would fly away, returning, however, in a few minutes to the same spot whence they had been driven.

CARPODACUS PURPUREUS, G m e l .—Purple Finch.

Fringilla purpurea, WILS. Am. Orn. vol. I, p. 119, pl. 7, fig. 4.—NUTT. Orn. vol. I, p. 529.—AUD. B. of A. Fol. pl. 4.

Erythrospiza purpurea, AUD. Oct. vol. III, p. 170, pl. 196.

Carpodacus californicus, BAIRD, Gen. Rep. IX, 413.

I met with but a small flock of these birds in the mountains on the Calaveras river.

CARPODACUS FAMILIARIS, M c C a l l .—Domestic Purple Finch.

Carpodacus familiaris, MCCALL, Proc. Ac. N. Sc. Phil. vol. VI, p. 61.—CASSIN'S B. of Tex. and Cal. p. 73, pl. 13.

Erythrospiza frontalis, HEERMANN, Journ. Ac. N. Sc. Phil. vol. I, 2d series, p. 53.

Carpodacus frontalis, BAIRD, Gen. Rep. IX, 415.

This beautiful and abundant species is found throughout the whole extent of California Sonora, and New Mexico, collecting in large flocks during the winter season and wandering over the country. Its food consists principally of the young buds of trees and bushes. Resorting in the spring of the year to the habitations of man, it forms its nest under the eaves of the

houses. At other times it chooses for the purposes of nidification the cactus plants, a deserted woodpecker's hole, or the branch of a small tree. According to the locality chosen, the nest is composed of different substances, but is generally made externally of coarse grass or weeds, and lined with hair or fine roots. The eggs, from four to six in number, are pale blue, marked with spots and lines of black.

COCCOBORUS CAERULEUS, Linn.—Blue Grosbeak.

Coccorobus caeruleus, DEKAY'S N. H. of N. Y. part I, p. 145, pl. 64, fig. 146.—AUD. B. of A. Oct. vol. III, p. 204, pl. 204.
Fringilla caerulea, AUD. Fol. pl. 122.—NUTT. Orn. vol. I, p. 529.

This bird is quite abundant in Lower California, whither it migrates from the north in the fall season. Specimens of both old and young were procured there late in the summer.

COCCOBORUS MELANOCEPHALUS, Swainson.—Black-headed Grosbeak.

Coccorobus melanocephalus, AUD. B. of A. Oct. vol. III, p. 214, pl. 206.
Fringilla maculata, AUD. B. of A. Fol. pl. 373, figs. 2, 3 & 4.
Fringilla melanocephala, AUD. Orn. Biog. vol. IV, p. 519.

Abundant and migratory. During spring we saw these birds in Sacramento valley and in the mountainous districts, feeding on the buds of young plants, and in September we saw numbers of the young plumaged birds in Tejon valley. Its song, clear and musical, resembles very much that of our robin, (*Turdus migratorius*.) The nest, formed with little care, of twigs very loosely thrown together and lined with roots, is placed on the branches of a bush. The eggs, four in number, are greenish blue, marked with irregular spots of umber brown varying in intensity of shade.

PIPILO MEGALONYX, Baird.

Pipilo megalonyx, BAIRD, Gen. Rep. IX, 515.

Very abundant in the valleys and mountains of California, where, retiring to the close sheltered thickets, it passes its time in pursuit of insects. When disturbed in its avocations it utters a note of alarm, and flying low passes from bush to bush, concealing itself with great facility. The nest, made on the ground, is composed externally of oak leaves and coarse weed stalks, the lining being of fine grasses and roots. The eggs, numbering from four to five, are of a faint greenish white, minutely dotted with reddish brown spots.

PIPILO FUSCA, Swainson.—Cañon Finch.

Pipilo fusca, SWAINSON. Philos. Mag. 1827, p. 434.—CASSIN, B. of Cal. & Tex. p. 124, pl. 17.

Abundant and a resident of the country, as it is found at all seasons of the year. It prefers the heavy growth of trees and shrubbery, on the borders of streams, building its nest in a bush or grape vine at some height from the earth, differing in this latter respect from the other American species with whose nidification we are acquainted and which always place their nests on the ground. The nest is of coarse twigs and grass and lined with fine roots. The eggs are four and of a pale blue, dashed with black spots and a few neutral tint blotches, forming a crown at the larger end. These eggs differ entirely from those of the other known species of the same genus, while they so resemble those of the different species of blackbirds as to be confounded with them, unless marked when taken from the nest.

PYRANGA LUDOVICIANA, Wils.—Louisiana Tanager.

Pyrranga ludoviciana, AUD. B. of A. Oct. vol. III, p. 231, pl. 210.

Tanagra ludoviciana, AUD. B. of A. Fol. pl. 400, fig. 3.—WILS. Am. Orn. vol. III, p. 27, pl. 20, fig. 1.—NUTT. Orn. vol. I, p. 471.

Occasionally seen on our late survey, frequenting the dense shady woods, uttering now and then its loud and mellow note as it sat perched amid the heavy foliage of the oak. During the month of August a fine male specimen was captured on Posa creek, in the act of eating the fruit of the elder bush, which at the same time was bearing blossoms, green and ripe fruit. Several specimens in young plumage were procured in September, while encamped at Tejon valley.

YPHANTES BULLOCKII, Swains.—Bullock's Oriole.

Xanthornus bullockii, SWAINSON, Philos. Mag. June, 1826, p. 436.

Icterus bullockii, AUD. B. of A. Oct. vol. IV, p. 43, pl. 218.—BAIRD, Gen. Rep. IX, 549.

Abundant and migratory, breeding in numbers in Sacramento valley, and also in the southern country. Its note, consisting in a clear mellow whistle varying in cadence, is repeated at intervals, and is of the same character as that of our Baltimore oriole, (*Yphantes baltimore.*) The nest, pendant from the branch of a tree, is composed of varied materials, such as rags, tow, cotton, strings, &c., when made in the neighborhood of civilization where these luxuries are obtainable; but in the large open plains of California I have often seen it swung to the branches of the oak and composed entirely of flexible grasses. The eggs, four to six in number, are ashy white, veined at the larger end with numerous lines of black and reddish umber.

MOLOTHRUS PECORIS, Gmel.—Common Cowbird.

Molothrus pecoris, RICH. & SW. F. Bor. Am. vol. II, p. 277.—AUD. B. of A. Oct. vol. IV, p. 16, pl. 212.—BAIRD, Gen. Rep. IX, 524.

Icterus pecoris, AUD. B. of A. Fol. pl. 424, fig. 4.—NUTT. Orn. vol. I, p. 178.

Abundant. I remarked a flock of these birds as far south as Fort Yuma, and also in New Mexico and Texas.

AGELAIUS XANTHOCEPHALUS, Bonap.—Saffron-headed Blackbird.

Agelaius xanthocephalus, RICH. & SW. F. Bor. Am. vol. II, p. 281.—AUD. B. of A. Oct. vol. IV, p. 24, pl. 213.

Icterus icterocephalus, BONAP. Am. Orn. vol. I, p. 27, pl. 3, figs. 1 and 2.—NUTT. Orn. vol. I, p. 176.

Xanthocephalus icterocephalus, BAIRD, Gen. Rep. IX, 531.

Abundant and found in the fall mingling among the flocks of other species of *Agelaius*, which collect by thousands at that period. On the approach of spring they separate into comparatively small bands, and scatter over the plains and marshes in search of food. In May they resort to the large marshy districts in the valleys, where they incubate. While on the wing over the marshes to and from their nests the male birds emit their notes, (consisting of a curious medley of sounds as though produced by strongly striking together pieces of metal or glass,) and continue them for some time after alighting. The nest is attached to the upright stalks of the reeds, and finally fixed by being wove around them by flexible grasses. It differs from the nidification of the other two California species, no mud entering into its composition. This can easily be accounted for by the fact that the nest, suspended in mid-air to the stalks of the reed,

must be built of the lightest material, so as not to be prostrated by the strong winds which sometimes prevail in that section of the country. The eggs, four in number, are pale ashy green, thickly covered and minutely dotted with points and spots of light umber brown. The egg of this species forms a remarkable exception to the rest of its genus, its coloring and markings resembling those of our towhee bunting, (*Pipilo erythrophthalmus*.) While passing a few days at Fort Inge, Texas, I was much astonished one day to find the parade ground, the horse and cattle yards, covered with immense flocks of these birds, having remarked but a few stray ones previous to this period. One of the officers informed me of a like occurrence the year before, and that they then had disappeared as suddenly as they came.

AGELAIUS TRICOLOR, A u d.—Red and White-winged Blackbird.

Agelaius tricolor, AUD. B. of A. Oct. vol. IV, p. 27, pl. 214.—BAIRD, Gen. Rep. IX, 530.

Abundant. During the winter of 1852, while hunting in the marshes of Suisun valley, I have often, on hearing a dull, rushing, roaring noise, looked upwards and found it was produced by a single flock of these birds, numbering so many thousands as to darken the sky for some distance by their masses. In the northern part of California I found a breeding place of this species occupying several acres covered with elder bushes and willow, and in the immediate vicinity of water. I was led to this retreat by following the direction taken by many small flocks on their return from the surrounding country over which they scattered for miles in quest of food for their young. The nests, often four or five on the same bush, were composed of mud and straw and lined with fine grasses. The eggs are light blue, marked with lines and spots of dark umber and a few light purple dashes. I fell in with several other breeding places at different times, but, though situated in the same kind of locality as the above one, they were abandoned; thus rendering it probable that every year different grounds are resorted to for the purposes of incubation.

AGELAIUS GUBERNATOR, W a g l e r.—Red and Black-winged Blackbird.

Agelaius gubernator, AUD. B. of A. Oct. vol. IV, p. 29, pl. 215.—BAIRD, Gen. Rep. IX, 529.

Abundant, and found in the fall season associating with the two preceding species. Its nest is built in the willow bushes and tussocks of grass, above the level of the water, in the marshes, and but a few pairs together, differing in this respect from the preceding species, which prefers dry situations near water, and congregates by thousands while breeding. The nest is composed of mud and roots, and lined with fine grasses. The eggs, four in number, are pale blue, dashed with spots and lines of black.

SCOLECOPHAGUS CYANOCEPHALUS, W a g l e r.—Mexican Grackle.

Scolecophagus mexicanus, SWAINS. Two Cent. and a Quart.

Quiscalus brewerii, AUD. B. of A. Oct. vol. VII, p. 345, pl. 492.

Scolecophagus cyanocephalus, BAIRD, Gen. Rep. IX, 552.

This abundant and beautiful species is scattered over the whole surface of California, and is also very common in New Mexico and Texas, though not a resident of the two last, leaving before the season of incubation. During the fall it frequents the cattle yards and outskirts of towns, where it obtains a plentiful supply of food. It appears very familiar, alighting on the houses and in the streets, having but little cause of fear from man. Its note, before taking

wing, is a soft, clear whistle, but when congregated in spring on the trees, according to their usual custom previous to migrating north, they keep up a continual chattering for hours at a time, as though revelling in an exuberance of spirits, ceasing occasionally only to recommence with renewed vigor and delight. Some few pairs breed in the oaks on the sand hills around San Francisco, though, while on entering the thickets where their nests were built, the parent birds gave every sign of anxiety and alarm, I had not the good fortune to discover a single one, so well were they concealed.

STURNELLA NEGLECTA, A u d.—Missouri Meadow Lark.

Sturnella neglecta, AUD. B. of A. Oct. vol. VII, p. 339, pl. 489.—BAIRD, Gen. Rep. IX, 537.

Abundant, frequenting the prairie lands where, in the fall, they collect in large flocks. The nest of this species, placed on the ground, is composed of fine grasses, and contains from four to five eggs of a pure white, marked with deep reddish brown spots and blotches.

CORVUS CORAX, L i n n.—Raven.

Corvus corax, AUD. B. of A. Oct. vol. IV, p. 78, pl. 224.—IB. B. of A. Fol. pl. 101.—WILS. Am. Orn. vol. IX, p. 113, pl. 75, fig. 3.—RICH. & SW. F. Bor. Am. vol. II, p. 290.

Corvus carnivorus, BAIRD, Gen. Rep. IX, 560.

This bird appears to inhabit the whole of our northern continent, and was our almost constant companion during the late surveys. Whenever we were about breaking up camp, even in the most arid regions, it was to be seen sailing around and waiting our departure to alight and snatch from the ground what few particles of food might have been left or thrown away. Lagging at times behind our train in pursuit of game, I have seen these birds follow our trail for miles on the road to pick up the grains of corn which would fall through the cracks of the wagons. In California I found its nest placed high on the bold, precipitous, rocky, cliffs, secure against all danger; but in the vast desolate plains of New Mexico it builds on low trees, and I saw two nests on cactus plants, at less than three feet from the ground, showing how much localities or circumstances will influence the habits of birds regarding incubation. It is very familiar in the neighborhood of slaughter houses and ranches, where it is rarely disturbed, its services as scavenger being considered an equivalent to the robbery it occasionally commits, when hard pressed for food, of some hapless young chicken.

CORVUS AMERICANUS, A u d.—American Crow.

Corvus americanus, AUD. B. of A. Oct. vol. IV, p. 87, pl. 225.

Corvus corone, WILS. Am. Orn. vol. IV, p. 79, pl. 35, fig. 3.—RICH. & SW. F. Bor. Am. vol. II, p. 291.—NUTT. Orn. vol. I, p. 209.

Abundant.

PICA NUTTALLII, A u d.—Nuttall's Yellow-billed Magpie.

Pica nuttalli, AUD. B. of A. Oct. vol. IV, p. 104, pl. 223.—BAIRD, Gen. Rep. IX, 578.

Corvus nuttalli, AUD. B. of A. Fol. pl. 362, fig. 1.

This bird appears to inhabit the western slope of the Sierra Nevada mountains, being found abundantly in California and Oregon, associating with the crows and ravens in the fall. Noisy and restless, it flies from tree to tree, calling its companions by a loud chattering note, and if once alarmed is not apt to figure as a specimen in the naturalist's collection, as it possesses all

the cunning and vigilance of the crow. The nest, built in an oak, often in the vicinity of some ranch, is composed of a mass of coarse twigs, forming a sphere with a small lateral aperture, the interior being lined with fine roots.

CYANURA STELLERI, Gmelin.—Steller Jay.

Corvus stellerii, GMEL. Syst. Nat. vol. I, p. 370.—NUTT. Orn. vol. I, p. 229.—AUD. B. of A. Fol. pl. 362, fig. 2.

Garrulus stelleri, AUD. Oct. vol. IV, p. 107, pl. 230.

Cyanura stelleri, BAIRD, Gen. Report IX, 531.

Abundant, and resident in the mountainous districts, and as far south as Warner's Rancho, where, though common, they were so wild and vigilant as not to be easily procured. They resort to the forests of pine and oak which cover the mountain sides, where, flying restlessly from tree to tree, and alighting on the lower branches, they proceed to ascend by hopping from twig to twig to the topmost point, procuring thus a plentiful supply of acorns or of the seeds of the pine. While thus employed they emit a harsh, screaming note that can be heard at a considerable distance.

CYANOCITTA CALIFORNICA, Vigors.—California Jay.

Garrulus californicus, VIGORS, Beechy's Voyage, Zool. p. 21, pl. 5.

Cyanocitta californica, BAIRD, Gen. Rep. IX, 534.

Corvus ultramarinus, AUD. B. of A. Oct. vol. IV, p. 115, pl. 232, fig. 3.

Frequenting not only the same districts as the preceding species, but abundantly found throughout the valleys. Noisy, alert, and cunning in its habits, wild and wary, it still often seeks the habitations of man, near which to rear its young; being drawn thither by the abundance of food found in such localities. The nest, built in a thick-leaved bush or on the lower branches of an oak, at but little height from the ground, is made of twigs and lined with roots. The eggs, four in number, are emerald green, dotted profusely with umber brown spots.

LANIUS EXCUBITOROIDES, Swains.—American Grey Shrike.

Lanius excubitoroides, RICH. & SW. F. Bor. Am. vol. II, p. 115, pl. 35.

Abundant.

VIREO SOLITARIUS, Vieill.—Solitary Vireo.

Vireo solitarius, AUD. B. of A. Oct. vol. IV, p. 144, pl. 239.

Abundant.

VIREO GILVUS, Vieill.—Warbling Vireo.

Vireo gilvus, NUTT. Orn. vol. I, p. 309.—AUD. B. of A. Oct. vol. IV, p. 149, pl. 241.

Muscicapa melodia, WILS. Am. Orn. vol. V, p. 85, pl. 42, fig. 2.

Abundant.

ICTERIA LONGICAUDA, Lawrence.—Western Chat.

Icteria longicauda, LAWRENCE, ANN. N. Y. LYCEUM.—BAIRD, Gen. Rep. IX, 249.

Abundant.

AMPELIS CEDRORUM, Vieillot.—Cedar Bird.

Bombycilla carolinensis, BRISS. Orn. vol. II, p. 337.—AUD. B. of A. Oct. vol. IV, p. 169, pl. 246.—NUTT. Orn. vol. I, p. 243.

Bombycilla cedrorum, VIEILL. Ois. de l' Am. Sept. vol. I, p. 88, pl. 57.

Ampelis cedrorum, BAIRD, Gen. Rep. IX, 318.

I occasionally met with small flocks during the fall and winter.

SITTA ACULEATA, Cassin.—Western Nuthatch.

Sitta aculeata, CASSIN, Pr. A. N. Sc.—BAIRD, Gen. Rep. IX, 375.

Abundant.

TROCHILUS ANNA, Lesson.—Anna Humming Bird.

Trochilus anna, AUD. B. of A. Oct. vol. IV, p. 188, pl. 252.

Ornismya anna, LESSON, Hist. Nat. des Ois. Mou. p. 205, pl. 74.

Calliphlox anna, HEERMANN, Proceed. Ac. N. Sc. Phil. vol. III, p. 111.

Atthis anna, BAIRD, Gen. Rep. IX, 137.

Trochilus icterocephalus, NUTT, Orn. 2d edit. vol. I, p. 712.

In the month of March, 1851, I found this beautiful species quite common at San Diego, and it had at that early period assumed its full spring plumage. In September, 1852, I procured many specimens on a small island in the Cosumnes river, where grew abundantly several varieties of flowers, to which these diminutive birds resorted in great numbers. At that season many of the young males had but a few metallic feathers about the throat and the plumage of the adults had already lost that fire and brilliancy of coloring which it possesses in spring. While on the wing in pursuit of insects, or immediately after alighting on a small branch, they utter a very weak twitter or note, sometimes continued for a minute or more. The nest, placed in the forks of a bush or on the branch of an oak, is composed of fine mosses and lined with the down taken from the fruit of the willow. The eggs, of a pure white color, are two in number.

TROCHILUS ALEXANDRI, Bourcier & Mulsant.—Purple-throated Humming Bird.

Trochilus alexandri, B. & M. Annals of the Roy. Soc. of Phys. and Nat. Sc. Lyons, vol. IX, p. 330.—CASSIN'S B. of Tex. and Cal. p. 141, pl. 22.—BAIRD, Gen. Rep. IX, 133.

On a trip to Sonora, Mexico, in the spring of 1851, I found for the first time this bird abounding in the arid country back of Guyamas. Here, amidst the most scanty vegetation, the cacti having predominance over all other, this little species, in the month of April, had constructed its nest. The same year, somewhat later, I found it among the flowers and bushes in the burial ground of Sacramento City, which locality had been chosen by several pairs for the purposes of incubation. I found it also on Dry creek and the Cosumnes river, and think that further researches will prove it to extend over a much larger range than we are aware of at present. The nest, beautifully constructed of fine mosses and lined with the down of various plants and seeds, contains two pure white eggs.

SELASPHORUS RUFUS, G m e l.—Nootka Sound Humming Bird.

Selasphorus rufus, GOULD'S Monog. of the Trochil. part III.—AUD. B. of A. Oct. vol. IV, p. 200, pl. 254.—BAIRD, Gen. Rep. IX, 134.

This diminutive species migrates to the higher northern latitudes, although some few pairs breed every year in the neighborhood of San Francisco, where I observed them during the whole summer, but was unable to discover their nests. I also noticed in this same locality the white-crowned finch (*Z. atricapilla*) and the chesnut-backed tit, (*Parus rufescens*,) which birds I have seen breeding in no other part of the country, the masses migrating north, while probably these few stragglers, arriving late in the season, stop at this point. The cold sea winds, which blow strongly every afternoon during the summer at San Francisco, give to this locality very much the climate we might expect in higher latitudes.

CERYLE ALCYON, L i n n.—Belted Kingfisher.

Alcedo alcyon, AUD. B. of A. Oct. vol. IV, p. 205, pl. 255.—WILS. Am. Orn. vol. III, p. 59, pl. 23, fig. 1.—NUTT, Orn. vol. I, p. 594.

Ceryle alcyon, BAIRD, Gen. Rep. IX, 158.

Abundant on all the principal lakes and water courses.

PICUS HARRISII, Aud.—Harris' Woodpecker.

Picus harrisii, AUD. B. of A. Oct. vol. IV, p. 242, pl. 261.—BAIRD, Gen. Rep. IX, 87.

Occasionally observed during the survey, but a somewhat rare species, though procured in northern California and at Tejon Pass. Its clear trumpet-like notes, uttered as it climbs the trees, betrays its locality and it is then easily shot.

PICUS MERIDIONALIS, S w a i n s.—Little Georgian Woodpecker.

Picus meridionalis, RICU. & SW. F. BOR. Am. vol. II, p. 308.

Picus gairdnerii, AUD. B. of A. Oct. vol. IV, p. 252.

Neither common or especially rare. I obtained several specimens in the mountains of northern California.

PICUS NUTTALLI, G a m b.—Nuttall's Woodpecker.

Picus nuttallii, GAMBEL, Proceed. Ac. N. Sc. Phil. vol. I, p. 259. (1841.)

Picus scalaris, (Wagl.) GAMBEL, Jour. Ac. N. Sc. Phil. vol. I, 2d series, p. 55, pl. 9, figs. 2 & 3. (Not of Wagler.)

Occasionally found in the same localities as the preceding species, but much more abundant in the valleys.

PICUS SCALARIS, W a g l e r.—Barred Woodpecker.

Picus scalaris, WAGLER, Isis, 1829, p. 511.—BAIRD, Gen. Rep. IX, 94.

I procured this bird first at Vallecitta, but found it abounding in the woods about Fort Yuma. This species is new to the California fauna though frequently seen in Texas, several expeditions sent having collected it.

PICUS RUBER, G m e l.—Red-breasted Woodpecker.

Picus ruber, GW. Syst. Nat. vol. I, p. 429.—LATH. Ind. Orn. vol. I, p. 228.—AUD. B. of A. Oct. vol. IV, p. 361, pl. 266.

Sphyrapicus ruber, BAIRD, Gen. Rep. IX, 104.

This species is not rare in the mountains, and occasionally a stray one is met in the valleys. Their call note, similar to the cry of a child in pain, is peculiarly disagreeable. Their quick restless motions and untiring diligence in quest of food, as they pass around the branches and trunks of the forest trees, are like those of the rest of the family.

PICUS VARIUS, Linn.—Yellow-bellied Woodpecker.

Picus varius, WILS. Am. Orn. vol. I, p. 147, pl. 9, fig. 2.—AUD. B. of A. Oct. vol. IV, p. 263, pl. 267.—NUTT. Orn. vol. I, p. 574.

? *Sphyrapicus nuchalis*, BAIRD, Gen. Rep. IX, 103.

Though one of our commonest species on the eastern side of the continent, I now introduce it for the first time into the fauna of California, having procured it at Fort Yuma, where it is not rare.

PICUS THYROIDEUS, Cassin.—Black-breasted Woodpecker.

Picus thyroideus, CASSIN, Illust. B. of Tex. & Cal. p. 201, pl. 32.—IB. Proceed. Ac. N. Sc. Phil. vol. V, p. 349

I procured this bird some three years since in the southern mines of California, where it frequents more especially the pine trees in search of food. I never saw it alight on the oak, though abundant in that locality.

CENTURUS UROPYGIALIS, Baird.—Gila Woodpecker.

Centurus uropygialis, BAIRD, Acad. Nat. Sc. Phil. vol. VII, p. 120.—IB. Gen. Rep. IX, 111.

It was with great pleasure that I found this bird in considerable numbers on the Colorado, and am able to add another brilliant species to the fauna of California. Its ordinary notes resemble those of our red-headed woodpecker, (*Picus erythrophthalmus*,) but it varies them often to a soft plaintive cry, as if hurt or wounded. I found, on dissection, their stomachs filled with the white gelatinous berry of a parasite plant. This plant grows abundantly on the mezquite trees, and its fruit forms the principal food of many species of birds during the fall.

MELANERPES TORQUATUS, Wils.—Lewis' Woodpecker.

Picus torquatus, WILS. Am. Orn. vol. III, p. 31, pl. 20, fig. 3.—AUD. B. of A. Oct. vol. IV, p. 280, pl. 272.—NUTT. Orn. vol. I, p. 577.

Melanerpes torquatus, BAIRD, Gen. Rep. IX, 115.

This large and abundant species extends all over California, being found in considerable numbers in the mountains as far south as Tejon Pass. They appear of a gay and sociable disposition, occasionally darting in the air in pursuit of insects, or chasing each other in playful mood while on the wing. Their note is a feeble, oft-repeated twitter, continued while flying and when about to alight. On alighting they gently open their wings, moving them tremulously for some time, and more especially so if in company.

MELANERPES FORMICIVORUS, Swains.—Ant-eating Woodpecker.

Melanerpes formicivorus, CASSIN'S B. of Cal. & Tex. p. 7, pl. 2.—BAIRD, Gen. Rep. IX, 114.

Picus formicivorus, SWAINS. Taylor's Phil. Mag. 1827, p. 439.

These gay plumaged birds, residents of California, are found in every portion of the country. Like the *Melanerpes torquatus*, they appear to be gay and sociable, collecting at times (a dozen or more) on the topmost limbs of some decayed monarch of the forest, whence they dart suddenly in the air in pursuit of insects, to return again to their elevated position, soon to repeat the

same manœuvre. When gathered in numbers their loud and querulous notes are heard at all hours of the day, as they are among the noisiest and most clamorous birds of this family. In the fall this species has the curious and peculiar habit of laying up provision against the inclement season. Small round holes are dug in the bark of the pine and oak, into each one of which is inserted an acorn, and so tightly is it fitted or driven in that it is with difficulty extracted. The bark of the pine trees, when thus filled, presents at a short distance the appearance of being studded with brass-headed nails. Stowed away in large quantities in this manner, the acorns not only supply the wants of the woodpecker, but the squirrels, mice, and jays avail themselves likewise of the fruits of its provident labor. The nest is hollowed out from the body of a tree or of some decayed branch, and varies from six inches to two feet in depth. The eggs, four or five in number, of a pure white, are placed at the bottom of this cavity, resting on the soft bed of dust and fine chips which have there fallen during the labor of excavation.

MELANERPES ALBOLARVATUS, Cassin.

Melanerpes albolarvatus, CASSIN, Journ. Ac. N. Sc. Phil. new series, vol. II, p. 257, pl. 22.

Picus albolarvatus, BAIRD, Gen. Rep. IX, 96.

Mr. Bell, of New York, first discovered this species in the vicinity of Sutter's mills, on the American river. It frequented the higher branches of the pines, keeping almost out of gunshot range. Active and restless in its movements, it utters at intervals its sharp and clear note as it pursues its avocations.

COLAPTES MEXICANUS, Swains.—Orange-shafted Woodpecker.

Colaptes mexicanus, Sw. Synop. of B. of Mexico, Philos. Mag. 1827, p. 440.—RICH. & Sw. F. Bor. Am. vol. II, p. 315.

Picus mexicanus, AUD. B. of A. Oct. vol. IV, p. 290, pl. 274.

Colaptes collaris, VIGORS, Zool. of Beechey's Voyage, p. 24, pl. 9.

Abundant, having procured specimens not only in California but also in the Rocky mountains, New Mexico, and Texas. Its habits are those of our golden-winged woodpecker, (*Colaptes auratus*.) It passes much of its time on the ground, carrying havoc among the ant-hills spread over all the dry portions of the country, occasionally varying its fare with such berries and wild fruits as there abound.

COLAPTES AYRESII, Aud.—Red-moustached Woodpecker.

Picus ayresii, AUD. B. of A. Oct. vol. VII, p. 318, pl. 494.

Rare, having met with but two specimens in the mountains bordering the Cosumnes river.

GEOCOCCYX MEXICANUS, Gmel.—Chaparral Cock.

Geococcyx variegata, WAGLER, Isis, 1831, p. 524.

Saurothera marginata, KAUP, Isis, 1832, p. 991.

Saurothera battae, BLAINVILLE, Less. Traité d'Orn. vol. I, p. 145.

Phasianus mexicanus, GMEL. Syst. Nat. vol. I, part II, p. 741.

Geococcyx californianus, BAIRD, Gen. Rep. IX, 73.

We found this bird throughout California, frequenting at times the most arid portions of the country. It often crossed our path, or ran before us for a short distance on the road, dashing, when alarmed, immediately into the chaparral, where, swift of foot, it easily evaded pursuit. It

may, however, be overtaken when followed on horseback over the vast open plains where no friendly bush offers the weary bird a shelter. When closely chased, if on an elevated point, it will sometimes fly, but always sailing downward. I once saw one captured by a couple of dogs, their appetites whetted by recent success in overtaking and bringing down a coyote or prairie wolf. Hotly pressed, the bird would gain upon his enemies while sailing down the mountain slope, but taking to his feet on the first ascent, this advantage was again soon lost, and the fugitive, worn out, fell at length a victim to their relentless determination.

The stomachs of the birds I examined were filled with the grasshopper and large black beetles found on the plains. The nest, laid on the branches of the cactus, is formed of a few loose sticks thrown negligently together in the same manner as that of our yellow-billed cuckoo, (*Coccyzus americanus*.) It contains two large, nearly spherical white eggs. I have not witnessed the following feat, but am assured by many old Californians that this bird, on perceiving the rattlesnake coiled up asleep, basking in the sun, will collect the cactus and hedge him around with a circle, out of which the reptile, unable to escape, and enraged by the prickly points opposing him on every side, strikes himself and dies from the effects of his self-inoculated venom. This bird is common in western Texas and on the Rio Grande.

ECTOPISTES CAROLINENSIS, Linn.—Carolina Turtle-dove.

Ectopistes carolinensis, DEKAY, N. H. of N. Y. part I, p. 197, pl. 74, fig. 166.—AUD. B. of A. Oct. vol. V, p. 36, pl. 286.

Columba carolinensis, NUTT. ORN. vol. I, p. 626.—WILS. Am. ORN. vol. V, p. 1, pl. 4.

Zenaidura carolinensis, BAIRD, Gen. Rep. IX.

Abundant.

CALLIPEPLA CALIFORNICA, Lath.—California Partridge.

Callipepla californica, GOULD'S Odontophorinae.

Oryz californica, AUD. B. A. Oct. vol. V, p. 67, pl. 290.

Perdix de la californie, ATLAS, Voyage de la Perouse, pl. 36.

This very numerous and beautiful species is found in California as far south as Vallecita, where commences the desert extending to the Colorado, and which forms an impassable barrier between it and its closely allied species, Gambel's partridge, (*Callipepla gambelii*.) When flushed from the ground it immediately flies to the trees, if in a wooded country, squatting so closely lengthwise on a branch that it is rarely seen and procured while thus hidden. It does not lay to the dog, but runs until so hotly pursued as to be forced to fly. It is easily tamed, and is often domesticated in California with poultry. Two years since, a gentleman having imported a large number, attempted to introduce this species on Long Island as a game bird. Unfortunately, after the first breeding season, they were all brought by the gunners to the New York market. The nest, made in the open field or at the foot of a bush, is composed of loose grasses, arranged without much care. The eggs, twelve or sixteen in number, are yellowish or grayish white, spotted and dashed with dark brown or burnt umber.

CALLIPEPLA GAMBELII, Nutt.—Gambel's Partridge.

Callipepla gambelii, GOULD'S Odontophorinae.—CASSIN'S Ill. B. of Cal. and Tex. p. 45, pl. 9.

Lophortyx gambelii, NUTT. Proc. A. N. Sc. Phil. vol. I, p. 260.—BAIRD, Gen. Rep. IX, 645.

I first discovered this beautiful species in California on the Mohave desert, at the point where the Mohave river empties into a large salt lake forming its terminus. The first intimation of

their probable vicinity was given by large quantities of their feathers strewed on the ground in the neighborhood of some deserted Indian huts. The single flock I met with, however, was so wild that it could not be approached. Later I observed them on the Big Lagoon of New river, which they had probably reached by following the river banks at the time of the overflow of the Colorado. At Fort Yuma they were quite abundant, congregating in large coveys, frequenting the thick underwood in the vicinity of the mesquite trees. I found, on dissection, their stomachs filled with the mesquite bean, a few grass seeds, and the berry of a parasite plant growing here in great quantities, and affording at certain seasons a dainty meal to the deer, who seek it with great avidity. On being suddenly flushed these birds separate very widely, but immediately upon alighting commence their call note, resembling the soft chirp of a young chicken. This note is kept up for some time, each individual fowl seeming to vie with the others in repeating it. The alarm past and the flock once more reunited, they relapse into silence, only broken by the occasional cluck of the male bird. Once scattered, unless closely marked, they are not readily started again, as they hug or lie close in their thick, bushy, and impenetrable coverts. Dr. Milhau, U. S. A., then stationed at Fort Yuma, informed me that in spring the Indians catch them in snares and bring them in numbers for sale.

CALLIPEPLA PICTA, Douglass.—Plumed Partridge.

Callipepla picta, GOULD'S Odontophorinae.

Ortyx plumifera, (GOULD,) AUD. B. of A. Oct. vol. V, p. 69, pl. 391.

Known by the miners and hunters of California as the mountain quail, from the localities which it prefers. They are wild and difficult to procure, flying and scattering at the least symptom of danger, and recalling each other together with a note expressive of great solicitude, which much resembles that of the hen turkey gathering her brood around her. During the survey I observed them only once, and then but for a few minutes, as we passed through a deep cañon leading down to Elizabeth lake. Our hunters saw them on the mountains surrounding Tejon valley, but though I went several times in search of them I procured none.

TETRAO OBSCURUS, Say.—Dusky Grouse.

Tetrao obscurus, SAY, Long's EX. to Rky. Mts. vol. II, p. 14.—BONAP. Am. Orn. vol. III, p. 27, pl. 18.—NUTT. Orn. vol. I, p. 666.—AUD. B. of A. Oct. vol. V, p. 89, pl. 295.—BAIRD, Gen. Rep. 620.

Abundant in the pine regions of California and Oregon. I have never met with this species, though I have often heard of it as one of the game birds most frequently brought into the markets of the small mining towns of northern California.

GALLINULA GALEATA, Licht.—Florida Gallinule.

Gallinula galeata, NUTT. Orn. vol. II, p. 223.—BONAP. Am. Orn. vol. IV, p. 128, pl. 27, fig. 1.

Gallinula chloropus, AUD. B. of A. Oct. vol. V, p. 132, pl. 304.

Found in the marshy valley districts, where it is not a rare bird. I procured several at Elizabeth lake, associated with the American coot, (*Fulica americana*,) both of which species were swimming in search of food among the reeds on its borders.

FULICA AMERICANA, Gmel.—American Coot.

Fulica americana, AUD. B. of A. Oct. vol. V, p. 133, pl. 305.—NUTT. Orn. vol. II, p. 229.

Fulica atra, WILS. Am. Orn. vol. IX, p. 61, pl. 63, fig. 1.

Plentiful, being found on all the small lakes and ponds which checker the plains of California. In the month of December we met with large numbers of these birds on the lakes of Warner's

Ranch. They incubate in the country, as their eggs were obtained in Sacramento valley during the month of May.

RALLUS VIRGINIANUS, Linn.—Virginia Rail.

Rallus virginianus, AUD. B. of A. Oct. vol. V, p. 174, pl. 311.—WILS. Am. Orn. vol. VII, p. 109, pl. 62, fig. 1.—NUTT. Orn. vol. II, p. 205.

I obtained this bird within a few miles of Sacramento City, but am unable to say whether it is a common species, so rarely does it show itself, even in localities where it may be in numbers. All the birds of this genus, being averse to take wing, run with remarkable swiftness, and are soon lost to the hunter, the compressibility of their bodies enabling them to slide with great ease through the dense masses of reeds which form their usual haunts.

RALLUS ELEGANS, Aud.—Red-breasted Rail.

Rallus elegans, AUD. B. of A. Oct. vol. V, p. 160, pl. 309 —DEKAY, N. H. of N. Y. part I, p. 260, pl. 99, fig. 221.

Abundant, having seen it on several occasions in different parts of California, and also exposed for sale in the San Francisco market. While hunting in the marshes of Suisun valley, I started a specimen of *Rallus* much smaller than the present one, but was unable to determine the species, as, (being embarrassed at the time with a load of fifteen geese killed shortly before,) it alighted before I could shoot.

GRUS CANADENSIS, Temminck.—Sand Hill Crane.

Grus canadensis, RICH. & SW. F. Bor. Am. vol. II, p. 373.—NUTT, Orn. vol. II, p. 38.—BAIRD, Gen. Rep. 655.
Grus americana, AUD. B. of A. Oct. vol. V, pl. 314.

These fine birds make their appearance in California in the fall in large flocks, coming from the north to spend the winter under a more genial clime. When migrating, they follow each other in a line, giving vent the while to a loud but not unmusical rattle. In the spring I have observed large flocks start from the ground, sail around in extensive circles, gradually rising to a great height, when the signal being sounded by one or more of the leaders they would at once fall into line and commence their migrations back to the northern regions for the purposes of incubation. While in California it frequents the plains and marshes, but being wild and very vigilant is difficult of approach. Among the many thousands I have seen both in spring and fall, I have never yet discovered the white whooping crane, (*Grus americana*) In the early settlement of California by Americans, when turkeys were yet scarce, I have known a sand hill crane to command from sixteen to twenty dollars in the San Francisco market for the purpose of replacing, on the Christmas dinner table, that almost indispensable feature of this particular festival.

IBIS MEXICANUS, Gmel.—Mexican Ibis.

Ibis chalcoptera, TEMM, Pl. Col. pl. 511.
Tantalus mexicanus, GMEL, Syst. Nat. vol. I, part II, p. 652.
Ibis ordii, BAIRD, Gen. Rep. IX, 635.

Abundant. Found in small flocks during the winter, which separate in pairs towards spring. It incubates in the country, selecting to that effect the most retired portions of the marshes in the large valleys. I have killed the young still retaining the down on the head but never discovered the nest. Its habits are very similar to those of the curlew, probing the ground and

searching in the mud of the sloughs and ponds for its food, which consists of small shells, worms, and even fish. It is often exposed for sale in the California markets.

ARDEA HERODIAS, L i n n .—Great Blue Heron.

Ardea herodias, WILS. Am. Orn. vol. VIII, pl. 65, fig. 2.—AUD. B. of A. Oct. vol. VI, p. 122, pl. 369.—NUTT. Orn. vol. II, p. 42.

Abundant on all the large water courses and lakes.

ARDEA VIRESCENS, L i n n .—Green Heron.

Ardea virescens, AUD. B. of A. Oct. vol. VI, p. 105, pl. 367.—WILS. Am. Orn. vol. VII, p. 97, pl. 61, fig. 1.—NUTT. Orn. vol. II, p. 63.

Butorides virescens, BAIRD, Gen. Rep. IX, 676.

Abundant. •

ARDEA EGRETTE, G m e l i n .—Great American Egret.

Ardea egretta, AUD. B. of A. Oct. vol. VI, p. 132, pl. 370.—WILS. Am. Orn. vol. VII, p. 106, pl. 61, fig. 4.—NUTT. Orn. vol. II, p. 47.

Herodias egretta, BAIRD, Gen. Rep. IX, 666.

They breed in large numbers, associated with other species, on the edges of sloughs and marshes.

ARDEA CANDIDISSIMA, G m e l .—Snowy Heron.

Ardea candidissima, WILS. Am. Orn. vol. VII, p. 120, pl. 62, fig. 4.—AUD. B. of A. Oct. vol. VI, p. 163, pl. 374.—NUTT. Orn. vol. II, p. 49.—GMEL. Syst. Nat. vol. I, part II, p. 633.

Garzetta candidissima, BAIRD, Gen. Rep. IX, 665.

Abundant.

BOTAURUS LENTIGINOSUS, S t e p h e n s .—American Bittern.

Ardea minor, WILS. Am. Orn. vol. VIII, p. 35, pl. 65, fig. 3.—AUD. B. of A. Fol. pl. 337.

Ardea lentiginosa, AUD. B. of A. Oct. vol. VI, p. 94, pl. 365.—NUTT. Orn. vol. II, p. 60.

Botaurus lentiginosus, BAIRD, Gen. Rep. IX, 674.

Plentiful, frequenting the marshes, where I have often shot from ten to fifteen in a day's hunt. The flesh is very palatable.

ARDETTA EXILIS, G m e l i n .—Least Bittern.

Ardea exilis, GMELIN, Syst. Nat. vol. I, part II, p. 645.—AUD. B. of A. Oct. vol. VI, p. 100, pl. 366.—WILS. Am. Orn. vol. VIII, p. 37, pl. 65, fig. 4.

Ardetta exilis, BAIRD, Gen. Rep. IX, 673.

Abundant, resorting to the same localities as the preceding species.

CHARADRIUS VOCIFERUS, L i n n .—Killdeer Plover.

Charadrius vociferus, GMEL. Syst. Nat. vol. I, part II, p. 685.—AUD. B. of A. Oct. vol. V, p. 207, pl. 317.—WILS. Am. Orn. vol. VII, p. 73, pl. 59, fig. 6.

Abundant in all portions of the country. The traveller is often started by its melancholy cry even on the most barren wastes, where this bird finds an ample supply of insects.

CHARADRIUS HELVETICUS, L i n n .—Black-bellied Plover.

Charadrius helveticus, AUD. B. of A. Oct. vol. V, p. 199, pl. 315.—NUTT, Orn. vol. II, p. 25.

Vanellus helveticus, WILS. Am. Orn. vol. VII, p. 42, pl. 57, fig. 4.

Tringa helvetica, GMEL. Syst. Nat. vol. I, part II, p. 676.

I shot a single specimen of this bird on the seashore of San Diego, in February, 1851, but have seen it several times exposed for sale in the San Francisco market.

? CHARADRIUS CANTIANUS, L a t h .—Kentish Plover.

Charadrius cantianus, LATH. Birds, vol. IX, p. 328.—GOULD, B. of Eur. vol. IV, pl. 293.—YARRELL, Brit. Birds, vol. II, p. 405.

Kentish plover, MACGILL. Brit. Birds, vol. VI, p. 44, pl. 186.

A young plumaged bird of the genus *Charadrius*, previously unknown to us as a North American species, was obtained at San Diego, in January, 1854. It so closely resembles in its young plumage the European plover (*Charadrius cantianus*) that I do not feel justified, at present, in describing it as a distinct species, more especially so as I did not procure the adult. The following is the description of the specimen procured: Upper parts of a brownish ash color, the primaries being of a dusky black. Wing coverts edged with white. Forehead, breast, a collar around the neck, and all the under parts, white. On each side of the breast an ash brown spot, which color also is that of the auriculars. Bill black. Feet dark brown. Length six inches. I found it associated in flocks with the peep, (*Tringa wilsoni*,) resorting to the sea beach, which, exposed at low tide, offers a bountiful supply of food to many species of waders. The low plaintive whistle of this plover is often repeated as it glides along the sandy beach, occasionally coming to a stand and gazing around for some moments as if on the lookout for danger. While thus stationary this bird is not readily perceived, as its color approaches closely that of the sand on which it rests.

CHARADRIUS MONTANUS, T o w n s .—Rocky Mountain Plover.

Charadrius montanus, Towns, Jour. Ac. N. Sc. Phil. vol. VII, p. 192.—AUD. B. of A. Oct. vol. V, p. 213, pl. 318.

I first met with this quiet and gentle bird on the plains near the Pueblo Los Angeles, in the month of November, scattered in small flocks industriously gleaning their subsistence over these broad levels. They appeared unsuspecting, uttering a low whistle when disturbed and flying but a short distance, resuming their occupation at once on alighting. I procured a pair of these birds in New Mexico and saw several flocks there, usually in the vicinity of prairie dog villages or on the most arid plains.

APHRIZA VIRGATA, G m e l i n .—Townsend's Surf Bird.

Aphriza townsendii, AUD. B. of A. Oct. vol. V, p. 228, pl. 322.

Aphriza virgata, BAIRD, Gen. Rep. IX, 698.

I obtained this bird in the San Francisco market in the winter of 1849, and subsequently in June, met with it on the Farrallone Islands. They there gathered in small flocks engaged in picking up marine insects from its rock bound shores, covered with kelp and shell fish. They did not appear wild, for when fired at, uttering a low piping note as they flew, they soon alighted again. Closely pursued, however, they would, after several shots, fly away beyond danger to the adjoining islands of the group.

HAEMATOPUS TOWNSENDII, A u d .—Townsend's Oyster-catcher.

Haematopus townsendii, AUD. B. of A. Oct. vol. V, p. 245, pl. 326.

Haematopus townsendii, AUD. B. of A. Fol. pl. 427, fig. 2.

I met with a pair of these birds on the Farrallone Islands in June. The female showed great signs of uneasiness, as do many of our waders at the season of incubation, but I was unable to find its nest, although searching long and diligently.

TRINGA WILSONII, N u t t a l l .—Little Sandpiper.

Tringa pusilla, WILS. Am. Orn. vol. V, p. 32, pl. 37, fig. 4.—AUD. B. of A. Oct. vol. V, p. 230, pl. 337.

Tringa wilsonii, NUTT. Orn. vol. II, p. 121.

Abundant on the sea shore and also found on the edges of ponds in the interior.

TRINGA ARENARIA, L i n n .—Sanderling Sandpiper.

Tringa arenaria, AUD. B. of A. Oct. vol. V, p. 287, pl. 333.—GMEL. Syst. Nat. vol. I, part II, p. 680.

Calidris arenaria, NUTT. Orn. vol. II, p. 4.—BAIRD, Gen. Rep. IX, 723.

Plentiful on the sea shore.

TOTANUS SEMIPALMATUS, G m e l .—Willet.

Totanus semipalmatus, AUD. B. of A. Oct. vol. V, p. 324, pl. 347.—NUTT. Orn. vol. II, p. 144.

Scolopax semipalmata, GMEL. Syst. Nat. vol. I, part II, p. 659.—WILS. Am. vol. VII, p. 27, pl. 56, fig. 3.

Symphemia semipalmata, BAIRD, Gen. Rep. IX, 727.

Plentiful on the marshy districts near the sea. Found also on Humboldt river on the eastern confines of California and on the whole sea board from San Francisco to San Diego.

TOTANUS MACULARIUS, L i n n .—Spotted Sandpiper.

Totanus macularius, AUD. B. of A. Oct. vol. V, p. 303, pl. 342.—NUTT. Orn. vol. II, p. 162.

Tringa macularia, LINN. Syst. Naturae, vol. I, part II, p. 672.—WILS. Am. Orn. vol. VII, p. 60, pl. 59, fig. 1.

Tringoides macularius, BAIRD, Gen. Rep. IX, 735.

Not so abundant a species as in the eastern States, and found occasionally only on the fresh water streams of California.

TOTANUS MELANOLEUCUS, V i e i l l .—Tell-tale Tattler.

Totanus melanoleucus, DEKAY, N. H. of N. Y. part I, p. 250, pl. 94, fig. 212.—AUD. B. of A. Fol. pl. 308.

Scolopax vociferus, AUD. Oct. vol. V, p. 316, pl. 345.—WILS. Am. Orn. vol. VII, p. 57, pl. 58, fig. 5.

Gambetta melanoleuca, BAIRD, Gen. Rep. IX, 731.

Abundant in the marshy districts. Ever too ready to sound the alarm on the hunter's approach, its unwelcome vigilance often causes it to fall a victim to his disappointment and ire.

LIMOSA FEDOA, Linn.—Great Marbled Godwit.

Limosa fedoa, AUD. B. of A. Oct. vol. V, p. 331, pl. 348.—NUTT. Orn. vol. II, p. 173.

Scolopax fedoa, LINN. Syst. Nat. vol. I, part II, p. 663.—WILS. Am. Orn. vol. VII, p. 30, pl. 66, fig. 4.

This bird was observed only in the vicinity of the salt marshes, and on the sea beach at low tide, where it collects in small flocks, often advancing some distance in the water in quest of food.

SCOLOPAX WILSONII, Temm.—Common Snipe.

Scolopax wilsonii, AUD. B. of A. Oct. vol. V, p. 339, pl. 350.—NUTT. Orn. vol. II p. 135.

Scolopax gallinago, WILS. Am. Orn. vol. VI, p. 18, pl. 47, fig. 1.

Gallinago wilsonii, BAIRD, Gen. Rep. IX, 710.

Arrives in California in September and remains until April, frequenting the marshes and moist grounds. When flushed it springs with a feeble squeak, and flying in rapid irregular zig-zag lines, is soon beyond the sportsman's reach unless his eye be quick and his aim unerring.

SCOLOPAX NOVEBORACENSIS, Gmel.—Red Breasted Snipe.

Scolopax noveboracensis, GM. Syst. Nat. vol. I, part II, p. 653.—RICH. & SW. F. Bor. Am. vol. II, p. 393.—AUD. B. of A. Oct. vol. VI, p. 10, pl. 351.

I have occasionally met with these birds in flocks on marshy grounds and in the vicinity of ponds. Gathering together after alighting they are often shot in large numbers while engaged in search of worms, insects, and small snails, which abound in the localities they frequent. On one occasion I procured, in two hours, over sixty of these birds, besides a dozen duck and teal.

RECURVIROSTRA OCCIDENTALIS, Vigor.—Western Avocet.

Recurvirostra occidentalis, VIGORS, Zoolog. Journ. vol. IV, p. 356.—IB. Zool. of Beechey's Voyage, p. 23, pl. 12.

This species was observed in various parts of California, resorting to the shallow pools, in which it wades breast deep, finding on the soft muddy bottom a plentiful feast of insects and snails. Although half web-footed it does not swim unless wounded, when it takes immediately to deep water, swimming with great celerity, soon advancing beyond range if not at once disabled by a second shot. Specimens were obtained from a small fresh water pond at Livermore's Rancho, on the salt marshes of Suisun valley, and on the borders of the reedy swamps covering a large portion of the lower part of the Sacramento valley.

NUMENIUS LONGIROSTRIS, Wilson.—Long-billed Curlew.

Numenius longirostris, WILS. Am. Orn. vol. VIII, p. 23, pl. 64, fig. 4.—NUTT. Orn. vol. II, p. 94.—AUD. B. of A. Oct. vol. VI, p. 35, pl. 355.

These birds arrive in flocks in California during September, resorting to the fields and open prairies, where they find an abundant supply of insects. Wild in their nature, always on the alert, and the prairie offering no undulations behind which the hunter can approach unseen, they are one of the most difficult game birds to secure. Their first whistle of alarm startles at once the whole flock, which, taking to wing, speeds away a long distance before again settling down. Abundant in fall and winter, they migrate to the northern regions in spring for the purposes of incubation.

NUMENIUS BOREALIS, Lath.—Esquimaux Curlew.

Numenius borealis, LATH. Birds, vol. IX, p. 180.—NUTT. Orn. vol. II, p. 101.—AUD. B. of A. Oct. vol. VI, p. 45, pl. 357

A common game bird in the San Francisco market, though I did not myself procure it.

BERNICLA CANADENSIS, Linn.—Canada Goose.

Anser canadensis, AUD. B. of A. Oct. vol. VI, p. 178, pl. 376.—RICH. & SW. F. Bor. Am. vol. II, p. 468.—NUTT. Orn. vol. II, p. 349.

Anas canadensis, WILS. Am. Orn. vol. VIII, p. 53, pl. 67, fig. 4.

Common in California, but the least abundant of the four species found there.

BERNICLA HUTCHINSII, Richardson.—Hutchin's Goose.

Bernicla hutchinsii, RICH. & SW. F. BOR. AM. vol. II, p. 470.—AUD. B. OF A. FOL. pl. 277.

Anser hutchinsii, AUD. OCT. vol. VI, p. 198, pl. 377.

Arrive in California towards the end of September or beginning of October. On their advent they are much emaciated by their long voyage from the northern regions, but after feeding a short time on the young, tender, nutritious grasses which sprout after the first winter rains, they form one of the greatest delicacies of the pioneer's repast. From the facility, however, with which great numbers of them are obtained, they soon fall into disrepute.

Whilst hunting during a space of two months in Suisun valley, I observed them, with other species of geese, at dawn, high in the air, winging their way towards the prairies and hilly slopes, where the tender young wild oats and grapes offered a tempting pasturage. This early flight lasted about two hours, and as far as the eye could reach the sky was spotted with flock after flock, closely following in each other's wake, until it seemed as though all the geese of California had given rendezvous at this particular point. Between ten and eleven o'clock they would leave the prairies, first in small squads, then in large masses, settling in the marshes and collecting around the ponds and sloughs thickly edged with heavy reeds. Here, swimming on the water, bathing and pluming themselves, they keep up a continued but not unmusical clatter. This proves the most propitious time of the day for the hunter, who, under cover of the tall reeds, and guided by their continual cackling, approaches closely enough to deal havoc among them. Discharging one load as they sit on the water and the other as they rise, I have thus seen twenty-three geese gathered from two shots, while many more, wounded and maimed, fluttered away and were lost. At about one o'clock they leave the marshes and return to feed on the prairies, flying low and affording the sportsman again an opportunity to stop their career. In the afternoon, about five o'clock, they finally leave the prairies, and rising high in the air wend their way to the roosting places whence they came in the morning. These were often at a great distance, as I have followed them in their evening flight until they were lost to view. Many, however, roost in the marshes. Our boat, sailing one night down the sloughs leading to Suisun bay, having come among them, the noise made as they rose in advance of us, emitting their cry of alarm, (their disordered masses being so serried that we could hear their pinions strike each other as they flew,) impressed us with the idea that we must have disturbed thousands. Such are the habits of the geese during the winter. Towards spring they separate into smaller flocks and gradually disappear from the country, some few only remaining, probably crippled and unable to follow the more vigorous in their northern migration. On examination, I found a great difference in the size of this bird, but beyond this could discover no peculiar characteristics by which to mark them as distinct species. Many have from a few white feathers up to a full and distinct white ring on the neck, at the point where the black joins the grey of the breast. Intermediate grades so closely approaching one another in size, form, and color render it impossible to make any decided, certain, and marked classification among them. I observed these birds very abundant about the bay of San Diego, searching for small shell-fish and sea grasses on the shores at low tide.

ANSER ALBIFRONS, B e c h s t .—White-fronted Goose.

Anser albifrons, AUD. B. of A. Oct. vol. VI, p. 209, pl. 380.—AUD. Fol. pl. 286.—GOULD'S B. of Europe, vol. V, pl. 349.—NUTT. Orn. vol. II, p. 346.—RICH. & SW. F. Bor. Am. vol. II, p. 466.

Anser gambeli, BAIRD, Gen. Rep. IX, 761.

One of the most common species, resorting to the same localities as the preceding and associating with them during the winter. Lieutenant Stoneman, United States army, informed me that he had, on one occasion, seen this as well as the others caught in a lasso while on the wing. The wind blowing violently, the birds flew low to avoid its influence, and as they passed by a point of rocks, behind which were concealed two Californians, the lasso was thrown in the air among them, seldom failing to bring down a bird, the noose encircling it by the neck, wings, or body. Of the geese this is considered the most delicate for the table, as it feeds almost exclusively on the young herbage growing on the highlands and about the fresh water ponds.

ANSER HYPERBOREUS, G m e l .—Snow Goose.

Anser hyperboreus, AUD. B. of A. Oct. vol. VI, p. 212, pl. 381.—GOULD, B. of Eur. vol. V, pl. 346.—GMEL. Syst. Nat. vol. I, part II, p. 504.—WILS. Am. Orn. vol. VIII, p. 76 and 89, pl. 68, fig. 5 and pl. 69, fig. 5.

Frequents more especially the salt marsh districts, though found also inland. The food which it selects in these localities gives their flesh a strong sedgy flavor, which causes them to be but little esteemed. These birds often cover so densely with their masses the plains in the vicinity of the marshes as to give the ground the appearance of being clothed in snow. Easily approached on horseback, the natives sometimes near them in this manner, then suddenly putting spurs to their animals gallop into the flock, striking to the right and left with short clubs, and trampling them beneath their horses' feet. I have known a native to procure seventeen birds in a single charge of this kind through a flock covering several acres.

CYGNUS BUCCINATOR, R i c h a r d s o n .—Trumpeter Swan.

Cygnus buccinator, RICH. & SW. F. Bor. Am. vol. II, p. 464.—NUTT. Orn. vol. II, p. 370.—AUD. B. of A. Oct. vol. VI, p. 219, pl. 382 and 383.

Occasionally seen in the air following each other in single file, and sounding their trumpet-like note as they advance. I observed a few in Suisun and Sacramento valleys, and found them frequently in the San Francisco market.

AIX SPONSA, L i n n .—Summer Duck.

Anas sponsa, GMEL. Syst. Nat. vol. I, part II, p. 539.—AUD. B. of A. Oct. vol. VI, p. 271, pl. 391.—WILS. Am. Orn. vol. VIII, p. 97, pl. 70, fig. 3.—NUTT. Orn. vol. II, p. 394.

Aix sponsa, BAIRD, Gen. Rep. IX, 735.

Abundant, breeding in the hollow trees bordering the streams of California.

MARECA AMERICANA, G m e l .—American Widgeon.

Anas americana, GMEL. Syst. Nat. vol. I, part II, p. 526.—WILS. Am. Orn. vol. VIII, p. 86, pl. 69, fig. 4.—AUD. B. of A. Oct. vol. VI, p. 259, pl. 389.

Mareca americana, BAIRD, Gen. Rep. IX, 833.

Abundant.

DAFILA ACUTA, L i n n.—Pintail Duck.

Anas acuta, GMEL. Syst. Nat. vol. I, part II, p. 525.—AUD. B. of A. Oct. vol. VI, p. 266, pl. 390.—NUTT. Orn. vol. II p. 386.

Dafila acuta, BAIRD, Gen. Rep. IX, 776.

Plentiful, especially so in spring, when they collect in large flocks on the open plains and about the fresh water ponds previous to migrating northward.

ANAS BOSCHAS, L i n n.—Mallard.

Anas boschas, GMEL. Syst. Nat. vol. I, part II, p. 538.—NUTT. Orn. vol. II, p. 379.—AUD. B. of A. Oct. vol. VI, p. 236, pl. 385.

Abundant; breeding wherever a suitable and secure locality offers, having found its nest in the marshes, on the edges of small fresh water ponds, and once also in a wild oat field at some distance from water. The Indians entrap these as well as other ducks in a weir constructed of willow branches and shoot them with arrows from ambushes built on the shore.

QUERQUEDULA CAROLINENSIS, G m e l.—Green Winged Teal.

Anas carolinensis, GM. Syst. Nat. vol. I, part II, p. 533.—AUD. B. of A. Oct. vol. VI, p. 281, pl. 392.

Nettion crecca, BAIRD, Gen. Rep. IX, 778.

Abundant in California, having procured it as far south as Carissa creek on the borders of the Colorado desert.

QUERQUEDULA CYANOPTERA, V i e i l l.—Red-breasted Teal.

Querquedula cyanoptera, CASSIN'S Illus. of B. of Cal. & Tex. p. 82, pl. 15.—BAIRD, Gen. Rep. IX, 780.

Anas cyanoptera, VIEILL. Nouv. Dict. vol. V, p. 104.

Anas rafflesii, KING, Zool. Journ. vol. IV, p. 97.

This beautiful teal is abundant in California during spring and summer, incubating on the marshes and migrating south on the approach of winter. Its nest is composed of coarse grasses, lined with the down taken from its own breast, and contains from twelve to fourteen eggs of a faint green color. I found this species in January near San Diego and at a later period in Texas near Fort Thorne, where Dr. C. Henry, United States army, informed me that it was quite a common bird. Its habits and flight, as far as observed, are similar to those of our blue wing teal, (*Q. discors*.)

CHAULELASMUS STREPERA, L i n n.—Gadwall Duck.

Anas strepera, GMEL., Syst. Nat. vol. I, part II, p. 520.—AUD. B. of A. Oct. vol. VI, p. 254, pl. 388.

Not rare, and some few pair incubate in the country, as I have procured the eggs in the marshy districts of Sacramento valley during the spring.

SPATULA CLYPEATA, L i n n.—Shoveller Duck.

Rynchaspis clypeata, GOULD. B. of Eur. vol. V, pl. 360.

Anas clypeata, GMEL., Syst. Nat. vol. I, part II, p. 518.—WILS. Am. Orn. vol. VIII, p. 65, pl. 67, fig. 7.—NUTT. Orn. vol. II, p. 375.—AUD. B. of A. Oct. vol. VI, p. 292, pl. 394.

Plentiful, preferring the fresh water ponds and streams, where it is found associated with the teal and mallard. I procured it as far south as the Big Lagoon of the Colorado desert.

FULIGULA MARILA, L i n n.—Seaup Duck.

Fuligula marila, AUD. B. of A. Oct. vol. VI, p. 316, pl. 397.—NUTT. ORN. vol. II, p. 437.

Anas marila, GMEL. Syst. Nat. vol. I, part II, p. 509.—WILS. AM. ORN. vol. VIII, p. 84, pl. 69, fig. 3

Abundant on the salt bays, and occasionally penetrates the interior of the country.

NYROCA VALLISNERIA, W i l s.—Canvas-back Duck.

Anas vallisneria, WILS. AM. ORN. vol. VIII, p. 103, pl. 20, fig. 5.

Fuligula vallisneria, AUD. B. of A. Oct. vol. VI, p. 299, pl. 395.—NUTT. ORN. vol. II, p. 430.

Aythya vallisneria, BAIRD, Gen. Rep. IX, 794.

Not abundant, though occasionally exposed in the market for sale. In 1849 I saw twelve dollars paid for a single bird of this kind for the table.

NYROCA ERYTHROCEPHALA, B o n a p.—Red-headed Duck.

Fuligula ferina, AUD. B. of A. Oct. vol. VI, p. 311, pl. 397.

Anas ferina, WILS. AM. ORN. vol. VIII, p. 110, pl. 70, fig. 6.

Aythya americana, BAIRD, Gen. Rep. 793.

Not abundant, but occasionally breeds in the country. I saw, on the swamps of Sacramento valley, several pair in June, and inspection of the female showed the breast to be denuded of feathers, as is the case with most of the birds of this family during the period of incubation.

CLANGULA ALBEOLA, L i n n.—Buffel-headed Duck.

Clangula albeola, RICH. & SW. F. BOR. AM. vol. II, p. 458.

Fuligula albeola, AUD. B. of A. Oct. vol. VI, p. 369, pl. 408.—NUTT. ORN. vol. II, p. 415.

Anas albeola, GMEL. Syst. Nat. vol. I, part II, p. 517.

Bucephala albeola, BAIRD, Gen. Rep. IX, 797.

This beautiful little species is abundant, both inland and on the salt bays of the coast. I observed it as far south as the Gila river.

OIDEMIA PERSPICILLATA, L i n n.—Surf Duck.

Oidemia perspicillata, RICH. & SW. F. BOR. AM. vol. II, p. 449.

Fuligula perspicillata, AUD. B. of A. Oct. vol. VI, p. 337, pl. 402.

Abundant. Found on the whole seaboard of California, in San Francisco bay, and about Benicia. The vast shallow flats bordering Suisun and San Pablo bays are among its favorite feeding grounds. Living almost exclusively on shell fish, its flesh acquires so rank a flavor that gunners seldom waste their shot upon it. I have known it, in consequence, to become so fearless as to pass under and about the wharves of San Diego while persons were walking overhead.

ERISMATURA RUBIDA, W i l s.—Ruddy Duck.

Fuligula rubida, AUD. B. of A. Oct. vol. VI, p. 324, pl. 399.—NUTT. ORN. vol. II, p. 426.

Anas rubidus, WILS. AM. ORN. vol. VIII, p. 128, pl. 71, figs. 5 and 6.

Observed both in fresh water and on the large salt bays and lesser indentations occurring on the California coast.

MERGUS SERRATOR, Linn.—Red-breasted Merganser.

Mergus serrator, GMEL. Syst. Nat. vol. I, part II, p. 546.—AUD. B. of A. Oct. vol. VI, p. 395, pl. 412.—WILS. Am. Orn. vol. VIII, p. 81, pl. 69, fig. 2.

Abundant throughout California. I procured specimens on the Gila river, east of Fort Yuma.

MERGUS CUCULLATUS, Linn.—Hooded Merganser.

Mergus cucullatus, GMEL. Syst. Nat. vol. I, part II, p. 544.—AUD. B. of A. Oct. vol. VI, p. 402, pl. 413.—NUTT. Orn. vol. II, p. 465.—WILS. Am. Orn. vol. VIII, p. 79, pl. 69, fig. 1.

Abundant.

PHALACROCORAX PENECELLATUS, Brandt.—Brandt's Cormorant.

Phalacrocorax penecillatus, BRANDT, Bull. Sci. Acad. Imp. Petersb. vol. III, p. 55.

Graculus penecillatus, LAWRENCE, in Baird's Gen. Rep. IX, 880.

The specimens in my possession, captured on the Farrallone Islands, appear to be of the same species as that described by Brandt under the above title. Not having the work in which he describes the *Phal. penecillatus*, I have resorted, for the purpose of comparison, to a specimen so labelled and purporting to come from North America, in the museum of the Academy of Natural Sciences, of Philadelphia. They tally exactly in their color and markings, though they differ much in size. The tail is greyish black, composed of twelve feathers; feet black; bill dusky, but of lighter color towards base of lower mandible; gular sac blue, and at its base a gorget of dirty white. Plumage of back of head, sides of neck, and to the middle of the back, interspersed with white linear feathers, varying from two lines to two inches in length. Plumage of head, neck, and abdomen black, with glossy reflections of blue and green. The back black, with glossy green reflections, each feather being margined with a narrow fringe of dark bluish black.

Dimensions of the academy's specimen: Length twenty-four inches. From the flexure to the tip of wing ten inches. From point of bill to angle of mouth three and a half inches. Length of outer toe three and three-eighths inches; of second toe three and one-eighth inches; of inner toe one and two-eighths inch.

Dimensions of my specimen: Length twenty-eight inches. From flexure to tip of wing eleven and a half inches. From point of bill to angle of mouth four inches. Length of outer toe three and six-eighths inches; second toe three and two-eighths inches; inner toe one and four-eighths inch.

The bill in my specimen is stouter, the gular sac extends further down the throat, and the bare space around the eyes is larger. Both specimens are in full spring plumage. Late in June these birds were quite numerous at the west end of the island and did not appear to associate with other species, but flocking together on the most elevated rocks, passed the after part of the day in a state of repose, the morning having been employed in pursuit of fish, upon which they prey. This bird was not incubating at that period as were both the *P. townsendii* and the *P. splendens*.

PHALACROCORAX TOWNSENDII, Aud.—Townsend's Cormorant.

Phalacrocorax townsendii, AUD. B. of A. Oct. vol. VI, p. 438, pl. 427.—IB. Orn. Biog. vol. V, p. 149.

Although this bird has, by several authors, been considered synonymous with the *Phalacrocorax dilophus*, (Swainson,) I consider it a distinct species. In many of its markings they

bear a strong resemblance, but though I have often procured it in full spring plumage, I have never yet been able to detect the elongated tufts from behind each eye which distinguish that species at the first glance. I procured their eggs early in July, on the Farrallone Islands, and can only account for their tardy nidification from the fact that upon their first incubation the nests were rifled by the inhabitants of the island to supply their swine with a sufficiency of food.

PHALACROCORAX RESPLENDENS, Aud.—Violet-green Cormorant.

Phalacrocorax resplendens, AUD. B. of A. Oct. vol. VI, p. 440, pl. 419.—IB. Fol. pl. 412.

This beautiful species, easily distinguished by the metallic reflections of its plumage as well as its smaller size, was first discovered by Mr. J. K. Townsend, on the Columbia river, and is among the cormorants which fix their resting place on the Farrallone Islands. Its nest, placed on a ledge of the most precipitous cliffs, is formed of sea weed and raised three or four inches above the surface of the rock. In it are deposited three or four eggs of a light greenish color, but coated with a calcareous deposit peculiar to the eggs of this whole genus. Its food, on examination by dissection, I found to consist entirely of fish.

PELECANUS TRACHYRHYNCHUS, Lath.—American Pelican.

Pelecanus trachyrhynchus, LATH. Birds, vol. X, p. 408.

Pelecanus americanus, AUD. B. of A. Oct. vol. VII, p. 20, pl. 422.—IB. Fol. pl. 311.

Pelecanus erythrorhynchus, LAWRENCE, Baird's Gen. Rep. IX, 868.

Abundant during the fall, when they migrate in long lines, following each other in single file so closely and exactly that if the least curve is described by the leader each one takes it precisely at the same point however large the flock. Some few pair breed in Sacramento valley, but the larger number go further north for that purpose.

PELECANUS FUSCUS, Lin n.—Brown Pelican.

Pelecanus fuscus, GMEL. Syst. Nat. vol. I, part II, p. 570.—AUD. B. of A. Oct. vol. VII, p. 32, pl. 423 & 424.—NUTT. Orn. vol. II, p. 476.

Abundant on our whole western coast, and seen even as far down as Panama. In the Gulf of California I observed a small black gull following this pelican incessantly on its flight, and as the latter plunged into the sea after fish the gull would immediately alight by its side. The pelican emerging from the water to discharge the fluid collected in the gular sac would drop its bill, when the fish partially protruding from between its mandibles, the gull would seize upon one and drag it out as his share of the booty. Although this feat is of hourly occurrence, I have never seen the pelican offer the least resistance, or show any anger or impatience at the intrusion or impudence of his little neighbor, who, like a tax gatherer, follows him through life, an evil inevitable.

STERNA CAYANENSIS, Gmel.—Cayenne Tern.

Sterna cayanensis, GMELN. Syst. Nat. vol. I, part II, p. 604.

Sterna caryana, AUD. B. of A. Oct. vol. VII, p. 76, pl. 429.—NUTT. Orn. vol. II, p. 268.

This bird is occasionally seen following up the rivers and hovering over the lakes in search of small fish, upon which it preys, plunging into the water after them, often disappearing beneath

its surface for some seconds. The specimen in the collection was obtained in January, at San Diego.

STERNA HIRUNDO, Linn.—Common Tern.

Sterna hirundo, GMEL. Syst. Nat. vol. I, part II, p. 606.—AUD. B. of A. Oct. vol. VII, p. 97, pl. 433.—IB. B. of A. Fol. pl. 309.

Very abundant. Seen during the spring and summer coursing over the large marshes and lakes of the Sacramento valley, where they incubate. Their migration south begins with the approach of the inclement season.

STERNA NIGRA, Linn.—Black Tern.

Sterna nigra, GMEL. Syst. Nat. vol. I, part II, p. 608.—AUD. B. of A. Oct. vol. VII, p. 116, pl. 438.—RICH. & SW. F. Bor. Am. vol. II, p. 415.

Sterna plumbea, WILS. Am Orn. vol. VII, p. 83, pl. 60, fig. 3.

Abundant, and one of the most noisy birds of its genus, emitting its sharp note, crik, crik, as it flits over the water in search of its prey. When, from a flock, one of these birds is shot, the others, uttering cries of distress, fly for some time around the hunter, and plunge as if to aid their disabled or dead companion. The sportsman can, consequently, if so inclined, obtain many specimens before they are sufficiently alarmed to fly from danger.

LARUS OCCIDENTALIS, Aud.—Western Gull.

Larus occidentalis, AUD. B. of A. Oct. vol. VII, p. 161.—IB. Orn. Biog. vol. V, p. 320.

Found on the whole seaboard of California. It is very abundant, as well as the greatest pest with which the egg hunters on the Farrallone Islands have to contend while gathering the eggs of the Murre, (*Uria brunnicchii*), which breeds here in countless numbers.

At one o'clock every day, during the egg season, Sundays and Thursdays excepted, (this is to give the birds some little respite,) the egg-hunters meet on the south side of the island. The roll is called to see that all are present, that each one may have an equal chance in gathering the spoil. The signal is given, every man starting off at a full run for the most productive egging grounds. The gulls understanding, apparently, what is about to occur, are on the alert, hovering over head and awaiting only the advance of the party. The men rush eagerly into the rookeries; the affrighted murrens have scarcely risen from their nests before the gull, with remarkable instinct, not to say almost reason, flying but a few paces ahead of the hunter, alights on the ground, tapping such eggs as the short time will allow before the egger comes up with him. The broken eggs are passed by the men, who remove only those which are sound. The gull then returning to the field of its exploits, procures a plentiful supply of its favorite food.

Mr. Audubon gives, as one of the marked characteristics of this species, that the ends of the first seven primaries are spotted with white, whereas only six of the blue back gull (*L. argentatus*) are marked in this manner. So slight a difference would scarcely warrant the introduction of a new species were there no other distinction, but having shot, one afternoon, some twenty or thirty on the wing, I found them indifferently with six or seven of the first primaries terminated with white. The back, however, of a deeper slate color instead of the light grayish blue of the *L. argentatus*, is a marked feature when the two are contrasted.

Though on the Farrallones during the breeding season, I saw no blue back gulls, notwithstanding a careful and diligent search. The nest of the western gull, placed on the rocky hill sides and on the flats, is composed of sea grasses and weeds, and contains from two to three eggs of a light olive green or brown, dashed with dark brown or black. Of these latter birds, as well as of their eggs, I obtained a great number.

LARUS ARGENTATUS, B r u n n.—Herring Gull.

Larus argentatus, AUD. B. of A. Oct. vol. VII, page 163, pl. 448.—NUTT. Orn. vol. II, p. 304.

Most abundant on the southern coast of California.

LARUS HEERMANNI, C a s s i n.—White-headed Gull.

Larus heermanni, CASSIN, Proceed. Ac. Nat. Sc. Phil. vol. VI, p. 187, (1852.)—IB. Illus B. of Cal. and Tex. p. 28, pl. 5.

I first discovered this gull on the coast as far north as Monterey, and again met it at all the intermediate points as far south as San Diego, where it was most plentiful. It there associates during the winter with the western gull, (*L. occidentalis*.) Following vessels as they enter the harbors, and circling around them, it appears to be waiting for such garbage as is from time to time thrown overboard from the cook's galley. It also alights on the kelp which covers an immense area off San Diego bay, amongst which it catches small fish and finds an ample supply of small crustacea and marine insects. Like the rest of the genus it eats carrion, having seen the body of a dead seal covered with this and the preceding species. The Coronadoes Islands, about fifteen miles to seaward from San Diego, are a favorite breeding resort of this bird. While travelling along the California coast, on one of the United States mail steamships, I observed two or three small species of gulls, for which I, of course, was unable to stop.

DIOMEDEA NIGRIPES, A u d.—Black-footed Albatross.

Diomedea nigripes, AUD. B. of A. Oct. vol. VII, p. 198.—IB. Orn. Biog. vol. V, p. 327.—CASSIN'S Ill. B. of Cal. and Tex. p. 210, pl. 35.

This species abounds on the California coast, skimming the waves in its flight, and following in the wake of passing vessels to pick up the refuse scraps thrown overboard. Voracious in its habits, it seizes on whatever is thrown on the water, of which propensity advantage may be taken by baiting a hook and drawing them on board. From the stern ports of a ship I have thus captured eight or ten of these birds in a single morning. I observed a white albatross on this coast, though smaller than the *Diomedea exulans* which we saw about Cape Horn. Not having procured it however, I cannot determine its species.

? PROCELLARIA.—? Fulmar.

Resembles very much our common fulmar (*P. glacialis*) in color and form, and was very abundant at some miles from the coast; but as I was unable to obtain a specimen, I cannot say what *Procellaria* it was. It may have been the Pacific fulmar (*P. pacificus*) described in Mr. Audubon's works. Two kinds of petrel (*Thalassidroma*) were also seen but not captured, in consequence of which their species still remains a matter of doubt.

MORMON CIRRHATUS, L a t h.—Tufted Puffin.

Mormon cirrhatus, AUD. B. of A. Oct. vol. VII, p. 234, pl. 462.—NUTT. Orn. vol. II, p. 539.

Alca cirrhata, LATHAM'S Birds, vol. X, p. 57, pl. 170.

This curious, odd-looking, and interesting species was observed on the Farrallones, and known by the inhabitants as the sea parrot. A deep cleft or crevice in the rock is chosen by them for the purposes of incubation, and a single dirty white egg, sometimes faintly dashed with brown, is laid on the bare ground at the innermost extremity of the cavity. To procure the eggs I was obliged to wrap my hand in a stout handkerchief, having several times ascertained by experience that a severe and cutting wound was the result of a bite from their knife-like and powerful bill.

PTYCHORHAMPHUS ALEUTICUS, P a l l a s.

Mergulus cassinii, GAMBEL, Proc. Acad. N. Sc. Phil. vol. II, p. 266. (1845.)

Ptychorhamphus aleuticus, CASSIN, in Baird's Gen. Rep. IX, 910.

In 1851 while enveloped in a dense fog some twenty miles off the bay of San Francisco, the captain of our ship, alarmed at the sound of breakers, lowered a boat to ascertain our whereabouts. Invited to join him, I took my gun and soon observed this small murre which occasionally shot by on its way to the Farrallones. Approaching within a few yards of the rock bound shores, its high peaks were seen covered with cormorants, gulls and other varieties of sea fowl. Our bearings taken, we returned to the ship, and on our way I shot a single specimen of this bird. The stomach I found, on dissection, to be filled with small fish and minute marine insects. They abound on these islands during the winter but on my return in spring they had already left to pass their summer in more northern climes.

CERORHINA OCCIDENTALIS, B o n a p.—Horn-Billed Auk.

Cerorhinca occidentalis, NUTT. Orn. vol. II, p. 538.

Ceratorhina occidentalis, AUD. B. of A. Fol. pl. 402, fig. 5.

Uria occidentalis, AUD. Oct. vol. VII, p. 364, pl. 471.

In the month of June on the Farrallones, while watching under the lee of a rock to shoot the sea lion, (a large species of seal,) which towards dusk leaves the ocean to crawl up on the shores, I first saw this singular bird pass by me with a small fish in its mouth and plunge suddenly as if into the ground. This aroused my attention as all other birds had retired to rest, save here and there a restless gull. On examining the ground next morning I found burrows leading under the rocks in which they lie concealed during the day, having never met them in my rambles which extended in all directions over the island and at all hours. By watching, however, several nights, I procured a few specimens. In these holes they had young, a single one being in each nest. I procured, during the winter, a young plumaged bird off the island of Santa Marguerita, on the coast of Lower California.

URIA BRUNNICHII, S a b i n e.—Large-Billed Guillemot.

Uria brunnichii, AUD. B. of A. Oct. vol. VII, p. 265, pl. 472.—RICH. & SW. F. Bor. Am. vol. II, p. 477.

Uria brunnichii, NUTT. Orn. vol. II, p. 529.—GOULD, B. of Eur. vol. V, pl. 398.

Uria ringvia, CASSIN, in Baird's Gen. Rep. IX, 914.

This bird is abundant on the sea coast, the Farrallones being one of its favorite breeding resorts. The traffic in their eggs from this place to San Francisco and inland reaches the value

annually of between one and two hundred thousand dollars. If undisturbed, it lays but a single egg and rears but one bird each season. No nest is prepared, but depositing her egg on the bare rock, ground or any slight ledge, the female, denuding a portion of her breast by plucking out the feathers, sits upright upon it during the period of incubation. Gentle and inoffensive, it is not only harassed by man but also by the gull, its most vigilant and often its worst enemy. I have frequently seen the gulls assemble in large numbers and by raising a great clamor and spreading their wings, endeavor to frighten them away from their trust that they might begin to plunder. I one day saw three gulls approach scientifically a single murre setting on her egg. Two of them feigning an attack in front, the murre raised herself to repel them with her sharp pointed bill, instantly the third advancing from the rear seized her solitary egg from beneath her and flew off with the booty, the two first immediately following to claim their share. The egg was dropped and broken on the rocks when a general scramble ensued between the three robbers for the valued prize. The egg hunters continue to rob them from May to July, when exhausted nature compels the bird to cease laying. During this period when driven from the rookeries, flying in terror to escape the threatening danger, they dash themselves to pieces against the rocky walls or collecting against them ten or twelve deep, numbers are crushed by the violence of each others' strugglings. At the time of the drive, (as it is called,) these birds all leave the island and settling on the water cover it for a mile around.

URIA COLUMBA, Pallas.—Black Guillemot.

Uria columba, CASSIN, in Baird's Gen. Rep. IX, 912.

Abundant and resident on the seacoast, breeding in the crevices of the rocks on the Farrallones.

COLYMBUS GLACIALIS, Linn.—Great Northern Diver or Loon.

Colymbus glacialis, Gmel. Syst. Nat. vol. I, part II, p. 588.—NUTT. Orn. vol. II, p. 513.—WILS. Am. Orn. vol. IX, p. 84, pl. 74, fig. 3.

Abundant on the fresh water lakes, where its lugubrious cry is occasionally heard towards evening.

COLYMBUS SEPTENTRIONALIS, Linn.—Red-throated Loon.

Colymbus septentrionalis, Gmel. Syst. Nat. vol. I, part II, p. 586.—NUTT. Orn. vol. II, p. 519.—AUD. B. of A. Oct. vol. VII, p. 299, pl. 478.

The specimen obtained was shot from the wharf at Newtown, San Diego.

PODICEPS CRISTATUS, Linn.—Crested Grebe.

Podiceps cristatus, AUD. B. of A. Oct. vol. VII, p. 308, pl. 474.—RICH. & SW. F. Ber. Am. vol. II, p. 410.—NUTT. Orn. vol. II, p. 250.

Abundant. Frequenting the fresh water districts, and observed also at Santa Barbara on the borders of the ocean.

PODICEPS CALIFORNICUS, Heermann.—California Grebe.

Podiceps californicus, HEERMANN, Proceed. Ac. Nat. Sc. Phil. vol. VII, p.

Form.—Size small. Bill slightly slender, curved upwards; wings short; first quill of primaries slightly longest; secondaries short; tertiaries longer, nearly equal to the primaries; tarsæ flattened; feet large.

Color.—The entire upper parts of a deep sooty brown, darkest and nearly black on the top of head and back; neck almost encircled with grayish white, and in front with an indistinct band of grayish brown. Sides and flanks tinged with brownish gray. Under parts silky white, and near the vent having a sullied appearance. Under wing coverts white. Some of the shorter primaries of a cinereous brown, faintly tipped with white; the secondaries white, of which a few have their outer webs brown. Bill dark, tipped with lighter horn color. Feet dark green. Length 12 inches.

At first sight this bird appears very closely allied to the *P. cornutus* and *P. auritus*, but on comparing them marked differences are at once perceived, both in size and form. I observed this grebe on the inland fresh water ponds, as well as on the sea shore, where it was abundant, passing its time on the water in pursuit of insects and small fish, with which, on dissection, I found its stomach filled. Having procured it only during the winter, I am unable to describe its spring livery, and between the two seasons there is much difference of plumage in the birds of this genus.

PODYLYMBUS LINEATUS, Heermann.—Lineated Diver.

Podilymbus lineatus, HEERMANN, Proceed. Ac. Nat. Sc. Phil. vol. VII, p.

Form.—Size small. Bill short and strong; nostrils conspicuous; wings short; second primary longest; secondaries short; tertiaries longer than secondaries; feet large.

Color.—Entire upper parts dark reddish brown. A white line from base of upper mandible under the eye, and running down the neck, succeeded by another under it of reddish brown. Spots at the base of under mandible reddish brown. Throat white, marked with a few obscure spots of reddish brown. Lower neck in front and upper part of breast pale reddish brown, with which the sides and flanks are also tinged; other under parts silky white; the lower portion of abdomen and vent mouse color. Quills dark cinereous; secondaries tipped with white. Bill horn color; feet black. Length 11 inches.

This bird is found on the fresh water courses and marshy lakes of California throughout the year, having procured it during the winter and discovered the nest in those localities during the summer. The nest, composed of a few loose straws or rushes, is placed on the ground near the edge of the water, and contains four eggs of a dirty white color.

LIST OF BIRDS

COLLECTED BETWEEN

San Francisco and Fort Yuma, California, during the survey of railroad route from the Mississippi to the Pacific ocean, under the command of Lieutenant R. S. Williamson, Top. Engs.

| | Specimens. | | Specimens. |
|--------------------------------|------------|---------------------------------------|------------|
| Pandion carolinensis..... | 1 | Polioptila melanura..... | 2 |
| Hypotriorchis columbarius..... | 1 | Myiodioides pusillus .. | 1 |
| Tinnunculus sparverius..... | 2 | Dendroica audubonii..... | 2 |
| Buteo insignatus..... | 1 | Dendroica aestiva..... | 2 |
| Buteo elegans..... | 2 | Dendroica nigrescens..... | 1 |
| Buteo borealis..... | 1 | Trichas delafieldii..... | 1 |
| Archibuteo ferrugineus..... | 1 | Helminthophaga celata | 2 |
| Elanus leucurus..... | 1 | Certhia americana..... | 1 |
| Accipiter cooperi..... | 2 | Troglodytes obsoletus | 2 |
| Accipiter fuscus..... | 1 | Troglodytes bewickii | 2 |
| Circus hudsonius | 1 | Troglodytes aedon..... | 1 |
| Athene cunicularia..... | 1 | Troglodytes palustris..... | 1 |
| Strix pratincola..... | 2 | Campylorhynchus brunneicapillus | 2 |
| Brachyotus cassini | 1 | Lophophanes inornatus..... | 2 |
| Bubo virginianus..... | 1 | Parus rufescens | 2 |
| Scops asio..... | 1 | Parus montanus | 2 |
| Chordeiles popetue | 2 | Psaltria minima | 1 |
| Progne purpurea.... | 1 | Chamaea fasciata | 2 |
| Hirundo rufa | 2 | Sialia mexicana | 2 |
| Hirundo lunifrons..... | 2 | Cinclus americanus..... | 1 |
| Hirundo thalassina..... | 1 | Mimus polyglottus..... | 2 |
| Cotyle riparia | 1 | Mimus montanus | 2 |
| Cotyle serripeennis..... | 1 | Harporhynchus redivivus | 1 |
| Tyrannus verticalis | 2 | Turdus migratorius..... | 2 |
| Tyrannula sayii..... | 2 | Turdus naevius..... | 2 |
| Tyrannula cinerascens | 1 | Turdus nanus..... | 1 |
| Tyrannula nigricans..... | 2 | Anthus ludovicianus..... | 1 |
| Tyrannula richardsonii?..... | 2 | Otocoris rufa..... | 1 |
| Pyrocephalus rubineus..... | 1 | Embernagra chlorura | 1 |
| Ptilogonys nitens..... | 2 | Chondestes grammaca..... | 2 |

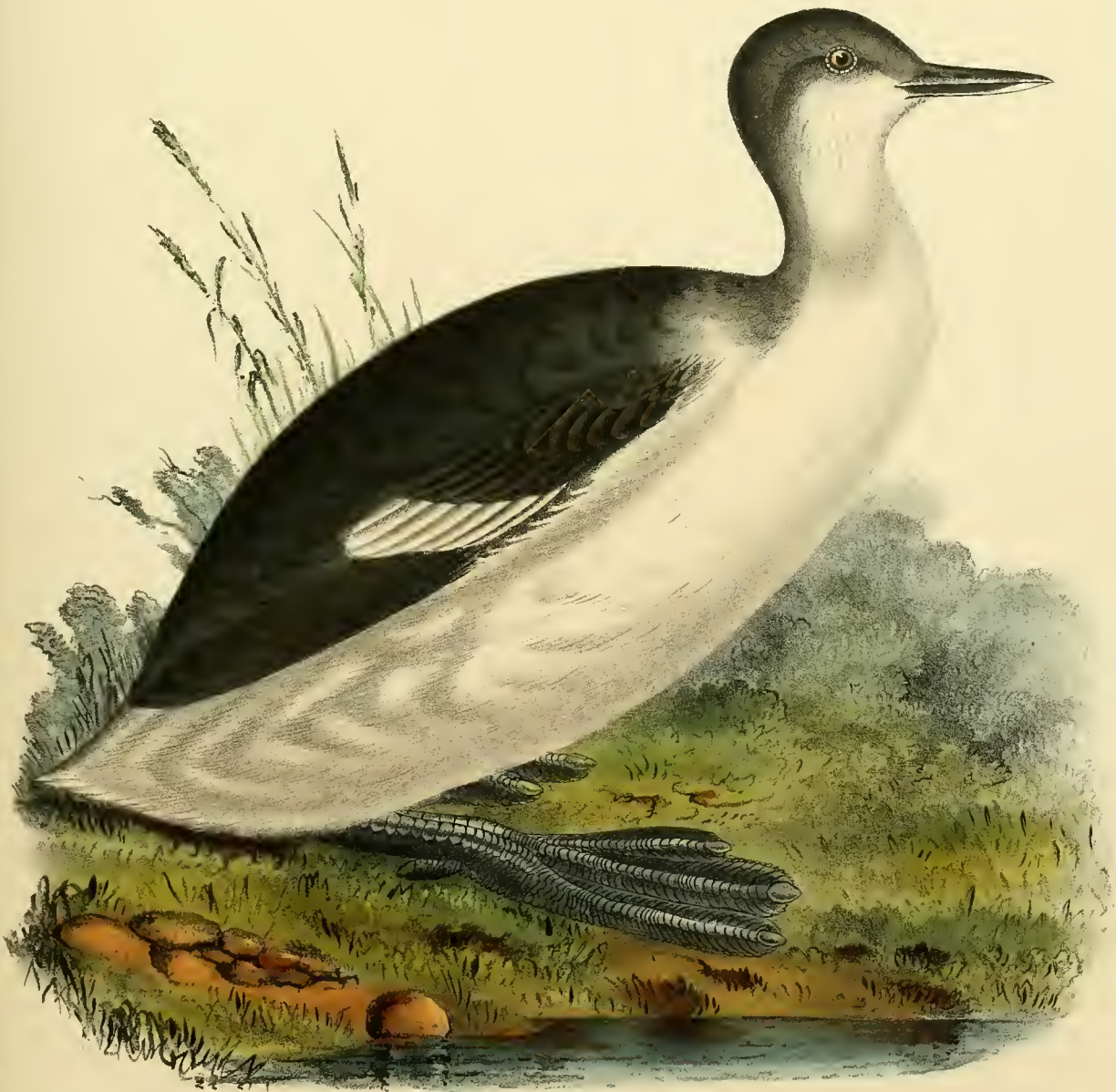
| | Specimens. | | Specimens. |
|----------------------------------|------------|----------------------------------|------------|
| Zonotrichia graminea..... | 2 | Picus meridionalis..... | 1 |
| Zonotrichia guttata | 1 | Picus ruber | 2 |
| Zonotrichia gambelii | 2 | Picus varius?..... | 1 |
| Zonotrichia coronata | 2 | Melanerpes torquatus..... | 2 |
| Passerella townsendii..... | 1 | Melanerpes formicivorus..... | 2 |
| Spizella socialis | 2 | Colaptes mexicanus..... | 2 |
| Spizella pallida | 2 | Geococcyx mexicanus..... | 2 |
| Poospiza bellii..... | 2 | Callipepla californica..... | 2 |
| Passerculus rostratus | 2 | Callipepla gambelii..... | 2 |
| Passerculus alaudinus..... | 1 | Gallinula galeata..... | 1 |
| Spiza amoena..... | 2 | Fulica americana | 1 |
| Junco oregona..... | 2 | Rallus virginianus | 2 |
| Ammodramus ruficeps | 1 | Ardea herodias..... | 1 |
| Peucaea lincolni | 2 | Ardea virescens..... | 2 |
| Linaria pinus..... | 1 | Ardea candidissima..... | 1 |
| Carduelis tristis..... | 2 | Ardetta exilis | 1 |
| Carduelis lawrencii..... | 1 | Charadrius vociferus..... | 1 |
| Carduelis psaltria | 2 | Charadrius montanus..... | 2 |
| Pipilo arctica..... | 3 | Totanus semipalmatus..... | 1 |
| Pipilo fusca | 2 | Totanus macularius..... | 2 |
| Carpodacus purpureus..... | 2 | Totanus melanoleucus..... | 2 |
| Carpodacus familiaris | 2 | Scolopax wilsonii..... | 2 |
| Coccyzus coeruleus..... | 2 | Scolopax noveboracensis..... | 1 |
| Coccyzus melanocephala..... | 1 | Recurvirostra occidentalis | 1 |
| Pyranga ludoviciana..... | 2 | Numenius longirostris..... | 1 |
| Yphantis bullockii..... | 2 | Aix sponsa..... | 1 |
| Molothrus pecoris..... | 2 | Querquedula cyanoptera..... | 2 |
| Agelaius xanthocephalus..... | 1 | Spatula clypeata..... | 1 |
| Agelaius tricolor | 2 | Nyroca valisneria..... | 1 |
| Agelaius gubernator..... | 2 | Fuligula marila..... | 1 |
| Scolecophagus cyanocephalus..... | 2 | Oedemia perspicillata | 1 |
| Sturnella neglecta..... | 2 | Mergus serrator..... | 1 |
| Corvus corax..... | 1 | Pelecanus trachyrhynchus..... | 1 |
| Corvus americanus | 1 | Pelecanus fuscus..... | 1 |
| Cyanura stellerii..... | 1 | Sterna hirundo..... | 1 |
| Cyanocitta californicus | 2 | Larus heermannii..... | 1 |
| Lanius excubitoroides | 1 | Diomedea nigripes | 1 |
| Sitta aculeata..... | 2 | Uria columba..... | 1 |
| Sitta canadensis.. | 1 | Colymbus septentrionalis..... | 1 |
| Trochilus anna..... | 1 | Podiceps cristatus | 1 |
| Picus harrisi..... | 2 | Podiceps californicus..... | 1 |



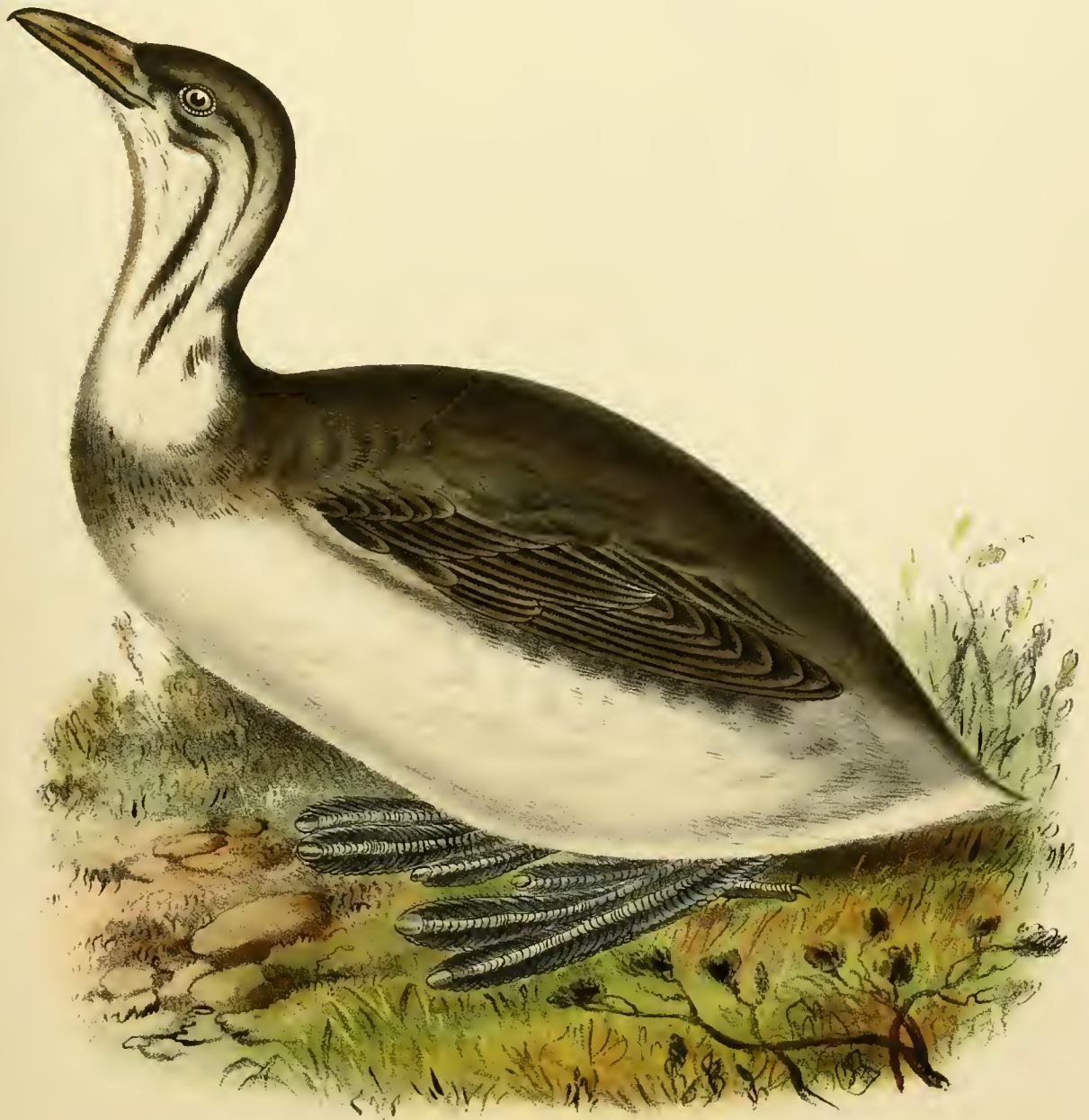














No. 3.

REPORT ON MAMMALS COLLECTED ON THE SURVEY.

BY S. F. BAIRD.

VESPERTILIS PALLIDUS, Leconte.—White Bat.

Vespertilis pallidus, LECONTE, Pr. A. N. Sc. Phil.

Of this white bat several specimens were collected.

LYNX RUFUS var. MACULATUS.—Texas Wild Cat.

BAIRD, Gen. Rep. Mammals, 1857, 93.

SP. CH.—Similar to the common wild cat, but with the general color red, with numerous dusky spots.

A specimen collected in the Tejon valley agrees pretty well with skins from the Rio Grande of Texas. The prevailing color is pale reddish, the tips of the hairs yellowish gray. The dorsal region is rather darker, and exhibits some faint longitudinal dark lines. Numerous rounded spots or blotches of darker color are scattered over the whole outer surface which, though not very conspicuous, are distinctly visible. The spots are darker and more mixed with brown on the legs; the under and inner surfaces are white; there is a faint reddish color on the throat in advance of the fore legs. The belly is blotched, and the inside of the legs banded transversely with black. The chin is unspotted. The ears are black inside, with a moderately large patch of grayish white; they are distinctly pencilled. The tail above is like the back, with several darker bands; the terminal fifth however is black.

SCIURUS FOSSOR, Peale.—California Grey Squirrel.

Sciurus fossor, PEALE, Mamm. and Birds U. S. Ex. Ex. 1848, 55.—BAIRD, Gen. Rep. Mammals, 1857, 264.

Sciurus heermanni, LECONTE, Pr. A. N. Sc. Phila. VI, Sept. 1852, 149.

SP. CH.—Size of *S. vulpinus*, but more slender. Tail vertebræ as long as the body; with the hairs, much longer. Five upper molars Above, grizzled bluish gray and black; beneath, white, without any differently colored separating line. Tail black, with the exterior white; the whole under surface finely grizzled. Back of ears and adjacent tuft on the occiput, chestnut.

A specimen of a squirrel was obtained at Fort Tejon which in general character closely resembles the *S. fossor*. The body is smaller in proportion, although as the skin has been preserved in alcohol it has probably contracted considerably. There is no chestnut on the back of the ear, the tuft here being dirty white. In this respect it resembles the *S. leporinus* of Audubon & Bachman, which may prove to be the same species with *S. fossor*, and will have priority.

SPERMOPHILUS BEECHEYI, Rich.—California Ground Squirrel.

Arctomys (Spermophilus) beecheyi, RICHARDSON, Fauna Boreali-Americana, I, 1829, 170; plate xii, B.—In. Gen. Rep. Mammals, 1857, 307.

SP. CH.—Size of the cat-squirrel, *S. cinereus*. Ears large, prominent. Tail more than two-thirds as long as the body. Above, mixed black, yellowish brown, and brown in indistinct mottlings; beneath, pale yellowish brown. Sides of head and neck, hoary yellowish, more or less lined with black, a more distinct stripe of the same, from behind the ears on each side, extending above the shoulders to the middle of the body. Ears black on their inner face. Dorsal space between the stripes scarcely darker than the rest of the back. Length, 9 to 11 inches; tail, with hairs, 7 to 9. Hind feet, 2 to 2.20 inches.

Specimens (A. and B.) were collected at the Tejon Pass, California.

SPERMOPHILUS HARRISII, A u d . & B a c h .—Harris' Squirrel.

Spermophilus harrisii, A u d . & B a c h . N. Am. Quad. III, 1854, 267; pl. cliv, fig. 1.—Baird, Gen. Rep. Mammals, 1857, 313.

Size rather less than that of *Tamias striatus*. Tail vertebræ about half the length of the body. Ears short, pointed. Soles hairy. Above, finely grizzled grayish, or whitish brown and black; under parts, and a stripe on each side, (without any black or dusky border,) whitish. Tail with one black and one light line, within the marginal whitish, black in the centre; uniform whitish beneath. Length, 5 inches; tail, with hairs, about 3. Hind foot, 1.45.

A specimen (No. 3) was collected in the Mohave Desert.

THOMOMYS BULBIVORUS, B a i r d .—California Gopher.

? *Diplostoma bulbivorum*, RICH. F. B. Am. I, 1829, 206; pl. xviii, B. (marked *Diplostoma douglassi*).—Ib. Zool. of Blossom, 1839, 13.

Thomomys bulbivorus, BAIRD, Gen. Rep. Mammals, 1857, 389.

SP. CH.—Cheek pouches large, completely furred inside, white to their very margin, which is dark brown, forming a very strong contrast. Tail from one-third to less than one-half the length of body; slender at base. Upper incisors quite convex transversely; groove obsolete. Hands small; claws very slender and delicate, nearly straight; middle claw $4\frac{1}{2}$ lines, its under surface occupying about two-sixths the whole hand, its finger barely shorter than this; claw of thumb extending over two-fifths of whole hand.

Color.—Reddish chestnut brown above and on sides, finely lined everywhere by dusky tips to the hairs, without any uniform dark wash on the back. Beneath paler. Tail grayish white, except a short line of dusky along the base above. Chin dusky; its extremity white.

Specimens collected at Tejon valley. (2.)

DIPODOMYS PHILLIPPII, G r a y .—Kangaroo Rat.

BAIRD, Gen. Rep. Mammals, 1857, 412.

Specimens of this species were collected at Posa creek.

PEROGNATHUS PARVUS, L e c c o n t e .

Cricetodipus parvus, PEALE, Mamm. and Birds, U. S. Ex. Ex. 1848, 53.

Perognathus parvus, BAIRD, Gen. Rep. Mammals, 1857, 425.

SP. CH.—Smallest known species of American rodent? Above, buff, mixed with dusky; beneath, white; entire fore leg white. Tail rather longer than the body. Hind foot from heel nearly as long as the head.

A specimen was collected on King's river, California. (6.)

HESPEROMYS GAMBELII, B a i r d .—California Mouse.

BAIRD, Gen. Rep. Mammals, 1857, 464.

The specimens of this species collected at Posa creek differed in some respects from those generally procured in northern California, in being smaller and darker colored. They are, however, possibly immature, which would account for the difference. (Nos. 4, 5, and 7.)

No. 4.

REPORT ON FISHES COLLECTED ON THE SURVEY.

BY CHARLES GIRARD, M. D.

1. POMOXIS NITIDUS, G r d.

GEN. REP. 6. PLATE II, FIGS. 5—8.

SPEC. CHAR.—Posterior extremity of maxillary corresponding to a line intersecting the pupil. Insertion of ventrals situated opposite the inferior edge of the base of the pectorals. Anterior spiny ray of anal fin under the fourth dorsal one. Posterior margin of caudal fin sub-concave. Upper regions reddish, spotted and fasciated with brown; inferior regions silver and golden.

161. Houston river, Kentucky. E. L. Berthaud.

2. AMBLOPLITES INTERRUPTUS, G r d.—The Perch of San Francisco.

GEN. REP. 10. PLATE II, FIGS. 1—4.

SPEC. CHAR.—Posterior extremity of maxillary reaching a vertical line drawn back of the pupil. Posterior margin of caudal fin sub-emarginated. Origin of anal fin opposite the eleventh ray of the dorsal. Interrupted dark bands on the sides. Two streaks diverging from the eye—one running towards the opercular spot, the other obliquely downwards.

278. San Joaquin river, California. Dr. A. L. Heermann.

3. PARALABRAX NEBULIFER, G r d.

GEN. REP. 33. PLATE XII, FIGS. 1—4.

SPEC. CHAR.—Snout sub-conical; extremity of maxillary reaching the anterior edge of the pupil. Eyes moderate. Base of pectorals a little in advance of that of the ventrals. Irregular dark blotches distributed over the dorsal region.

282. Monterey, California. Lieutenant W. P. Trowbridge.

4. PARALABRAX CLATHRATUS, G r d.

GEN. REP. 34. PLATE XII, FIGS. 5—8.

SPEC. CHAR.—Snout rather pointed; extremity of maxillary intersecting the middle of the pupil. Eyes rather large. Base of pectorals even with the base of ventrals. Blotches of dorsal region assuming a fenestrated disposition.

283. San Diego, California. Lieutenant W. P. Trowbridge.

5. CHIOPSIS CONSTELLATUS, G r d.

GEN. REP. 42. PLATE XIX.

SPEC. CHAR.—Dorsal fins contiguous. Caudal fin posteriorly sub-concave. Anal exteriorly rounded, or convex. Scales on the middle of the flanks conspicuously larger than elsewhere. Greenish-brown with groups of black dots on the anterior part body and sides of head. Pectorals densely dotted with black.

264. San Francisco, California. Dr. A. L. Heermann.

6. CHIOPSIS PICTUS, G r d .

GEN. REP. 43. PLATE XX, FIGS. 1—4.

SPEC. CHAR.—Dorsal fins contiguous; caudal fin sub-truncated posteriorly. Ground color dark brown, with numerous vermilion spots, bordered with black, upon the sides and lower fins. Under surface of head, throat, and belly whitish or yellowish.

266. San Francisco, California. Dr. A. L. Heermann.

7. CHIOPSIS GUTTATUS, G r d .

GEN. REP. 44. PLATE XX, FIGS. 5—8.

SPEC. CHAR.—Dorsal fins contiguous. Caudal fin posteriorly sub-concave. Ground color olivaceous; upper regions with crowded small black spots, fins blackish brown.

269. San Francisco, California. Dr. A. L. Heermann.

8. OPHIODON ELONGATUS, G r d .

GEN. REP. 48. PLATE XVIII, FIGS. 4—7.

SPEC. CHAR.—Body lanceolated; head sub-conical, depressed. Mouth deeply cleft; posterior extremity of maxillary extending to the vertical of the posterior rim of the orbit. Spinous portion of dorsal fin much longer than the articulated one. Anal somewhat longer than soft portion of dorsal. Caudal slightly emarginated posteriorly. Extremities of the pectorals nearly even with the tips of the ventrals. Color above olivaceous brown, scattered all over with blackish, sub-circular spots. Beneath yellowish.

276. San Francisco, California. Dr. A. L. Heermann.

9. COTTOPSIS GULOSUS, G r d .

GEN. REP. 53.

SPEC. CHAR.—Origin of anterior dorsal fin situated opposite the insertion of the upper ray of pectorals. First ray of anal fin placed under the fourth of second dorsal. Extremities of pectorals extending beyond the origin of the anal. Skin generally smooth; lateral line undergoing a sudden fall upon the peduncle of the tail. Reddish brown, spotted, and transversally barred with black; beneath unicolor.

291. San Joaquin river, California. Dr. A. L. Heermann.

10. LEPTOCOTTUS ARMATUS, G r d .

GEN. REP. 60. PLATE XV, FIG. 2.

SPEC. CHAR.—Head much depressed; upper jaw longer than the lower; posterior extremity of maxillary extending somewhat beyond the vertical of the posterior rim of the orbit. A preopercular process provided with three spines directed upwards. Blackish brown above; whitish beneath; dorsals, caudal, and pectorals yellowish, barred with black; anterior dorsal with a black spot posteriorly. Ventrals and anal whitish.

310. San Francisco, California. Dr. A. L. Heermann.

11. SCORPAENICHTHYS MARMORATUS, G r d .

GEN. REP. 64. PLATE XVI, FIG. 1.

SPEC. CHAR.—Membranous flaps upon the upper and posterior part of the orbit, upon the snout, and at the posterior extremity of the maxillary bones. The latter extending to a vertical line passing immediately behind the eye. Two spines

of moderate development upon the preopercle. Fins all well developed. Ground color either light or dark brown, marmorated with black.

314. San Francisco, California. Dr. A. L. Heermann.

12. *ASPICOTTUS BISON*, Gr d.

GEN. REP. 66. PLATE XV, FIG. 1.

SPEC. CHAR.—The posterior extremity of the maxillary extends to a vertical line drawn midway between the posterior edge of the pupil and the posterior rim of the orbit. The scutellae constituting the lateral line are crowded, vertically elongated. Upper regions dark brown, mottled or blotched with black. Beneath dull yellowish, with meandric dark lines under the head and throat. Ventrals uniform yellowish white; other fins mottled yellow and black.

324. San Francisco, California. Dr. A. L. Heermann.

13. *HEMILEPIDOTUS SPINOSUS*, Ayres.

GEN. REP. 68.

SPEC. CHAR.—Upper surface and sides of head provided with membranous flaps. Eye quite large. Posterior free extremity of maxillary extending to a vertical line drawn across the posterior rim of the pupil. Dorsal band of scales composed of six rows or series; lateral band, of seven, five below and two above the lateral line. Ground color dark reddish brown, with darker transverse bands and blotches.

326. San Francisco, California. Dr. John S. Newberry.

14. *SEBASTES FASCIATUS*, Gr d.

GEN. REP. 79. PLATE XXII.

SPEC. CHAR.—Upper surface of head provided with large spinous ridges. Posterior extremity of maxillary extending beyond the pupil. Origin of dorsal fin situated in advance of the base of the pectorals. Ground color greenish yellow or sulphur yellow, clouded with dark patches, spotted with whitish; a dorsal fascicle of the ground color extends from the third or fourth dorsal spine to the base of the caudal.

345. Presidio, California. Lieutenant W. P. Trowbridge.

15. *SEBASTES AURICULATUS*, Gr d.

GEN. REP. 80.

SPEC. CHAR.—Upper surface of head provided with small horizontal and acute spines. Posterior extremity of maxillary extending to a vertical line drawn posteriorly to the orbit. Origin of dorsal fin situated in advance of the base of the pectorals. Blackish brown above, lighter beneath. A black spot upon the upper part of the opercle.

348. San Francisco, California. Dr. A. L. Heermann.

16. *GASTEROSTEUS MICROCEPHALUS*, Gr d.

GEN. REP. 91.

SPEC. CHAR.—Body partly plated; peduncle of tail not keeled. Dorsal spines three, stoutish, slightly serrated upon their edge; insertion of anterior one situated opposite the upper part of the base of the pectorals. Insertion of ventrals in advance of second dorsal spine, their own spine being very large, serrated upon its upper edge, and extending beyond the tips of the *ossa innominata*. Posterior margin of caudal sub crescentic.

338. Four Creeks, Tulare valley. Dr. A. L. Heermann.

17. GASTEROSTEUS WILLIAMSONI, G r d .

GEN. REP. 93.

SPEC. CHAR.—Body smooth all over; peduncle of tail not keeled. Dorsal spines three, exiguous and slender and not serrated; insertion of anterior one situated above the base of the pectorals. Insertion of ventrals slightly in advance of the second dorsal spine; their own spines are serrated upon both edges, and their extremities do not reach the tips of the *ossa innominata*. Posterior margin of caudal fin sub-crescentic.

340. Williamson's Pass, California. Dr. A. L. Heermann.

18. ATHERINOPSIS CALIFORNIENSIS, G r d .—California "Smelt."

GEN. REP. 103. PLATE XXII c.

SPEC. CHAR.—Head small and sub-quadrangularly pyramidal, constituting the sixth of the entire length. Base of anal fin much longer than that of the second dorsal. Greyish brown above; light brown or silvery beneath. Fins olivaceous, unicolor.

351. San Francisco, California. Dr. A. L. Heermann.

19. GOBIUS LEPIDUS, G r d .

GEN. REP. 127. PLATE XXXVa, FIGS. 5—6.

SPEC. CHAR.—Body elongated, slender, and very compressed. Head sub-conical; jaws equal; gape of mouth oblique; posterior extremity of maxillary extending to a vertical line drawn back of the pupil. Interocular space narrow. Reddish brown; fins blackish.

361. San Francisco, California. Dr. A. L. Heermann.

20. MORRHUA PROXIMA, G r d .

GEN. REP. 142. PLATE XLa, FIGS 5—8.

SPEC. CHAR.—Snout sub-conical; thickish; upper jaw protruding beyond the lower one. Posterior extremity of maxillary bone extending to a vertical line which would intersect the pupil. Dorsal and anal fins all distinct from one another. Anterior anal longer than the second dorsal. Caudal fin posteriorly sub-truncated. Yellowish ash or brown above; sides and belly silvery white.

525. San Francisco, California. Dr. A. L. Heermann.

21. PLATICHTHYS RUGOSUS, G r d .

GEN. REP. 148.

SPEC. CHAR.—Eyes moderate, situated on the left side. Interocular space moderate. Peduncle of tail long. Origin of dorsal fin corresponding to a vertical line intersecting the middle of the pupil. Scales very rugose and plate-like. Lateral line slightly arched above the pectoral fins. Left side dark reddish brown; fins olivaceous, dorsal and anal with alternate vertical bands of black, caudal with longitudinal bands of the same hue. Ventrals and pectorals unicolor. Right side dull yellow.

695. San Francisco, California. Dr. A. L. Heermann.

22. PLEURONICHTHYS COENOSUS, G r d .

GEN. REP. 151.

SPEC. CHAR.—Body sub-elliptical. Posterior extremity of maxillary extending to a vertical line drawn midway between the pupil and the anterior rim of the orbit. Origin of dorsal fin curved towards the left side of the head, and corresponding to the anterior rim of the upper orbit on the right side. Ground color olivaceous brown, maculated.

697. San Francisco, California. Dr. A. L. Heermann.

23. PAROPHRYS VETULUS, Grd.

GEN. REP. 153.

SPEC. CHAR.—Body quite elongated and sub-elliptical; peduncle of the tail slender. Posterior extremity of maxillary extending to a vertical line drawn inwardly to the anterior rim of the orbit. Origin of anal fin placed posteriorly to the base of the pectorals. Dorsal and anal fins nearly even posteriorly. Scales minute; lateral line very conspicuous. Color of body and head reddish ash; fins olivaceous, unaculated.

698. San Francisco, California. Dr. A. L. Heermann.

24. PSETTICHTHYS MELANOSTICTUS, Grd.

GEN. REP. 154.

SPEC. CHAR.—Body elongated and rather slender. Eyes moderate, situated on the right side; interocular space moderate. Lower jaw somewhat longer than the upper. Posterior extremity of maxillary extending to a vertical line drawn in front of the pupil. Anterior rays of dorsal higher than those immediately succeeding. Dorsal and anal fins even posteriorly. Origin of anal fin situated somewhat posteriorly to the base of the pectorals, and provided with a small spine. Scales quite small, cycloid in structure; lateral line very slightly raised above the pectorals. Ground color cinereous, interspersed with crowded black dots.

704. San Francisco, California. Dr. A. L. Heermann.

25. EMBIOTOCA JACKSONI, Agass.

GEN. REP. 168. PLATES XXVII & XXVIII, and PLATE XXVI, FIGS. 3 & 4.

SPEC. CHAR.—General form sub-elliptical. Anal broadly rounded upon its external margin; origin of that fin opposite the sixth or seventh articulated ray of the dorsal. Tips of pectorals reaching a vertical line intersecting the base of the third articulated ray of dorsal. Eyes rather of small than of medium development. Posterior extremity of maxillary reaching a vertical line passing in advance of anterior rim of orbit. Frontal region slightly depressed above the eyes. Branchiostegals five in number. About sixty scales in lateral line. Female, uniform dark purplish brown; male, olive brown with diffused darker blotches.

530 and 531. San Francisco, California. Dr. A. L. Heermann.

26. EMBIOTOCA LINEATA, Grd.

GEN. REP. 174. PLATE XXXI and PLATE XXVI, FIGS. 5 & 6.

SPEC. CHAR.—Body sub-elliptically elongated. Anal fin elongated, with external margin nearly straight, diminishing gradually in depth posteriorly, its origin being opposite to the sixth articulated ray of the dorsal. Tip of pectorals reaching a vertical line intersecting the base of last but one dorsal spine. Eyes of medium size. Posterior extremity of maxillary even with the vertical of anterior rim of orbit. Frontal region slightly depressed above the eyes. Branchiostegals five in number. Sixty-two scales in lateral line. Ground color of upper region dark olive or reddish brown; reddish yellow beneath. Sides of abdomen with light longitudinal stripes intersecting the point of union of the rows of scales. Anal deep purple, with a yellowish vitta at its base.

533 and 534. San Francisco, California. Dr. A. L. Heermann.

27. HOLCONOTUS RHODOTERUS, Agass.

GEN. REP. 193. PLATE XXXV, PLATE XXXVI, FIGS. 1—4; and PLATE XXVI, FIGS. 7 & 8.

SPEC. CHAR.—General form elongated, neither elliptical nor fusiform. Frontal region sub-concave. Head sub-conical; mouth small; posterior extremity of maxillary not quite reaching the vertical of anterior rim of orbit. Eyes rather large and circular. Branchiostegals five. About four scales in lateral line. Bluish grey or olive above, silvery or yellow upon the sides, with rose-colored spots disposed in longitudinal series.

563 and 564. San Francisco, California. Dr. A. L. Heermann.

28. ENNICHTHYS HEERMANNI, G r d .

GEN. REP. 199. PLATE XXXVIII and PLATE XXVI, FIG. 9.

SPEC. CHAR.—General form sub-elliptical; snout sub-conical; mouth moderate; posterior extremity of maxillary even with a vertical line intersecting the centre of the pupil. Eye of medium size. Branchiostegals six. About sixty-two scales in lateral line. Back olivaceous, sides and abdomen silver and golden; flank with indistinct transverse bars or bands. Fins unicolor, yellowish and greyish.

549. San Francisco, California. Dr. A. L. Heermann.

29. AMPHISTICHUS ARGENTEUS, A g a s s .

GEN. REP. 201. PLATE XXXIX.

SPEC. CHAR.—General form sub-elliptical, more convex above than below. Snout anteriorly rounded. Posterior extremity of maxillary reaching a vertical line passing behind the pupil. Anterior anal spines rather large. Sixty-eight scales in lateral line. Branchiostegals, six. Bluish grey above, sides silvery with indistinct olivaceous transverse bands. Vertical fins and ventrals olivaceous; pectorals yellowish.

557. San Francisco, California. Dr. A. L. Heermann.

30. AMPHISTICHUS SIMILIS, G r d .

GEN. REP. 203. PLATE XXXVI, FIGS. 5—9.

SPEC. CHAR.—General form regularly sub-elliptical. Snout sub-conical. Posterior extremity of maxillary reaching a vertical line passing in advance of the pupil. Spinous portion of dorsal as high as the soft. Anterior anal spines rather small. Branchiostegal rays, five. Bluish grey above; sides silvery. Dorsal and caudal greyish yellow; anal, ventrals, and pectorals, dull yellowish.

560. San Francisco, California. Dr. A. L. Heermann.

31. MYLOPHARODON ROBUSTUS, A y r e s .

GEN. REP. 216. PLATE XLVII.

SPEC. CHAR.—Upper surface of head very declivous; snout tapering, almost wedge-shaped. Posterior extremity of maxillary extending to a vertical line drawn across the anterior rim of the orbit. Eye of medium size. Pectoral and ventral fins broad and stout. Anal nearly as large as the dorsal. Ground color olivaceous, darker above than below.

244. San Francisco, California. Dr. John S. Newberry.

32. MYLOPHARODON CONOCEPHALUS, G r d .

GEN. REP. 216. PLATE XLVI, FIGS. 5—8.

SPEC. CHAR.—Head sub-conical. Posterior extremity of maxillary bone not extending as far as the anterior rim of the orbit. Eye well developed. Pectoral and ventral fins of moderate size. Vertical fins well developed. Anal and dorsal much deeper than long. Base of anal entering twelve times and a half in the total length. Brown above; whitish beneath.

243. San Joaquin river, California. Dr. A. L. Heermann.

33. ALGANSEA FORMOSA, G r d .

GEN. REP. 240.

SPEC. CHAR.—Head contained four times in the total length. Eye moderate sized; its diameter entering five times in the length of the side of the head. Posterior extremity of the maxillary bone corresponding to a vertical line drawn behind the nostrils. Anterior margin of dorsal fin equidistant between the extremity of the snout and the insertion of the caudal.

Insertion of ventrals nearer the extremity of the snout than the base of the caudal. Scales moderate. Greenish brown above; yellowish or whitish beneath, sometimes with small scattered black spots. Fins greyish olive.

196. Mercede river, California. Dr. A. L. Heermann.

197. Mohave river, California. Dr. A. L. Heermann.

34. LAVINIA EXILICAUDA, B. & G.

GEN. REP. 241. PLATE LIV, FIGS. 1—4.

SPEC. CHAR.—Body very compressed, quite deep upon its middle; peduncle of tail rather slender. Head small; eye moderate; posterior extremity of maxillary not reaching the anterior rim of the orbit. Isthmus small. Insertion of ventral fins situated in advance of the anterior margin of the dorsal. Pectorals rather small. Caudal deeply furcated. Reddish brown above, silvery grey on the sides, the scales being minutely dotted upon their margin. Beneath yellowish.

207. Sacramento river, California. Dr. A. L. Heermann.

208. Posa creek, California. Dr. A. L. Heermann.

35. POGONICHTHYS INAEQUILOBUS, B. & G.

GEN. REP. 245. PLATE LVI, FIGS. 1—4.

SPEC. CHAR.—Head forming a little less than the fifth of the total length; snout rounded, sub-conical, thickish; gape of mouth nearly horizontal; lower jaw shorter than the upper. Posterior extremity of maxillar bone scarcely even with a vertical line drawn in front of the orbit. Anterior margin of dorsal fin somewhat nearer the extremity of the snout than the insertion of the caudal. Insertion of ventrals placed posteriorly to the anterior margin of the dorsal; their origin being nearly equidistant between the extremity of the snout and the base of the caudal. Lobes of the caudal fin unequally developed; upper one the longest. Greyish brown above; yellowish beneath.

182. San Joaquin river, California. Dr. A. L. Heermann.

36. POGONICHTHYS SYMMETRICUS, B. & G.

GEN. REP. 246.

SPEC. CHAR.—Head constituting the fifth of the total length. Snout rounded and sub-conical. Gape of mouth somewhat arched; lower jaw shorter than the upper. Posterior extremity of the maxillary corresponding to a vertical line drawn behind the nostrils. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Insertion of ventrals placed in advance of the anterior margin of the dorsal, and somewhat nearer the insertion of the caudal than the tip of the snout. Lobes of caudal fin equally developed. Dark greyish brown or blackish above; yellowish golden beneath.

191. Fort Miller, San Joaquin valley, California.—Dr. A. L. Heermann.

37. LUXILUS OCCIDENTALIS, G r d.

GEN. REP. 280.

SPEC. CHAR.—Body rather elongated, sub-fusiform in its outline. Head constituting about the fifth of the total length. Snout sub-conical, rather tapering. Gape of the mouth oblique. Posterior extremity of maxillar bone extending to a vertical line which would intersect the hind nostril. Eye large and circular; its diameter entering four times in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the extremity of the snout. Origin of ventrals nearer the insertion of the caudal than the extremity of the snout. Anterior edge of anal fin equidistant between the isthmus and the tip of the lower lobe of the caudal. Dark greyish brown above; yellowish beneath, speckled with grey.

57. Posa, or O-co-ya, creek, California. Dr. A. L. Heermann.—58 and 59. Four Creeks, Tulare valley. Dr. A. L. Heermann.

38. TIGOMA CONFORMIS, G r d .

GEN. REP. 289.

SPEC. CHAR.—Body rather short, sub-fusiform in its outlines. Head of moderate development, constituting the fourth of the total length. Mouth rather small, with its gape somewhat oblique; posterior extremity of maxillar bone extending to a vertical line drawn behind the nostrils. Eye moderate sized; its diameter entering nearly five times in the length of the side of the head. Isthmus small. Anterior margin of dorsal fin nearer the fork of the caudal than the extremity of the snout. Origin of ventrals nearer the isthmus than the insertion of the caudal. Scales well developed. Purplish brown above; dark yellowish beneath.

231. Posa, or O-co-ya, creek, California. Dr. A. L. Heermann.

39. TIGOMA CRASSA, G r d .

GEN. REP. 293. PLATE LXII.

SPEC. CHAR.—Body plump and contracted. Head rather small, constituting about the fifth of the total length. Snout short and depressed, rounded off anteriorly. Mouth moderate; posterior extremity of maxillary extending to a vertical line drawn behind the nostrils. Eye small; its diameter entering six times in the length of the side of the head. Anterior margin of dorsal fin equidistant between the extremity of the snout and the fork of the caudal. Origin of ventrals nearer the isthmus than the insertion of the caudal. Pectorals and ventrals small. Scales large. Upper region deep bluish or purplish black, lighter on the sides; beneath yellow.

216. Sacramento river, California. Dr. John S. Newberry.

40. SIBOMA CRASSICAUDA, G r d .

GEN. REP. 296. PLATE LXIV, FIGS. 1—4.

SPEC. CHAR.—Body somewhat elongated, rather thick. Peduncle of the tail very stout. Head contained four times and a half in the total length; its profile is very much inclined, and the snout sub-pyramidal. Posterior extremity of maxillar bone extending to a vertical line drawn midway between the nostrils and the orbit. Eye rather small, sub-circular; its diameter entering nearly six times in the length of the side of the head. Anterior margin of dorsal fin a little nearer the extremity of the snout than the fork of the caudal. Light purplish brown above; yellowish beneath.

235. Rio San Joaquin, California. Dr. A. L. Heermann.

41. CLUPEA MIRABILIS, G r d .

GEN. REP. 229.

SPEC. CHAR.—Body rather short, deepest upon its middle, and tapering towards either extremity. Head constituting the fifth of the length. Posterior extremity of the maxillar bone extending to a vertical line drawn through the pupil. Eye large and sub-circular; its diameter entering about four times in the length of the side of the head. Anterior margin of dorsal fin nearer the insertion of the caudal than the apex of the upper jaw. Base of anal fin comprised about eleven times in the total length; its anterior margin being nearer the insertion of the caudal than the origin of the ventrals. Origin of ventrals placed somewhat behind the anterior margin of the dorsal, and a little nearer the apex of the lower jaw than the tip of the lower lobe of the caudal. Dorsal region bluish purple; flanks and belly metallic whitish or yellowish.

949. San Francisco, California. Dr. A. L. Heermann.

42. MELETTA COERULEA, G r d .

GEN. REP. 230. PLATE LXXV, FIGS. 5—7. (By error on the plate: Figs. 1—3.)

SPEC. CHAR.—Body slender, elongated, sub-fusiform in profile. Head constituting more than the fifth of the total length. Posterior extremity of maxillar bone extending to a vertical line drawn through the middle of the orbit. Eye large and sub-

circular; its diameter entering four times and a half in the length of the side of the head. Anterior margin of dorsal fin nearer the extremity of the snout than the insertion of the caudal. Base of anal fin entering about ten times in the total length. Insertion of ventrals opposite the posterior third of the base of the dorsal fin. Bluish black above; yellowish or whitish beneath, with metallic reflects. Fins unicolor.

953. San Francisco, California. Dr. A. L. Heermann.

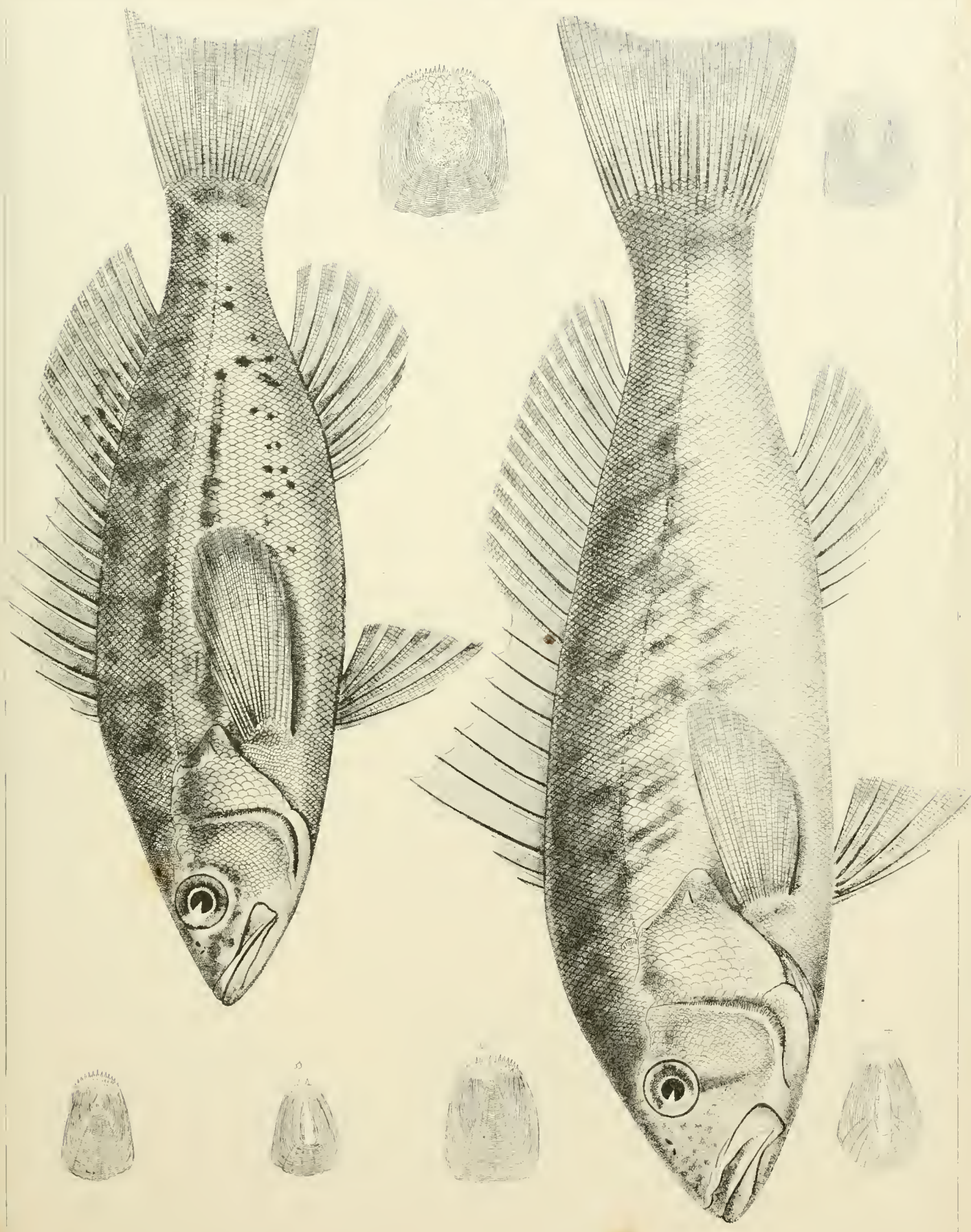
43. ENGRAULIS NANUS, G r d.

GEN. REP. 335.

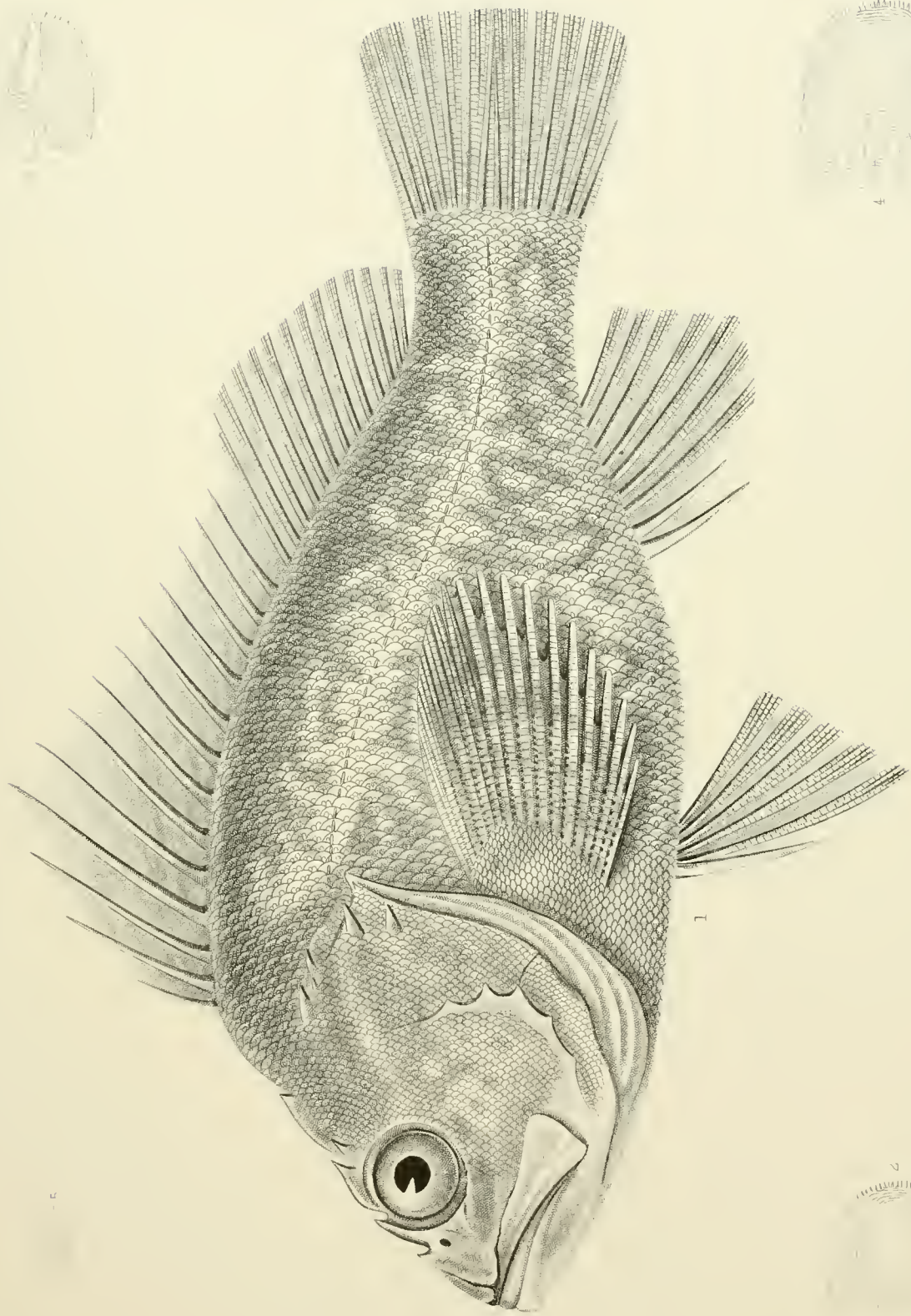
SPEC. CHAR.—Body short and slender, tapering posteriorly, and very much compressed. Head constituting the third of the length, the caudal fin excluded. Snout sub-conical. Posterior extremity of maxillar bone extending to the interopercle. Eye large and sub-circular; its diameter entering four times and a half in the length of the side of the head, exactly once in advance of its anterior rim. Anterior margin of dorsal fin equidistant between the tip of the snout and the fork of the caudal fin. Base of anal fin entering six times and a half in the total length. Vent situated immediately in advance of the anterior.

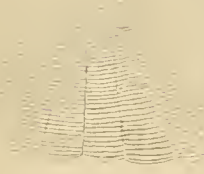
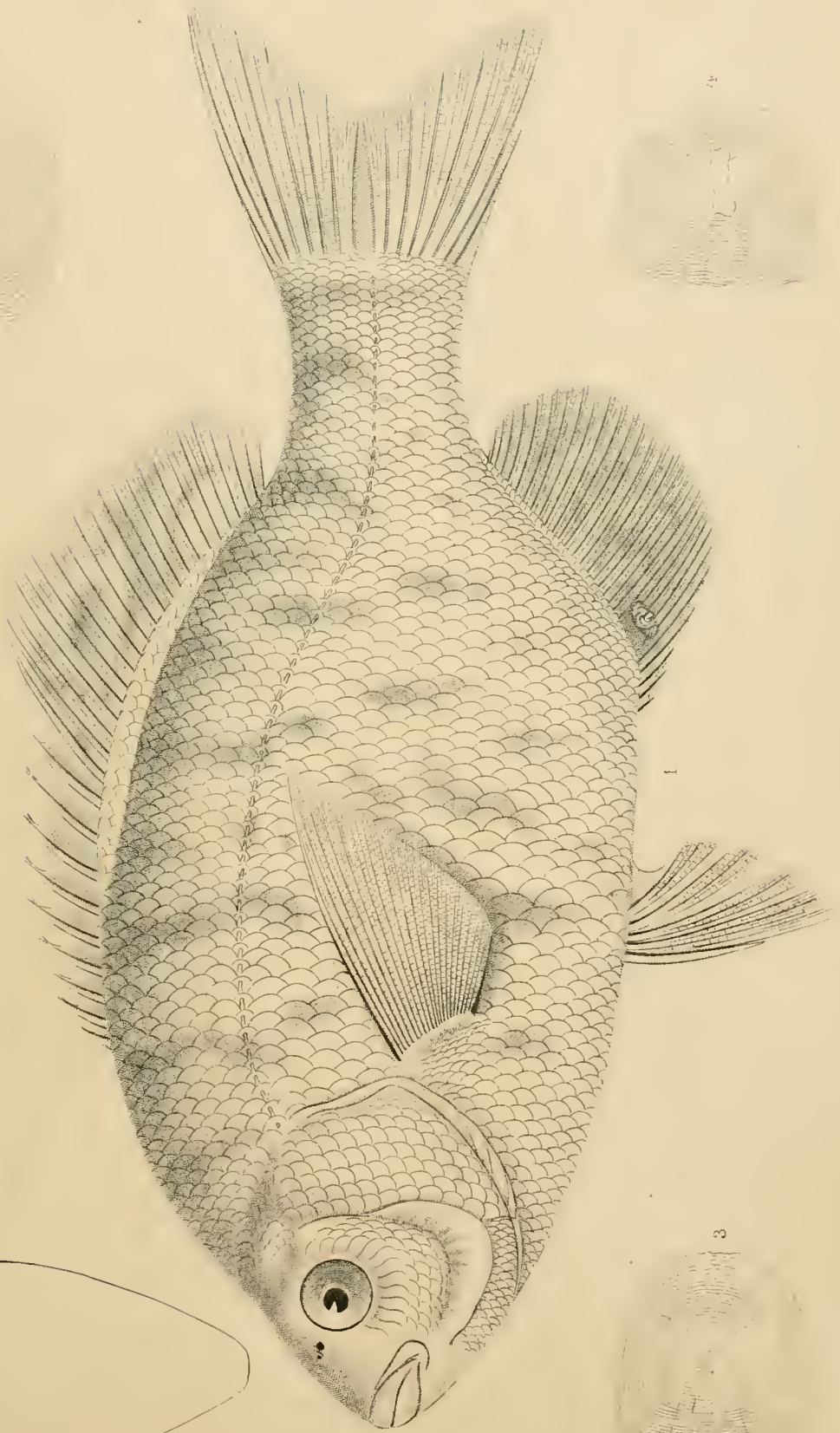
946. San Francisco, California. Dr. A. L. Heermann.











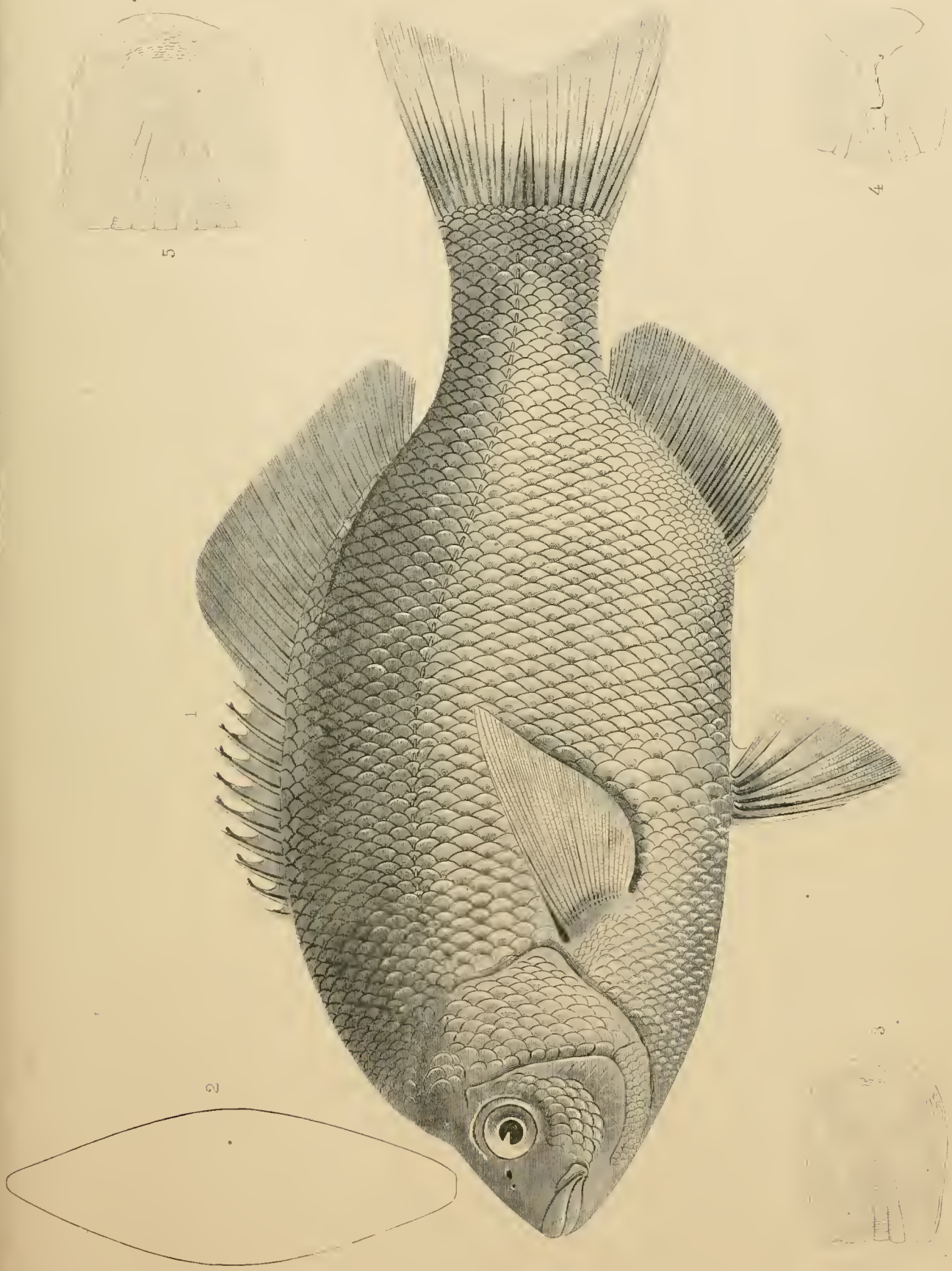
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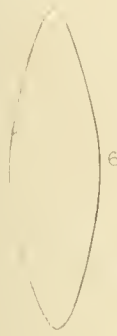


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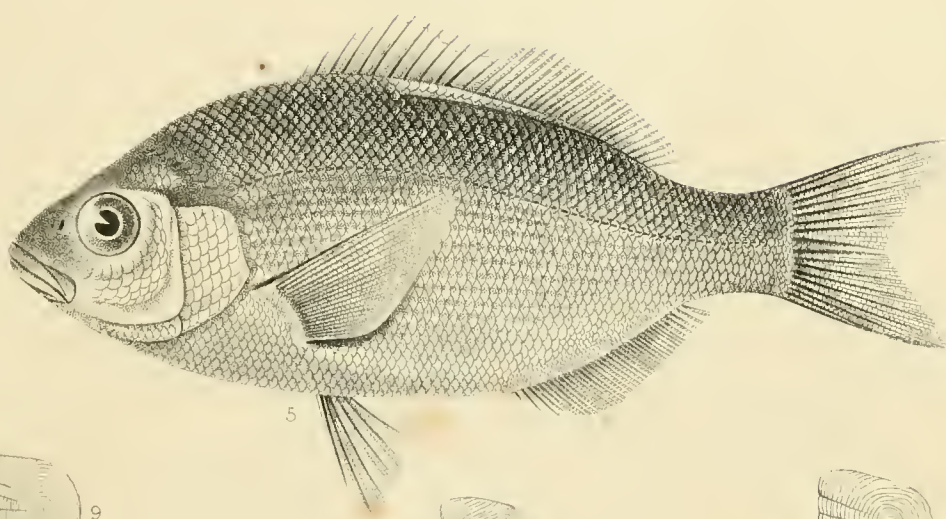








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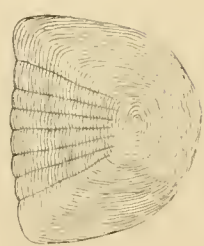
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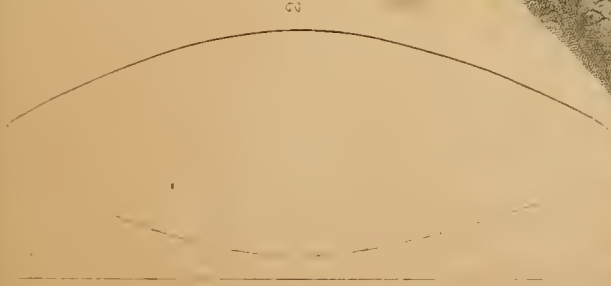
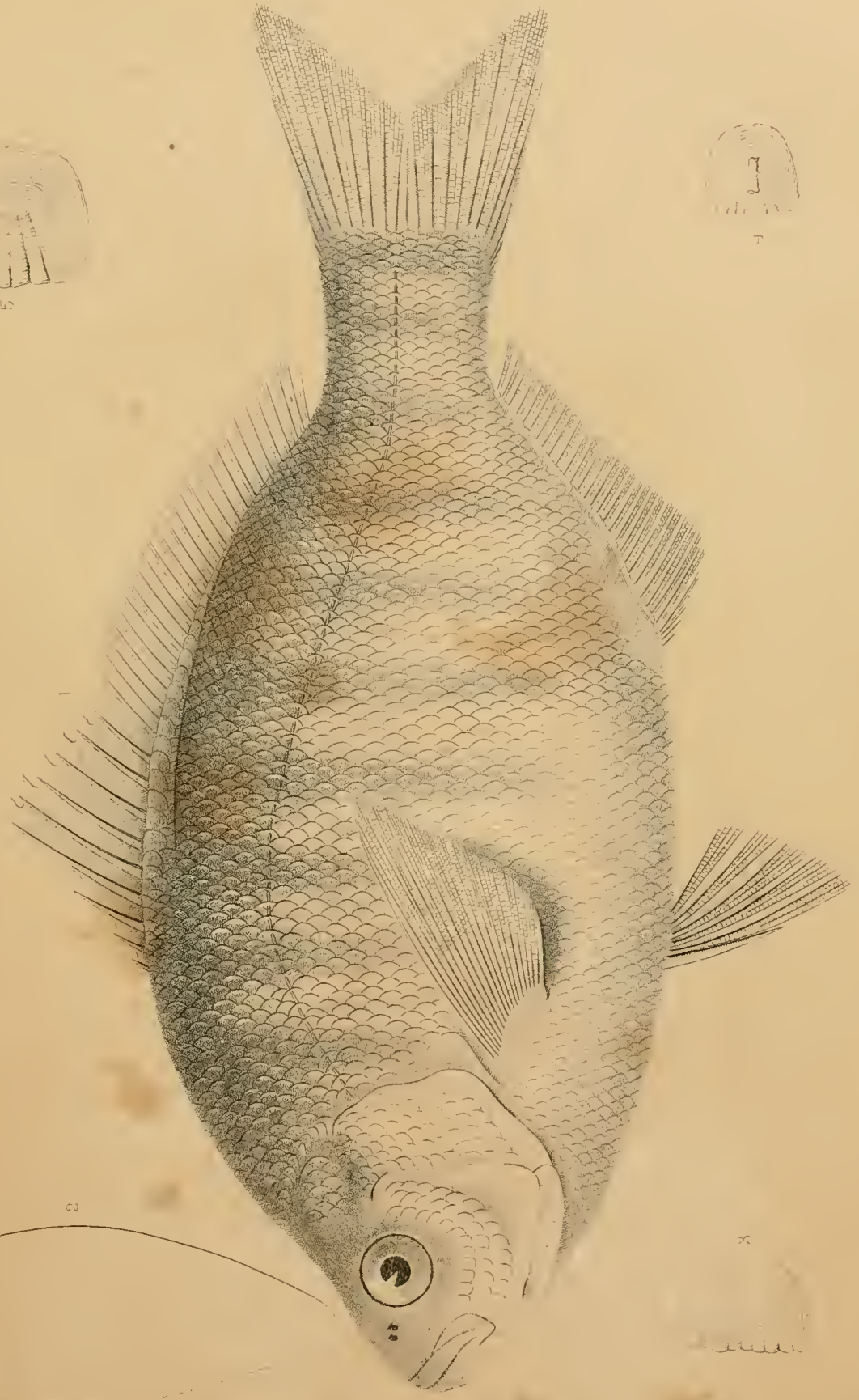
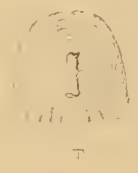
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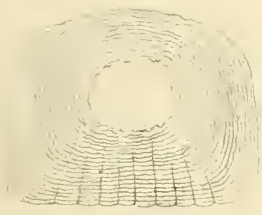
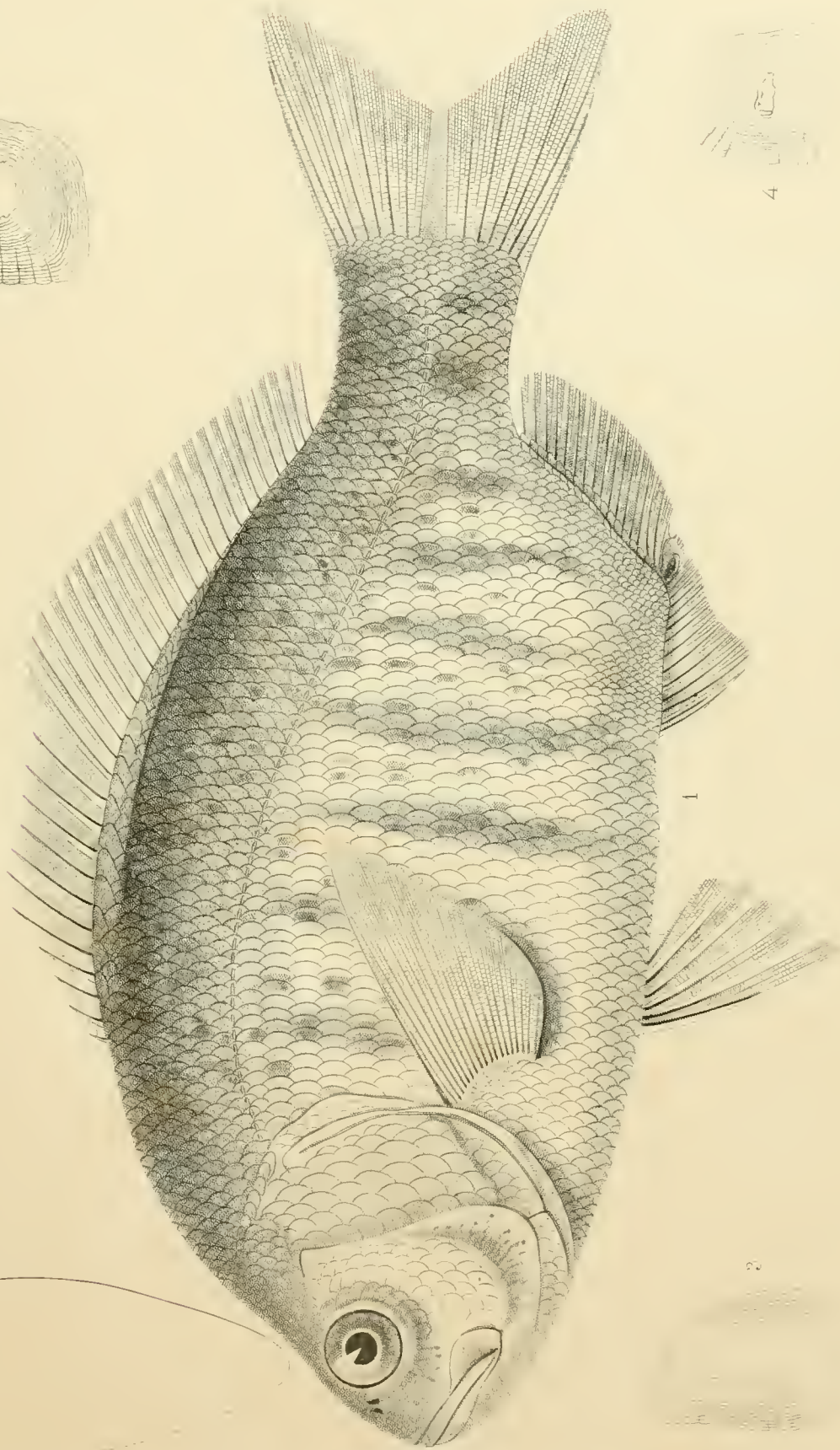


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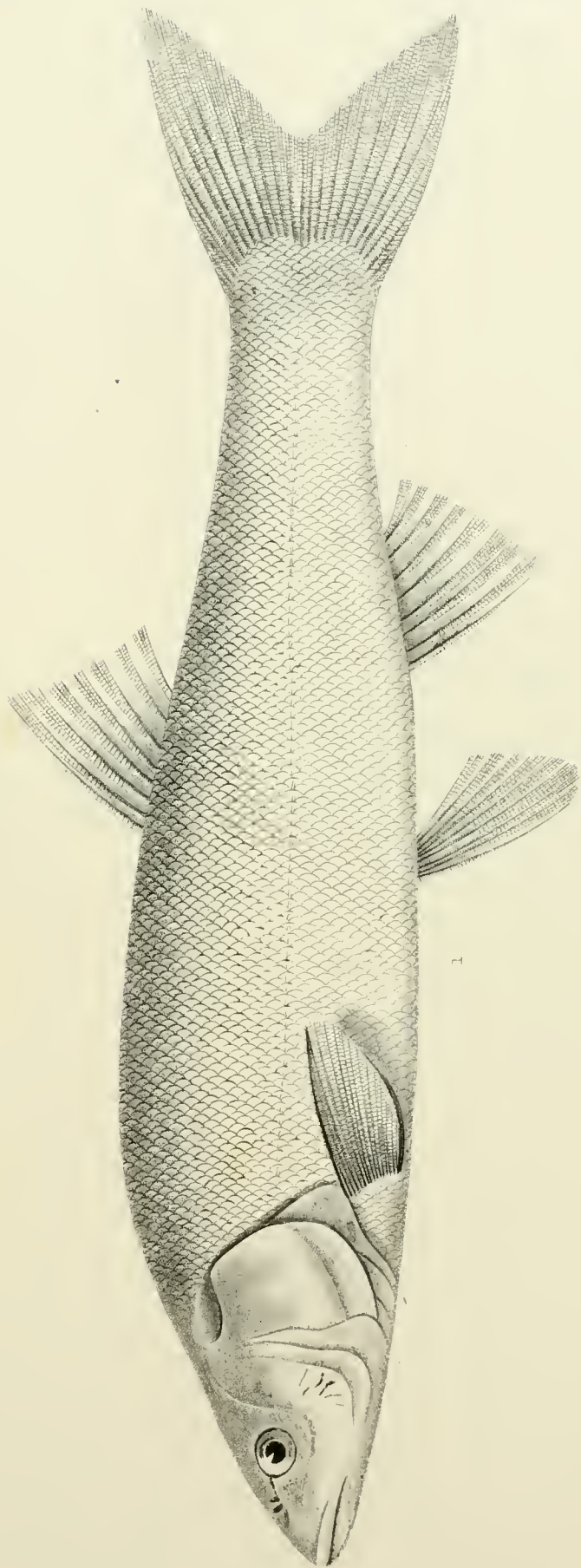
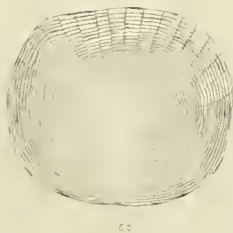
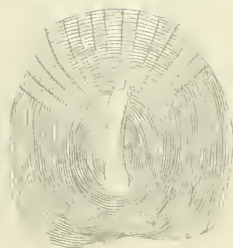


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EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.
WAR DEPARTMENT.

REPORT

OF

LIEUT. HENRY L. ABBOT,

CORPS OF TOPOGRAPHICAL ENGINEERS,

UPON

EXPLORATIONS FOR A RAILROAD ROUTE,

FROM

THE SACRAMENTO VALLEY TO THE COLUMBIA RIVER,

MADE BY

LIEUT. R. S. WILLIAMSON,

CORPS OF TOPOGRAPHICAL ENGINEERS,

ASSISTED BY

LIEUT. HENRY L. ABBOT,

CORPS OF TOPOGRAPHICAL ENGINEERS.

1855.

PART IV.

EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.
WAR DEPARTMENT.

ROUTES IN CALIFORNIA AND OREGON EXPLORED BY LIEUT. R. S. WILLIAMSON, CORPS OF TOPOGRAPHICAL
ENGINEERS, AND LIEUT. HENRY L. ABBOT, CORPS OF TOPOGRAPHICAL ENGINEERS, IN 1855.

ZOOLOGICAL REPORT.

WASHINGTON, D. C.

1857.

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BY DR. CHARLES GIRARD.

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REPORT UPON THE ZOOLOGY OF THE ROUTE.

BY J. S. NEWBERRY, M. D.

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Report upon the Mammals.

CHAPTER II.

Report upon the Birds.

No. 3.

REPORT UPON LAND SHELLS COLLECTED ON THE SURVEY.

BY W. G. BINNEY,

MEMBER OF THE ACADEMY OF NATURAL SCIENCES, PHILADELPHIA.

No. 4.

REPORT UPON REPTILES COLLECTED ON THE SURVEY.

BY S. F. BAIRD.

¹ Numbers 1, 2, and 3 will be found in Vol. VI of the Pacific Railroad Surveys, printed and published in 1857. No. 4 dates 1859.

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¹ The illustrations and page references of fishes, mammals, and birds will be found in volume VI of the Pacific Railroad series.

No. 4.

REPORT ON REPTILES COLLECTED ON THE SURVEY.

BY S. F. BAIRD.

SCOLOPORUS GRACIOSUS, B. & G.

Sceloporus graciosus, B. & G. Pr. A. N. Sc. VI, April, 1852, 69.—IB. Stansbury's Expl. Great Salt Lake, 1852, 346; pl. v, fig. 1.

Sceloporus gracilis, B. & G. Pr. A. N. Sc. VI, Oct. 1852, 175.—GIRARD, Herp. U. S. Ex. Ex. 1858, 386; pl. xx figs. 1—9.

2832. Upper Pit river. Dr. Newberry.

SCOLOPORUS OCCIDENTALIS, B. & G.

Sceloporus occidentalis, B. & G. Pr. A. N. Sc. VI, Oct. 1852, 175.—GIRARD, Herp. U. S. Ex. Ex. 1858, 383; pl. xix.

Sceloporus frontalis, B. & G. Pr. A. N. Sc. VI, Oct. 1852, 175.—GIRARD, Herp. U. S. Ex. Ex. 1858, 384; pl. xix, figs. 1—7.

2866. Upper Willamette valley. Dr. Newberry. 2838. Benicia, California. Do.

TAPAYA DOUGLASHI, Girard.

Agama douglashii, BELL, Trans. Linn. Soc. Lond. XVI, 1833, 105; pl. x.

Phrynosoma douglashii, HOLBROOK, N. Am. Herp. II, 1842, 101; pl. xiv.

Tapaya douglashii, GIRARD, Herp. U. S. Ex. Ex. 1853, 398; pl. xxi, figs. 1—5.

219. Upper Klamath valley. 220. Klamath Lake. Dr. Newberry.

ELGARIA SCINCICAUDA, B. & G.

Tropidolepis scincicauda, SKILTON, Am. Jour. Sc. VII, 1849, 202; plate —, figs. 1—3.

Elgaria scincicauda, B. & G. Pr. An. S. VI, Ap 1852, 69.—IB. Stansbury's expl. 1852, 348; pl. iv.—GIRARD, Herp. U. S. Ex. Ex. 1845, 210; pl. xxiii, figs. 1—9.

3100. Bodega, California. Dr. Newberry.

PLESTIODON SKILTONIANUS, B. & G.

Plestiodon skiltonianus, B. & G. Pr. A. N. Sc. VI, April, 1852, 69.—IB. Stansbury's Rep. 1852, 349; Reptiles, pl. iv, figs. 4—6.

Eumeces quadrilineatus, HALLOWELL, Pr. A. N. Sc. VII, June, 1854, 94.

3168. California. Dr. Newberry. 3148. Pit river, California. Do.

CROTALUS LUCIFER, B. & G.—Oregon Rattlesnake.

PLATE XI.

Crotalus lucifer, B. & G. Pr. A. N. Sc. VI, 1852, 177.—In. Catal. N. Am. Serp. 1853, 6.—GIRARD, Herp. U. S. Ex. Ex. 1858, 187, pl. xv. figs. 1—6.

SPEC. CHAR.—Head short, rather broad and deep, angles much rounded; nose less pointed than in *C. confluentus*. Labials above 15—16; below 15—16. Dorsal rows 25. A dorsal series of brown blotches not margined by whitish; two small, irregular lateral series on each side. Posteriorly 15 or 20 half rings, becoming blackish in old specimens. Light stripe from orbit below superciliary to angle of jaw above upper labials. Light stripe before the eye expanded upon the whole of the upper labials and front and sides of face below the crown and in front of the orbits. Single light transverse line on superciliaries often obsolete. Rostral not edged with lighter.—(Kennicott.)

No. 379. Lost river, Oregon Territory. Dr. Newberry.

EUTAENIA INFERNALIS, B. & G.

? *Coluber infernalis*, BLAINVILLE, NOUV. ANN. DU MUS. III, 1834, 59, pl. xxvi, fig. 3.

Eutaenia infernalis, B. & G. Catal. N. Am. Serp. 1853, 26 —GIRARD, Herp. U. S. Ex. Ex. 1858, 143, pl. xiv, figs. 11—16.

SPEC. CHAR.—Most slender of all the species of the section. Head and eye large. Above black; a series of about 110 triangular reddish yellow spots, confluent with the indistinct lateral stripe, itself confluent with the greenish white sides and abdoceo. Lateral stripe on second and third lateral rows. Dorsal rows 19.

No. 893. Fort Reading, California. Dr. Hammond.

EUTAENIA CONCINNA, B. & G.

Tropidonotus concinnus, HALLOWELL, Pr. A. N. Sc. VI, 1852, 182.

Eutaenia concinna, B. & G. Catal. N. Am. Serp. 1853, 146.

SPEC. CHAR.—Dorsal rows of scales 21, all carinated. Black, with a dorsal light stripe, and the usual lateral stripes replaced by a series of distinct salmon-colored spots.

No. 937. Portland, Oregon. Dr. J. S. Newberry.

EUTAENIA ELEGANS, B. & G.

Eutaenia elegans, B. & G. Catal. N. Am. Serp. 1853, 35.

Tropidonotus trivittatus, HALLOW. Pr. A. N. Sc. VI, Jan. 1853, 237.

SPEC. CHAR.—Body moderately stout, compact, and cylindrical; stouter than *E. pickeringii*, and the tail proportionally shorter. Head short, labials largely developed, eight above, sixth largest. Dorsal rows 19—21. Scales smaller than in *E. pickeringii*. In color strongly resembles *E. faireyii*, but with the lateral stripes differently situated. Uniform black above. Uniform light greenish below, not darker posteriorly. A broad light yellow dorsal stripe distinct to the end of the tail; the lateral stripe, on the second and third rows, broad and well defined of a greenish white color.—(Kennicott.)

No. 879. Canoe Creek, Oregon Territory.—831. Willamette valley, Oregon Territory.—884. Pit River valley, California. Dr. J. S. Newberry.—No. 878. Fort Reading, California. Dr. Hammond.

EUTAENIA COUCHII, Kennicott.

SPEC. CHAR.—Body moderately stout. Tail less than one-fourth the total length and very small. Head exceedingly elongated and narrow, more so than in any other of the genus. Snout very long, narrow, and pointed. Crown plane above; eye large; 8 upper labials, 6 largest, 7 scarcely smaller. Dorsal rows 21; outer row large, very faintly carinated; the second smaller but broader than the third; the rest rather large, elongated, and strongly carinated. Dorsal stripe narrow and very indistinct. An

indistinct dull whitish lateral stripe on second and third rows. Dark olive brown or black above the lateral stripe. Abdomen dark ashy olive or black.—(Kennicott.)

No. 866. Bank of Pit river, California. Dr. J. S. Newberry.

PITYOPHIS CATENIFER, B. & G.

Coluber catenifer, BLAINVILLE, NOUV. ANN. MUA. III, 1834; pl. xxvi, fig. 2.

Pituophis catenifer, B. & G. Catal. Am. Serp. 1853, 69.—GIRARD, Herp. Ex. Ex. 1853, 135; pl. viii, figs. 1—7.

SP. CH. CHAR.—Head elongated, conical anteriorly, narrow; snout obtuse. Rostral very broad, vertical plate pentagonal elongated, narrow, broader anteriorly. The ante-orbitals 2, post-orbitals 3. Tail forming $\frac{1}{7}$ to $\frac{1}{6}$ the total length. Dorsal rows of scales 29—31; 7 to 9 of the external rows smooth. Ground color yellowish, deepest on the back. A series of about 60—70 sub quadrate blotches from head to anus, 3 or 4 smaller series on each side. Two or three of the lateral series perfect to the tail, one continued on it. The lateral blotches not assuming the form of a series of vertical bars posteriorly. Fifteen or twenty broad, short transverse bands on the tail which are separated from the sub-caudal acutellae by the width of two or three scales.—(Kennicott.)

No. 1423. Willamette valley, Oregon. 1810. Banks of Pit river, California. Dr. J. S. Newberry.

OPHIBOLUS BOYLI, B. & G.

Ophibolus boylii, B. & G. Catal. N. Am. Serp. 1853, 82.

Coronula bultata, HALLOW. Pr. A. N. Sc. VI, Jan. 1853, 236.

SP. CH.—Black, with upwards of 30 broad ivory white transverse bands widening on the sides. Dorsal rows of scales 23.

1703. Fort Reading, California. Dr. Newberry.

MASTICOPHIS TAENIATUS, B. & G.

Leptophis taeniata, HALLOWELL, Pr. A. N. Sc. VI, 1852, 181.

Masticophis taeniotus, B. & G. Catal. Serp. 1853, 103.

SP. CH.—A broad brown dorsal stripe margined by a darker line. The four outer rows of scales on each side yellow, with a dark line through the centre of each. A dark line along the edge of the abdomen, making six dark lines on each side. Beneath yellowish. Dorsal rows 15. Tail about one-third the total length.

1983. Canoe creek, California. Dr. Newberry.

BASCANION VETUSTUS, B. & G.

Bascanion vetustus, B. & G. Catal. N. Am. Serp. 1853, 97.—GIRARD, Herp. U. S. Ex. Ex. 1853, 127; pl. viii, figs. 12—19.

SP. CH.—Stouter than *B. flaviventris*. Breadth of head across superciliaries equal to half the interval between tip of rostral and posterior end of occipitals. Lower postorbital in notch between the fourth and fifth labials. Olive-brown above, greenish white beneath.

No. 1765. Pit river valley, California. 1785. Klamath Lake, Oregon. Dr. Newberry.

DIADOPHIS PULCHELLUS, B. & G.

Diadophis pulchellus, B. & G. Catal. N. Am. Serp. 1853, 115.

SP. CH. CHAR.—Body above uniform dark greenish brown; beneath orange with small black spots scattered irregularly all over from head to tail; these spots sometimes absent. Color of abdomen extending upon lateral dorsal scales. Occipital ring broad. Dorsal scales in 15 rows.

No. 2071. California. Dr. Newberry.

WENONA PLUMBEA, B. & G.

Wenona plumbea, B. & G. Pr. A. N. Sc. VI, 1852, 176.—IB. Catal. N. A. Serp. 1853, 139.—GIRARD, Herp. U. S. Ex. Ex, 1853, 112; pl. vii, figs. 1—7.

SPEC. CHAR.—Uniform bluish lead color above; uniform yellowish white beneath. Three pairs of frontal plates. Middle pair united with the loreal, and thus extending to the labials. Labials not entering into the orbit. Dorsal scales in 45 rows.

Upper Willamette valley, Oregon. Dr. Newberry.

BUFO COLUMBIENSIS, B. & G.

Bufo columbiensis, B. & G. Pr. A. N. Sc. VI, 1853, 378.—GIRARD, Herp. U. S. Ex. Ex. 1858, 77; pl. v, figs. 4—9.

SPEC. CHAR.—Upper surface of head plane, skin adhering to the skull and granulated. Parotids and tympanum small. A membranous tarsal fold. Toes palmated. Color light greenish with black blotches and reddish spots. A dorsal white vitta. An oblique dark patch beneath the eye. Beneath soiled yellow, spotted.—(Girard.)

2578. Upper Pit river.—2580. Upper Klamath. Dr. Newberry.

SCAPHIOPUS HAMMONDII, Baird.

PLATE XXVIII, FIG. 2.

SPEC. CHAR.—Tongue very large, orbicular, without notch behind. Spade highly developed. Color above dark olive brown, with very indistinct blotches of darker. Summits of dorsal pustulation whitish. Beneath whitish, the chin black. Head and body two inches long. Hind leg $2\frac{1}{2}$.

This species is easily distinguished by its nearly uniform and very dark color, without the light lines of *S. holbrookii*, figured for comparison on figure 1 of the same plate. The tongue appears to be much broader.

3695. Fort Reading, California. Dr. J. F. Hammond, U. S. A.

HYLA REGILLA, B. & G.

PLATE XXVIII, FIGS. 3.

Hyla regilla, B. & G. Pr. A. N. Sc. VI, 1852, 174.—Id. 1853, 301.—GIRARD, Herp. U. S. Ex. Ex. 1858, 60; pl. iii, figs. 13—18.

Hyla scopularis, HALLOWELL, Pr. A. N. Sc. V, 1852, 183.

SPEC. CHAR.—Olive or ashy green, coarsely marked on each side with blotches in two longitudinal series, bordered on either side with scattered smaller and more rounded ones. A triangular blotch between the eye. A dark narrow line from snout to eye; a broad postocular vitta to the arm, beneath which is a bar of grayish white about half the width. Dorsal blotches sometimes wanting.

3229. Yreka, California, and 3231, Klamath lake. Dr. Newberry.

RANA BOYLI, Baird.

Rana boylii, BAIRD, Pr. A. N. Sc. VII, April, 1854, 62.

SPEC. CHAR.—A broad depressed ridge of skin on each side of back. Skin finely tubercular above. Head broader than long. Tympanum scarcely evident, pustulated. Tibia more than half the length of body; hind foot less than half this length; webbed entirely to the horny tips; outer toe decidedly longer than the third. An elongated tubercle at base of inner toe, with another opposite to it. Above dull reddish olivaceous, with indistinct blotches on the back, and fasciae on the legs. Beneath yellowish, mottled anteriorly. Two inches long.

Sacramento river. Dr. Newberry.

AMBLYSTOMA CALIFORNIENSE, Gray.

PLATE XXX, FIGS. 1, 2, and 3.

Amblystoma californiense, GRAY, Pr. Zool. Soc. Lond. Jan. 1853, 11; pl. vii.

SPEC. CHAR.—Black. Sides of lips, lower part of neck, body and tail, and limbs, with large white spots. Palatine teeth in an

elongated angular transverse line, bent forwards in the middle and extending to the outer edge of the hinder part of the internal nostril.—(Gray.)

Petaluma, California. E. Samuels.

ANAIDES LUGUBRIS, Baird.

PLATE XXX, FIG. 4.

Salamandra lugubris, HALLOWELL, Pr. A. N. Sc. IV, 1848, 26.

Anaides lugubris, BAIRD, Iconographie Encyclopedica, II, 1849, 256.—GIARD, Herp. U. S. Ex. Ex. 1858, 8; pl. i, figs. 26—33.

Columbia river. Dr. Newberry.

SIREDON GRACILIS, Baird.

PLATE XLIV, FIG. 2.

SPEC. CHAR.—Body slender; head short; branchial arches almost vertical, their pectination coarse and distant. General color reddish brown, marmorated and blotched, (almost vermiculated,) obscurely with blackish; quite distinctly so on the belly. Length $6\frac{1}{2}$ inches. Head and body about $3\frac{1}{2}$.

This species differs from *S. lichenoides*¹ in the variegation of reddish brown and dark brown in nearly equal proportions. The body is more slender; the branchial arches more perpendicular to the axis of the body. The feet are quite well developed. The form is much more slender than in *S. mexicanus*, the limbs stouter, the color quite different.

4080. Cascade mountains, near latitude 40°. Dr. Newberry.

¹ A full grown specimen of *S. lichenoides*, from the Rocky mountains, is figured on the same plate for comparison.

