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PROCEEDINGS

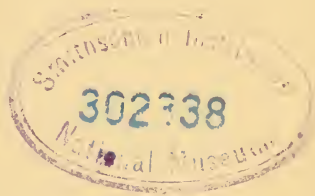
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The Committee on Publications declares that each paper of this volume was distributed on the date indicated on its initial page. The Index, title page, and minutes of meetings for 1924 (pp. i-xi; 153-156) were issued on March 12, 1925.

ERRATA

Page 80, line 24, for *Notopodium* read *Neuropodium*.
Page 83, line 8, for *labrium* read *labrum*.

PLATES

- I, II. Facing p. 18. Upper Miocene Vertebrates from Texas.
- III. Upper Miocene Mammals from Texas.
- IV, V, VI. Upper Miocene Camel from Texas.
- VII. New subspecies of *Scorpaena*.
- VIII, IX. Characters of *Drosophilidae*.
- X. *Rhinotermes longidens* Snyder.
- XI. *Rana heckscheri*.
- XII. Venters of adult males of Uncommon *Ranas* of E. U. S.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

PROCEEDINGS.

The Society meets from October to May, on alternate Saturdays, at 8 P. M. All meetings during 1924 were held in the new lecture hall of the Cosmos Club.

January 5, 1924—659th Meeting.¹

Vice-President H. C. Oberholser in the chair; 60 persons present.

The membership of the following committees was announced: Committee on Communications: E. A. Goldman, Chairman, S. A. Rohwer, H. C. Oberholser, C. E. Chambliss, J. S. Gutsell, W. R. Maxon; Committee on Publications: C. W. Richmond, Chairman, J. H. Riley, T. E. Snyder, F. C. Lincoln, G. S. Miller, Jr.; Committee on Zoological Nomenclature: G. S. Miller, Jr., Chairman, P. Bartsch, S. A. Rohwer, E. A. Chapin, H. C. Oberholser.

President Gidley was nominated as a Vice-President of the Washington Academy of Sciences as a representative of the Society.

New members: C. S. Brimley, Frank C. Baldwin.

Informal communication: S. F. Blake, Observation of a blue-gray gnatcatcher in Washington in winter.

Formal communications: W. E. Safford, Economic plants as indicators of the origin and migrations of primitive races; V. Bailey, Some habits of the grasshopper mouse, an insect-eating rodent.

January 19, 1924—660th Meeting.²

President Gidley in the chair; 41 persons present.

Informal communications: B. A. Barton, Note on the com-

¹Abstract in Journ. Washington Acad. Sci., vol. 14, p. 223-224, May 19, 1924.

²Abstract in Journ. Washington Acad. Sci., vol. 14, p. 224-226, May 19, 1924.

pletion of Prof. Bashford Dean's Bibliography of Fishes; P. Bartsch, Note on gray squirrels rolling in decayed wood.

Formal communications: P. Bartsch, Additional facts concerning the *Cerion* breeding experiments; C. D. Marsh, Relation of poisonous plants to milk-sickness in man and animals.

February 2, 1924—661st Meeting.¹

President Gidley in the chair; 90 persons present.

New member: Wilber Brotherton, Jr.

Informal communications: V. Bailey, Behavior of chipmunks in captivity; C. W. Stiles, Note on the typification of the genus *Musca*.

Formal communications: A. Wetmore, Visit of a naturalist to Wake Island; M. K. Brady, Salamanders of the District of Columbia.

February 16, 1924—662d Meeting.²

Vice-President Oberholser in the chair; 67 persons present.

Informal communications: P. B. Johnson, Note on correlations between physical measurements and susceptibility to disease; M. K. Brady, Another local record of *Pseudotriton m. montanus*.

Formal communications: L. O. Howard, Importing foreign parasites of introduced injurious insects; V. Bailey, Hoarding habits of mammals in relation to disposition and social instincts.

March 1, 1924—663d Meeting.³

Vice-President Oberholser in the chair; 111 persons present.

Informal communications: A. S. Hitchcock, Laboratory of Institute for Tropical Research in the Canal Zone.

Formal communications: H. M. Albright, Progress in wild life protection in Yellowstone National Park; O. F. Cook, The domestication of plants in Peru.

¹Abstract in Journ. Washington Acad. Sci., vol. 14, p. 226-227, May 19, 1924.

²Abstract in Journ. Washington Acad. Sci., vol. 14, p. 227, May 19, 1924.

³Abstract in Journ. Washington Acad. Sci., vol. 14, p. 227-228, May 19, 1924.

March 15, 1924—664th Meeting.¹

Vice-President Oberholser in the chair; 34 persons present.

Informal communications: H. C. Skeels, Question regarding the ending of specific personal names; R. W. Shufeldt, Extract from letters relating to *Archaeopteryx* and the Labrador duck; S. F. Blake, Roosting of purple grackles in the Soldiers' Home grounds.

Formal communications: F. V. Coville, *Grossularia echinella*, a new species of gooseberry from Florida; O. E. Sette, Conservation studies on California sardines; O. P. Hay, Distribution of vertebrates in the Pleistocene of North America.

March 29, 1924—665th Meeting.²

Vice-President Oberholser in the chair; 95 persons present.

Formal communications: E. P. Killip, Botanical exploration in Colombia; N. A. Cobb, Two blue jays, Jack and Jill, and their home life.

April 12, 1924—666th Meeting.³

Vice-President Rohwer in the chair; 50 persons present.

New members: W. W. Diehl, W. H. Rich, O. E. Sette, Mary Van Meter, J. R. Weir.

Informal communications: M. K. Brady, Discovery of a three-toed salamander in Rock Creek Park; T. S. Palmer, Note on box turtles; C. W. Stiles, Longevity of typhoid germs in the soil.

Formal communication: A. S. Hitchcock, Presidential address—
a, Remarks on the scientific attitude; b, Botanizing in Ecuador; c, How to aid the Biological Society.

April 26, 1924—667th Meeting.⁴

President Gidley in the chair; 61 persons present.

The President announced the appointment of the following trustees of the permanent funds of the Society; T. S. Palmer (3 years), H. C. Oberholser (2 years), A. S. Hitchcock (1 year).

New members: A. M. Bagusin, M. W. Talbot.

¹Abstract in Journ. Washington Acad. Sci., vol. 14, p. 393-394, October 4, 1924.

²Abstract in Journ. Washington Acad. Sci., vol. 14, p. 394-395, October 4, 1924.

³Abstract in Journ. Washington Acad. Sci., vol. 14, p. 395-396, October 4, 1924.

⁴Abstract in Journ. Washington Acad. Sci., vol. 14, p. 396-397, October 4, 1924.

Informal communications: T. S. Palmer, Note on the way in which box turtles enter the ground to hibernate; M. K. Brady, Exhibition of local lizards; A. S. Hitchcock, Question regarding the use of the trunk by elephants.

Formal communications: A. H. Clark, Animal flight; W. H. Rich, Migration of salmon in the Alaska Peninsula region.

May 10, 1924—668th Meeting.¹

Vice-President Goldman in the chair; 36 persons present.

New members: I. L. Towers, M. T. Donoho.

Informal communications: C. P. Hartley, Exhibition of specimens showing influence of length of day on growth of corn; I. N. Hoffman, Exhibition of large Coleoptera; E. A. Goldman, Note on a belief regarding the effect of the phases of the moon on the qualities of timber; J. M. Aldrich, Odor of *Dynastes tityus*, and Note on the visit of Prof. Mario Bezzi to the United States.

Formal communication: E. D. Ball, Migratory habits of insects in arid regions.

October 25, 1924—669th Meeting.²

President Gidley in the chair; 72 persons present.

Informal communications: F. C. Lincoln, Exhibition of copies of the new Authors' Index to the Proceedings of the Society; S. F. Blake, Note on the jumping habits of a snapping turtle.

Formal communications: V. Bailey, Recent observations in Glacier National Park; P. J. Baldensperger, Palestine and its fauna.

November 8, 1924—670th Meeting.³

President Gidley in the chair; 53 persons present.

Informal communication: L. O. Howard, Resolutions on the death of Ned Hollister.

Formal communications: T. H. Scheffer, Mountain beavers and moles in the Puget Sound country; G. A. Dean, The European corn borer in America; F. C. Lincoln, Results of bird banding in Europe.

¹Abstract in Journ. Washington Acad. Sci., vol. 14, p. 456-457, November 19, 1924.

²Abstract in Journ. Washington Acad. Sci., vol. 15, p. 59-60, February 4, 1925.

³Abstract in Journ. Washington Acad. Sci., vol. 15, p. 60-62, February 4, 1925.

November 22, 1924—671st Meeting.¹

President Gidley in the chair; 98 persons present.

New members: Albert L. Barrows, C. S. East, Arthur Loveridge.

Informal communications: T. S. Palmer, Remarks on the recent A. O. U. meeting at Pittsburgh, and Notes on the box turtle; V. Bailey, Note on the edible quality of wild rice; M. K. Brady, Exhibition of rare Japanese salamanders; V. Bailey, Note on the hibernation of jumping mice and bats; S. F. Blake, Note on the minute books of the Society; A. Wetmore, Occurrence of the pheasant at Takoma Park.

Formal communications: Joseph Grinnell, Faunal changes now taking place in California; H. V. Harlan, The plains and hills of the Punjab and Kashmir.

December 6, 1924—672d Meeting.²

FORTY-FIFTH ANNUAL MEETING.

President Gidley in the chair; 22 persons present.

Reports were received from the Recording and Corresponding Secretaries, the Treasurer, and the Committee on Publications.

The following officers and members of the council were elected:

President, S. A. Rohwer.

Vice-Presidents, H. C. Oberholser, E. A. Goldman, A. Wetmore, C. E. Chambliss.

Recording Secretary, S. F. Blake.

Corresponding Secretary, T. E. Snyder.

Treasurer, F. C. Lincoln.

Members of the Council, H. H. T. Jackson, H. C. Fuller, W. R. Maxon, C. W. Stiles, A. A. Doolittle.

President-elect S. A. Rohwer was nominated as a Vice-President of the Washington Academy of Sciences.

¹Abstract in Journ. Washington Acad. Sci., vol. 15, p. 63-64, February 4, 1925.

²Abstract in Journ. Washington Acad. Sci., vol. 15, p. 64, February 4, 1925.



PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

DESCRIPTION OF SOME FOSSIL VERTEBRATES
FROM THE UPPER MIOCENE OF TEXAS.

BY OLIVER P. HAY.

The fossil vertebrates described in this paper were collected by Dr. Mark Francis, of College Station, Texas, and were generously sent to the writer for examination. One collection was made on the farm of Ed. Noble, about 5 miles southeast of Navasota, about one-half mile south of Woods, on the Gulf, Colorado and Santa Fe Railroad, apparently along Walker Creek. Another collection was secured on the Jesse Garvin farm, about two and a quarter miles directly north of Navasota. The locality is between the International and Great Northern Railroad and the wagon road from Navasota to Ewing, apparently a short distance from the bench mark 305, of the map of the Navasota quadrangle. The lower jaw of a species of *Aelurodon* was found 12 miles east of Navasota and 3 miles north of Stoneham.

In securing these collections Doctor Francis had in Professor Solon N. Blackberg, of College Station, an enthusiastic assistant.

A comparison of the genera and species here described with the lists published by Mathew in 1909 (Bull. U. S. Nat. Mus. 361, pp. 112-120), and with the Snake Creek fauna (Matthew, Bull. Amer. Mus., vol. XXVI, pp. 364-365) indicates that the formation from which they came belongs near the top of the Upper Miocene or even in the Lower Pliocene.

***Ameiurus? decorus*, new species.**

In the Francis collection is the left pectoral spine of a species of catfish, belonging apparently to the genus *Ameiurus* and here described as *Ameiurus? decorus*. The specimen (pl. I, fig. 1) was found on the Garvin farm.

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It is in perfect condition, except that a little of the distal end is broken off. The original length was probably about 60 mm. The width at the middle of the length is 7.8 mm.; the thickness, 4 mm. The front edge is sharp. Immediately below this is a sharp groove; but there are no barbs on this edge. The hinder border is thickened and has two edges separated by a sharp groove. In this groove are tooth-like processes projecting but little beyond the borders of the groove, and corresponding to the barbs of existing catfish. This must have been a fish of considerable size.

***Aelurodon francisi*, new species.**

The type of this apparently new species is a lower jaw lacking the ascending rami and the symphysis. The left branch contains the two hinder premolars and the three molars, all in fine condition. The hard sandstone matrix still adheres to the outer face. The left branch is practically free from matrix, but the teeth are badly preserved. The specimen was discovered in a well, at a depth of 22 feet, on the farm of J. Niscavit, on the Grimes Prairie, 12 miles east of Navasota and 3 miles north of Stoneham. On account of the finding of these bones the well was abandoned.

Fig. 1 of plate III presents a view, of the natural size, of the outside of the left ramus; figure 2, a view of the teeth seen from above. Most of the bone of figure 1 is hidden. There are two premolars and three molars, all of which are slightly worn. The length of the series is 61 mm.

Following are the measurements of the individual teeth:

	Pm ₃	Pm ₄	M ₁	M ₂	M ₃
Length.....	9.	12.8	24.	10.5	6.5
Width.....	6.	7.2	10.5	7.	4.6

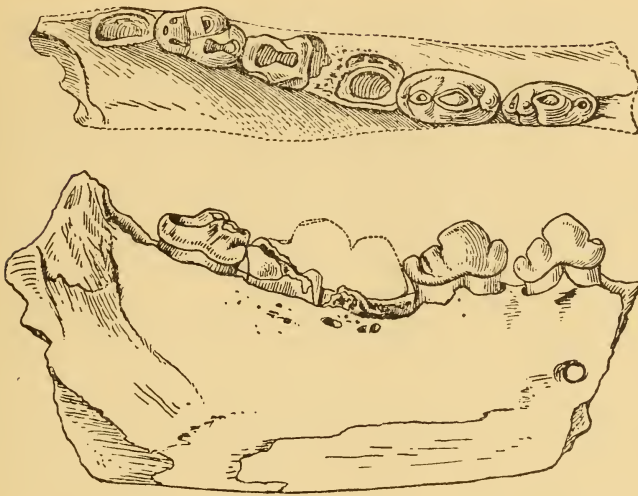
The depth of the jaw below the first molar is 28 mm.; below the third premolar, 24 mm. The thickness beneath the first molar is 15 mm.

The type of *Ae. saevus*, the genotype of *Aelurodon*, is in the U. S. National Museum. It was a larger species than *Ae. francisi*, the length of the teeth pm₃-m₃ being close to 70 mm. The length of pm₄ is 15 mm.; the width, 11mm. This tooth differs from that of *Ae. francisi* in having a more prominent metaconid and a broader heel, 9.5 mm., instead of 7.5 in *Ae. francisi*. The jaw in the latter species is relatively thicker, 15.5 mm.; in *Ae. saevus*, 15 mm. In *Ae. francisi* the inner face of the jaw is flatter than in *Ae. saevus*. The premolars have anterior basal cusps. As compared with Matthew's *Ae. saevus secundus*, the two hinder premolars of *Ae. francisi* are thinner, and have a distinct paraconid and a heavy inner cingulum.

Inasmuch as this jaw was found in a deposit of sand, at a depth of 22 feet, it may be older than the other fossils.

***Aelurodon simulans*, new species.**

In the collection made on the Noble farm is a part of the right horizontal ramus of a lower jaw of a dog which the writer describes under the name *Aelurodon simulans*. There are present, in fine condition, the third and fourth premolars, and the second molar; also the front socket and the hinder root of the first molar and the socket of the third molar. The crowns of the



Aelurodon simulans. Right side lower jaw. Upper figure. Occlusal aspect. Lower figure. Outer face.

teeth in place are little worn. At first this specimen was taken to belong to *Ae. francisi*.

The jaw presents almost exactly the part shown in the type of *Ae. francisi*. The depth beneath the first molar is 24 mm.; under the third premolar 24 mm.; under the first molar 13 mm. Following are the measurements of the teeth:

	Pm ₃	Pm ₄	M ₁	M ₂
Length.....	11.	13.4	21±	11.8
Width.....	5.5	7.	7.

The teeth are in general longer and narrower than those of *Ae. francisi*; but the first molar was evidently shorter. The second molar has a longer talon than that of *Ae. francisi*, and a more developed anterior cusp. Also these cusps on the premolars are rather larger than those of *Ae. francisi*. The main cusp on the premolars have the backward pitch of other species of the genus. The diameters of the socket of the canine, just below the second premolar, are 5.4 mm. and 9 mm. In *Ae. francisi* they are 5 mm. and 7 mm.

Tephrocyon scitulus, new species.

In the Francis collection is a part of the right maxilla of a dog-like animal which is referred to *Tephrocyon*. Inasmuch as it appears not to agree with any of the known species it is described as *Tephrocyon scitulus*. The jaw was collected in the Garvin gully.

The fragment of bone contains the fourth premolar and the first molar; also the sockets for the third premolar, one of those of the second premolar

and one of those of the second molar (pl. I, figs. 2, 3). The teeth present are only slightly affected by wear. The fourth premolar is complete; the first molar has the inner border of the crown broken off.

The distance from the front of the third premolar sockets to the rear of the first molar is 38.5 mm. From the front of pm⁴ to the rear of m¹ is 26 mm. These measurements are taken in a straight line. Pm⁴ is 17 mm. long, 9 mm. wide at the protocone; the paracone is 9.5 mm. high. The first molar is 11 mm. long on the outer border. Its width can not be accurately determined. On the front end the width must have been close to 14 mm. The outer border of the molar makes a large angle with the carnassial. The protocone of the carnassial projects somewhat in front of the body of the tooth and only slightly inward. On the front edge of the paracone is a very small rudiment of a protostyle. A distinct cingulum passes around the crown.

On the first molar a paracone and a metacone are well developed. A prominent ridge connects, with hardly any interruption, the protocone and the hypocone. A basin is thus enclosed. In the rear of this is a cusp which may be the metaconule. Outside of the paracone and the metacone is a heavy cingulum.

The first molar of *T. rurestris* (Merriam, Bull. Dept. Geol. Univ. Calif., vol. VII, p. 364, fig. 3) is much larger than in the species here described. In *T. hippophagus* the first upper molar is 14.2 mm. long; in *T. scitulus*, 11 mm. *T. temerarius* and *T. confertus* appear to have had the size of *T. scitulus*, but are known from lower jaws only.

Two species are here referred to the genus *Miohippus*. The generic characters appear to conform to those determined by Osborn in his Iconographic Revision. Hitherto the genus has not been found later than in the Lower Rosebud of the Lower Miocene.

Miohippus blackbergi, new species.

This supposed new species has for its type an upper left tooth which is taken to be the third true molar. With it is associated provisionally a part of the right ramus of the lower jaw containing two premolars and two molars. These were collected in the Garvin gully. The species is named in honor of Prof. Solon N. Blackberg, of College Station, Texas.

The upper molar (pl. I, figs. 4, 5) is wholly unworn. The following measurements in millimeters have been secured:

Length of the ectoloph.....	11.3
Height of the ectoloph.....	9.8
Height of hypocone.....	7.
Length of crown at middle of width.....	10.6
Width of crown along front border	13.
Width of crown along rear border.....	11.5

The ectoloph forms an angle of about 75° with the front border of the crown. The parastyle and the mesostyle are prominent and narrow. The corresponding ribs are well developed. The protoloph is interrupted by

the protoconule. There is no break in the metaloph between the hypocone and the metaconule. The metaconule has met the lamina advancing from the ectoloph, but there is a deep notch at the line of union. A similar notch remains where the protoloph joins the parastyle. The triangular hypostyle is not wholly free from the cingulum. A spur is approaching a lamina from the ectoloph and another joins the metaloph, so that the post-fossette is enclosed. There is no trace of the crochet. The anterior and posterior cingula are present; the external is feeble; the internal, obsolete.

Another upper left grinder, the hindermost, has lost the enamel of the outer face. The lophs are somewhat worn. There is no trace of the crochet. The crown is 10 mm. long.

In the fragment of the right ramus of the lower jaw are four teeth, pm_3 - m_2 (pl. I, fig. 8; pl. III, fig. 3). The length of this series is 41.5 mm. The teeth are well worn, and they did not belong to the same individual as the molars just described. The length of the two premolars is only slightly greater than that of the two molars, but the width is greater, so that they are larger teeth.

Measurements of lower teeth in millimeters.

Teeth	Length	Width
pm_3	10.5	8.8
pm_4	10.	9.1
m_1	9.8	7.2
m_2	10.	7.1

An external cingulum is present; also a noticeable internal cingulum. In the entrance of the inner valley of the premolars and molars is a minute tubercle. A little cement is observed along the outer cingulum. There is no trace of a groove between the metaconids and the metastylids. Infolds of enamel into the areas of the protoconids and hypoconids are simple. The parastylids are well developed.

Among the loose teeth in the collection is a small, wholly unworn lower left first molar (pl. I, figs. 6, 7) which appears to belong to this species. The height is 8.2 mm.; the length 11 mm.; the width 7.4 mm. The metaconid and the metastylid are hardly separated at their summits. The hypoconulid is relatively large. There is a cingulum at each end of the crown, but none externally or internally. No root had yet developed.

This species appears to have been even smaller than Osborn's *Miohippus equinanus* (Mem. Amer. Mus. Nat. Hist., n. s. vol. II, pt. 1, p. 66, fig. 6), from the Lower Rosebud, of South Dakota. The supposed molar of *M. blackbergi* has about the same length as the first molar of Osborn's type, but it is considerably narrower. The Texan tooth appears not to be more hypsodont than those of *Mesohippus bairdi*.

***Miohippus navasotae*, new species.**

The type of this species is a single upper tooth (pl. I, figs. 9, 10) taken to be the third true molar. It is wholly unworn. The ectoloph is placed obliquely to the front border; and the inner end of the protoloph and of the

metaloph are thrown well backward. There is slight indication of cement on the crown. This tooth and those here referred to the same species were collected in the Garvin gully.

The following measurements of the type molar are taken in millimeters:

Greatest height of paracone.....	14.5
Height of protocone.....	8.5
Length of crown at middle of width.....	16.5
Greatest width of crown.....	22.

The protoloph is hardly interrupted by the protoconule and the metaloph not at all by a metaconule. There is a minute crochet. The protoloph ends within the anterior cingulum before it reaches the parastyle. The metaloph fails by a little to attain the ectoloph. On the ectoloph is a ridge beginning to reach out toward the metaloph. The hypostyle is large, V-shaped, still attached to the posterior cingulum and sending a spur toward the ectoloph. It joins the base of the metaloph, so that at an advanced stage of wear the postfossette would be enclosed. The outer styles are all well developed and the corresponding ribs are present, but inconspicuous. Front, outer, and rear cingula are present.

Among the approximately 50 lower grinding teeth of the primitive horses sent by Doctor Francis are three which appear to belong to *Miohippus navasotae*. One of these is taken to be the first or the second true molar of the left side (pl. I, figs. 11, 12). The edges of the lophs are only slightly touched by wear. Like the upper molar, the tooth is brachyodont. The total length of the crown is 21 mm. The height of both protoconid and hypoconid is 9.1 mm. The slope of these cusps is such that their summits reach the middle of the width of the crown. This width is 14.3 mm. The height of the metaconid is 8.2 mm. At a very early stage of wear the groove between this and the metastylid would disappear. The hypoconulid is large, and the prominent cingulum passes from this around the base outside to the parastylid. The roots of this tooth were not yet developed.

The two lower teeth of the right side are apparently third (pl. I, fig. 13) and fourth premolars. They are considerably worn. Each is 18.5 mm. long. The supposed third premolar is 12.6 mm. wide on the front lobe; 14.3 on the hinder. The lobes of the fourth premolar are more nearly equal in width, 14 mm. There is no groove between the metaconid and the metastylid. Except on the inner face, the cingulum is well developed.

This species is apparently not far removed from *M. gemmarosae* Osborn (Mem. Amer. Mus. Nat. Hist., n. s. vol. II, pt. 1, p. 66, figs. 46, 47) from the Lower Rosebud, of the Lower Miocene of South Dakota. In the Texas type tooth the obliquity of the ectoloph is greater than in Osborn's type; the protocone is less nearly separated from the protoconule, and the metaloph appears to join more nearly the ectoloph. At no stage of wear in *M. navasotae* would the metaloph be constricted as shown in Osborn's figures.

Parahippus minutalis, new species.

This small species is based on four upper teeth found in the Garvin gully. Two of these belong to the right side and two to the left. The writer indi-

cates these teeth by the letters *a, b, c, d*. Those having the letters *a, b*, appear to be molars. The other two may be premolars. The one indicated by *d* has lost its parastyle, and is more worn than any of the others; they are low crowned teeth (pl. I, figs. 14–17).

Measurements of teeth in millimeters.

	<i>a.</i>	<i>b.</i>	<i>c.</i>	<i>d.</i>
Height of crown				
at paracone.....	7.	7.5	7.
Length on midline..	9.5	10.5	10.	9.
Mesostyle-hypo-				
cone width.....	13.	13.5	13.5	12.3

In all these teeth the transverse lophs are fully joined to the ectolophs. The protoconule is separated from the protocone by only a slight constriction; the metaconule similarly from the hypocone. The hypostyle rests on the rear cingulum and early coalesces with the metaloph and ectoloph. It is large, triangular, and not notched behind. The crochet is present in all the teeth except *d*. Where present, it is pressed against the protoloph, but has not coalesced with it. No enamel folds enter the fossettes. Through the union of the hypostyle with the metaloph the postfossette is early entirely closed.

The external styles are prominent; the intervening ribs low and rounded. The external cingulum is relatively strong; as are, too, the front and rear cingula along the protocone and the hypocone. The internal cingulum is obsolete. There appears to have been no cement.

A prominent character of these teeth is their breadth relative to the length of the crown. In Douglass's *Parahippus minimus* the length is about .70 of the width; in *P. minutalis*, only about .55 the width.

The writer estimates that the skull of this species was only about 8 inches long.

Merychippus vellicans, new species.

In the collection made in the Garvin gully are about a dozen upper molars which appear to belong to an undescribed form of *Merychippus*. Inasmuch as these are loose teeth, one is chosen as the type of the species. This is an upper left tooth believed to be a fourth premolar (pl. I, figs. 18, 19). It is worn only moderately. The measurements of this tooth are as follows:

Height of paracone.....	15. mm.
Height of protocone.....	8.5
Length of crown.....	15.
Width at base in front.....	20.5

The protocone is on the point of joining the protoconule, and this has united with the ectoloph. The hypocone has joined the metaconule; and the latter, the ectoloph. The crochet is pressed against the protoloph, but the enamel of both separates them. From the metaloph two enamel folds enter the pefossette, and one has pressed into the postfossette.

The protocone is broadly pyriform and is larger than the hypocone. The abraded hypostyle sends an enamel fold into the postfossette and another joins the metaloph. The outer cingulum is weak and the others are obsolescent. The outer styles are well developed; the anterior is rather broad. The ribs between the styles are low and rounded. There is a lining of cement in the fossettes, but these are not filled. A rather thin layer of cement covers portions of the external walls.

A series of three teeth (pl. I, figs. 20, 21) believed to be the second, third, and fourth premolars, but possibly belonging to as many individuals, is described and figured. They represent different stages of wear.

Measurements of upper premolars in millimeters.

	Pm ²	Pm ³	Pm ⁴
Length.....	19.	15.5	15.1
Width of base.....	18.	18.6	20.9
Height of paracone.....	8.	16.5	18.0

From the protocone of the second premolar some enamel is missing. In this tooth the protocone has fully united with the protoconule, but between this and the ectoloph there is a thin notch. The inner valley opens out into the prefossette, but the way is obstructed by a little ring of enamel. The hypostyle is broadly connected with the metaloph.

The third premolar is less worn. The crochet, the protocone, and the protoconule are in close contact, but separated by their enamel. The metaloph sends two folds into the prefossette. The triangular hypostyle is not abraded, but joins the metaloph nearly to its summit. The fourth premolar has not been affected by wear. All its surface is thinly covered with cement. Occasionally an upper tooth is found which has the caballine fold.

Most of the 50 loose molars and premolars sent by Doctor Francis appear from their size, degree of hypsodonty, and development of cement, to belong to *Merychippus vellicans*. Three premolars of the right side are selected for description, pm₂, pm₃, pm₄ (pl. I, figs. 22). They may have belonged to as many individuals. The second premolar is worn somewhat; the third less; the fourth not at all.

Measurements of lower premolars in millimeters.

	Pm ₂	Pm ₃	Pm ₄
Height of crown on outside.....	8.8	14.5	17.5
Height of crown on inside.....	7.5	10.0	12.0
Length.....	16.0	14.5	16.0
Width.....	10.0	11.0	12.5

In the second premolar the metaconid and the metastylid form a single cusp. In the other the cusps are distinct; and on the inner face of the tooth a shallow groove separates them nearly to the base. The outer and the inner cingula are obsolete. On the front end a distinct cingulum starts at

the bottom of the protoconid and passes inward to the summit of the parastylid. At the rear end is a similar cingulum rising to the summit of the hypoconulid. All of these teeth are well cemented.

Figure 23 of plate I shows two left lower molars and figure 24 the same teeth, with the first molar.

Measurements of lower molars in millimeters.

	M ₁	M ₂	M ₃
Height of crown on outside.....	11.	15.	15.
Length.....	15.	16.5	19.
Width.....	12.	10.	9.

This species seems to be the most closely related to Osborn's *Merychippus isonesus primus* (Mem. Amer. Mus. Nat. Hist., n. s. vol. II, pt. 1, p. 104, figs. 2-4). It differs from that, however, in having lower crowned upper teeth, with two or three enamel folds entering the prefossette. Apparently, too, the enamel of the lower teeth in *M. isonesus primus* is much less complicated than in *M. vellicans*. Osborn's species is from the Arikaree formation, lower Middle Miocene, western Nebraska.

Merychippus socius, new species.

In the collection made in the Garvin gully are several upper molars which resemble in many respects the species here called *Miohippus vellicans*, but which differ so much that it seems best to regard them as belonging to a distinct species. Two of these teeth (pl. I, figs. 25, 27) appear to be second and third premolars; two others (pl. I, fig. 26) to be second and third molars. These four teeth are taken as the type of the species. They appear to have belonged to one individual, but this is not certain. These teeth differ from the corresponding ones of *M. vellicans* especially in being considerably shorter crowned. The four teeth figured are only moderately worn. The two premolars taken together are 32 mm. long; the two molars, 26.5 mm. The height of the metacone of the third premolar is 14 mm. That of the corresponding tooth of *M. vellicans*, in about the same stage of wear, is 16 mm. In *M. vellicans* the metaloph is uninterrupted from the first; in *M. socius* the hypocone is for a while distinct. In *M. vellicans* the metaloph sends at least two folds into the prefossette and one into the postfossette; in *M. socius* there is apparently only one in each, and these may be wanting.

Merychippus francisi, new species.

This species is based on teeth which were found by Dr. Mark Francis on the Noble farm.

Of teeth there is an upper which is taken to be a left first or second true molar (pl. I, figs. 28, 29) and this is made the special type of the species. There are also an upper right second premolar, the outer half of another upper molar or premolar, and a hindmost lower molar. It is not certain that any two of these teeth belonged to the same individual.

The type tooth, m¹ or m², of the left side, is practically complete and only moderately worn. The height on the outer face is 22 mm., on the inner 15

mm. It is considerably curved and has a coat of cement. The fossettes too are filled with cement. The length of the crown is 15 mm.; the width 16 mm.

The structure of the tooth is an advanced one, not greatly different from that of *Equus*. The protocone is elongated, flat, and 7 mm. wide. There is no caballine fold in the median valley. At the front of the protocone is a notch but no loop of enamel. In the rear wall of the prefossette are two enamel folds, none in the front wall. Likewise in the postfossette are two folds in the anterior wall; none in the rear. The hypostyle is represented by a ring of enamel. The parastyle and mesostyle are prominent and thin. The corresponding ribs are low.

This tooth is somewhat smaller than the type of *M. severus* Cope. It is in a much more progressive stage of development.

The upper right second premolar (pl. II, figs. 1, 2) appears to be worn down about one-half of the height. The height at the rear of the outer face is 18 mm.; on the inner face, 10 mm. The length of the grinding face is 22.5 mm.; the width 19.5 mm. The protocone is circular and opens into the protoconule. In the rear wall of the prefossette is one deep fold and outward from this two shallow folds. In the rear wall is one deep fold. The median valley still opens into the prefossette.

The outer half of an upper molar (or premolar) is wholly unworn. It presents the thin sharp mesostyle, obsolescent ribs, and the fossettes filled with cement. The height of the crown on the outer face is 25 mm., the width at half the height, 16.5 mm. A fragment of another upper grinder presents the postfossette, the median valley, and part of the protocone. There is a distinct caballine fold.

A right lower molar or premolar is moderately worn. The height of the crown is 17 mm.; the length about mid-height is 15 mm.; the thickness 9 mm. Most of its surface is covered with cement. Where exposed, the enamel is provided with wrinkles directed up and down. The metaconid and the metastylid are separated by a distinct groove. The infolds from the inner face are deep. There is a distinct hypoconulid.

The left hindermost lower molar (pl. II, figs. 3, 4) is slightly worn. Its height is 22 mm.; the length 21 mm.; the thickness in front 7.5 mm. The metaconid and metastylid are separated by a deep groove. The infolds into the protoconid and the hypoconid are deep and complicated, quite as in *Equus*. The faces of the tooth are covered with cement.

Procamelus leptognathus Cope.

In the collection made on the Noble farm is a fragment of the right side of the lower jaw which contains the first and second molars. It seems necessary to refer this specimen to Cope's *Procamelus leptognathus*. This was described by Cope in 1893 (*Vert. Paleont. Llano Estacado*, p. 37), and was found in the Clarendon formation in northwestern Texas. Apparently no figure of the type has ever been published. Cope thought it uncertain that the species belonged to the genus *Procamelus*. Inasmuch as the upper incisors and premolars are not known and no limb bones, the species may belong to *Protolabis*.

The teeth of the specimen to be described (pl. II, fig. 5; pl. III, fig. 4) are in good condition and only moderately worn.

Measurements of molars in millimeters.

	M ₁	M ₂
Length of base.....	15.	20.
Length of grinding surface.....	18.	22.
Thickness at base.....	9.	10.2
Height on outer face.....	10.	13.

On the inner face the styles are weak and the ribs are low, broad and rounded. The jaw is slender. The depth at the front of the second molar is 23 mm. on the inner face; 19 mm. on the outer.

That part of Cope's description which may be applied to the specimen at hand runs as follows: "The mandibular ramus is remarkable for its slender proportions." "The crowns of the second and third true molars in both jaws are compressed. Vertical ridges are little marked on the internal side of the inferior molars." "Elevation of jaw at Mii, 23 mm." "Diameters inferior Mii, anterioposterior, 23 mm.; transverse at base, 12 mm."

Procamelus concerptus, new species.

The type specimen of this species is a part of the left horizontal ramus of a lower jaw (pl. IV, figs. 1, 2) found in the Fleming formation on the Garvin farm. It belonged to a young animal whose third permanent incisor had not yet appeared and which still retained the fourth milk molar. The first and second incisors and the last molar are not present. With the exception of the fourth milk molar, the teeth are only slightly worn. The following measurements are taken: The height is taken on the inner face.

Measurements of teeth in millimeters.

	C.	Pm ₁	Pm ₂	Pm ₃	Dm ₄	M ₁	M ₂
Height of crown.....	8.	10.	7.	7.	8.3	14.5	19.
Length of crown.....	8.5	9.	10.2	13.4	23.	21.3	25.
Thickness of crown....	3.4	5.	4.	6.	10.6	13.	15.

The third permanent incisor was ready to appear. It is a sharp blade, 11 mm. wide. The first and second permanent incisors probably fell out of their sockets after the death of the animal. The canine is convex on the outer face; the inner face has two grooves separated by a broad rib. The first premolar is convex on the outer face; less so on the inner. The fourth milk molar is three-lobed. The first and second molars have, on the inner faces, moderately developed styles and ribs. On the outer side the front and rear faces of each lobe meet to form a rather definite ridge. The first diastema is 21 mm.; the second, 18 mm. Measured on the inner face, the depth of the jaw just behind the first premolar is 19 mm.; below the first molar 29 mm. The mental foramen is in front of the first premolar. The symphysis was about 50 mm. long. Some of these measurements will probably be found greater in older specimens. The molars of this camel

differ from those referred to *Protolabis francisi* in being larger, thicker, and with less prominent ribs.

From the specimen here referred to *Procamelus leptognathus* the jaw described differs in being deeper; also the molars are longer and thicker and have better defined ribs on the inner faces. *Protolabis angustidens*, of the Pawnee Creek beds, Middle Miocene of Colorado (Cope and Matthew, Tertiary Mamm., etc., 1915, pl. CLIV, fig. 4), differs in greater inequality of length of the first and second molars. Also the second molar measures 30 mm. instead of 25 mm. as in *P. concerptus*.

Procamelus gracilis, of the Arikaree, Upper Miocene of Nebraska and South Dakota, as illustrated by Cope's figure of "*P. occidentalis*" (Wheeler's West 100th Merid., vol. IV, pl. LXXVII, fig. 3), later referred (Cope, Llano Estacado, 1893, p. 37) to *P. gracilis*, has the second molar longer (27 mm. \pm) and thicker (17 mm. \pm).

Inasmuch as only the lower jaw is present, it is possible that the species belongs to the genus *Protolabis*. It may be, too, that some of the limb bones in the Francis collection belong to the same species, but there is now no way of connecting them.

This camel was apparently about one-fifth larger than the llama, *Lama glama*.

***Procamelus benedentatus*, new species.**

This species has for its type the nearly complete right ramus of a lower jaw containing the teeth, excepting the incisors and the canine; to it are referred also four loose lower molars. The jaw and the teeth were collected in the Garvin gully.

The ramus is preserved to the rear of the last molar (pl. V). The teeth are in good condition, except that a little is broken from the front of the third and the fourth premolars. The symphysis was not coössified.

Measurements of lower jaw and teeth:

	mm.
From incisive border to rear of m_3	200
From incisive border to rear of alveolous of canine.....	30
From incisive border to rear of pm_1	56
Length of symphysis.....	58
Depth of jaw on outer face at middle of diastema between pm_1 and pm_2	26
Depth of jaw at front of m_1	39
Depth of jaw at middle of m_3	44
Length of pm_2 to m_3 inclusive.....	119
Length of pm_2 to pm_4 inclusive.....	38
Length of molars.....	79
Length of m_1	20
Width of m_1	14
Length of m_2	23
Width of m_2	16
Length of m_3	35

Width of m_3	16
Length of pm_1	9
Thickness of pm_1	6
Length of pm_2	11
Thickness of pm_2	5.5
Length of pm_4	16
Thickness of pm_4	10

A slightly worn m_2 has the crown 17 mm. high. The anterior, median styles are moderately developed; the intervening ribs are about as in *Lama glama*.

This jaw resembles in many respects that of *Protolabis longiceps* (Matthew, Mem. Amer. Mus. Nat. Hist., n. s., vol. I, 1901, pp. 435-439, figs. 31-33), but Matthew's species lacks the first premolar. The same is true of Sinclair's *Protolabis princetonianus*. The lower molars of *Procamelus benedentatus* do not possess certain structures found in Cope's *P. fissidens* (Cope, Wheeler's Exped. W. 100th Merid., vol. IV, p. 328).

Protolabis francisi, new species.

In the collection made in the Garvin gully there are an ulno-radius, a remarkable third metacarpal bone, and the third and fourth metatarsals of a camel. There are likewise several teeth which are referred provisionally to the same camel. Inasmuch, however, as two species may be involved, it is to be understood that the metacarpal and the metatarsals form the type of the species, *Protolabis francisi* (pl. VI, figs. 1, 2).

The ulno-radius (pl. VI, fig. 3) belongs to the right side. The two bones are nearly complete, only some fragments missing in the shaft and at the distal end of the ulna. The two are as strongly consolidated as in the llama. On comparison with the same bones in the llama it is found that the fossil lacks only about 10 mm. in equalling in length that of the llama. That of the fossil is 345 mm. long, measured in a straight line. There is, however, a great difference between the bones of the two animals. The side-to-side diameter at the middle of the length of the fossil bone, is only about two-thirds that of the llama. The fore-and-aft diameter is about four-fifths that of the llama. The width of the greater sigmoid cavity is 40 mm. At the middle of the length the side-to-side diameter is 24 mm.; the fore-and-aft, 18 mm.

The metacarpal is that of an adult animal, inasmuch as the distal epiphysis is completely united to the shaft. The bone was nevertheless not co-ossified with the fourth metacarpal to form a cannon bone. The species appears therefore to belong to the genus *Protolabis*, although its proportions contravene one of the characters assigned as follows to *Protolabis* by Dr. W. D. Matthew (Mem. Amer. Mus. Nat. Hist., vol. I, 1901, p. 426):

"Metapodials separate, limbs and feet short and disproportionately small."

The metacarpal in question is 310 mm. long. The corresponding bone of a llama is 235 mm. long. Nevertheless the shaft of the bone in the fossil

camel has about the same diameters as that of the llama. There was then apparently in Fleming time either a *Protolabis* with long slender legs or a "split-footed" *Procamelus*. Future discoveries may solve the doubt.

The third metacarpal belongs to the right leg and is practically complete. It was originally in close contact with the fourth metacarpal, but was not ankylosed to it. A view of the surface in contact with the fourth metacarpal is presented (pl. VI, fig. 1). The side-to-side diameter at the middle of the length is 12.5 mm.; hence the diameter of the two bones was 25 mm. In the llama, at the same level the diameter is less, only 22.5 mm. The fore-and-aft diameter in the fossil is 26 mm.; in the llama, 21 mm. Relatively to the length the bone in the fossil is the slenderer. The diameter of the articulation with the third finger is 20 mm. wide in the fossil; 23.5 in the llama.

The left third and the fourth metatarsals, the elements forming in the recent camels the hinder cannon bone, are closely applied but not ankylosed. It appears probable that they belonged to the same individual as did the ulno-radius and the third metacarpal. The bones lack only unimportant fragments. At the rear of the upper end the process is broken off which rises between the cuboid and the middle cuneiform. The length of the combined bones is 300 mm.; that of the llama used for comparison, 230 mm. The side-to-side diameter at the middle of the length is 23 mm.; in the llama 20 mm. The fore-and-aft diameter at the same level is 23 mm. in the fossil; in the llama, the same. A broad groove occupies the whole length of the rear of the bone; a narrower one in front follows the line of junction between the two metatarsals.

In the collection are 6 proximal phalanges. One of these fits well with the distal ends of both the metacarpals and the metatarsals. The length of the bone is 73 mm. At the middle of the length the fore-and-aft diameter is 14 mm.; the transverse, 12 mm. Inasmuch as it is shorter than the same bone in the llama it is supposed to belong to the hinder foot. Another first phalanx has nearly the same length, but is more compressed. It probably belongs to another species. The other four phalanges are shorter and probably belonged to still another species.

Four lower molars are referred to this species and others probably belong to it. Three belonging on the left side are described and figured (pl. III, figs. 5-7). The third molar is too much worn to have belonged in the same jaw as the others. The following are the measurements. The whole series has a length of 58 mm., the same as those of a llama at hand. The measurements of the length are taken at half the height of the crowns and on the inner face. The width is taken at the base, the height on the outer face. All these teeth are only slightly worn.

Measurements of lower molars in millimeters.

	M ₁	M ₂	M ₃
Length.....	16.	17.	25.5
Width.....	10.2	12.2	11.5
Height.....	11.3	18.	15.

Another lower third molar is figured (pl. III, fig. 8). It belonged on the right side and is only slightly worn. The length is 25 mm.; the width, 11.1 mm.; the height, 20 mm. These teeth differ from those referred to *Procamelus leptognathus* in having less length, less thickness, but apparently greater height. The ribs on the inner face are more prominent and narrower.

This camel was evidently one having longer, slenderer legs than those of the llama. Doubtless, too, the body was of less heavy build and probably the neck was relatively longer. We may suppose that it was a fleet animal.

Besides the camel remains described above are parts of others not determinable. Some fragments of teeth are among these. There is a part of an ulno-radius whose side-to-side diameter at the middle of the length is nearly 40 mm.; also another intermediate in size between this and that of *Protolabis francisi*.

There is present from the Garvin gully also a right fourth metatarsal of a split-foot camel much smaller than that of *Protolabis francisi*. Its length exceeded by an unknown, but probably small amount, 255 mm. At the middle of the length the fore-and-aft diameter is 19.5 mm. A cervical vertebra of a camel is 135 mm. long.

Dromomeryx texanus, new species.

In the collection made on the Garvin farm are ten upper molars which appear to belong to *Dromomeryx* and to differ from those of any species heretofore described. Four of these teeth are figured (pl. II, figs. 8 to 12). Three (figs. 11, 10, 9 and 8) are regarded as the upper first, the second and the third molars of the right side. They probably belonged to as many individuals. At least, the first molar is too little worn to have belonged with the others. The third molar is taken as the special type of the species.

Measurements of molars in millimeters.

	M ¹ (Fig. 11)	M ² (Fig. 10)	M ³ (Figs. 8, 9)
Height of crown at paracone.....	9.5	7.	15.
Length of crown at middle of width.....	14.	16.	17.
Width of crown at base of front lobe....	15.	16.4	17.

The less height of the second molar is due to greater wear.

Another upper molar, probably the second, is illustrated (fig. 12). Its length is 17 mm.; width 18 mm.

The parastyles and mesostyles are prominent; the metastyle is moderately developed. The ribs are prominent. There are distinct anterior and posterior cingula, but none external or internal. There is, on the outer face of the first and the second molars, between the two lobes, a V-shaped cusp, but on the third molar is a single cusp adhering to the hinder lobe. The anterior horn of the hinder crescent is prolonged to the ectoloph. The hinder horn of the anterior crescent falls short of this. There are no folds

of enamel pushed into the fossettes. The enamel is minutely wrinkled. Although there are in the collection lower teeth which in size correspond to the upper molars described, they do not appear to possess the characters presented by those of other species of the genus.

These teeth appear to differ from those of *D. borealis* in having no folds of enamel in the fossettes, in being far more hypsodont, and smaller (Matthew, Bull. Amer. Mus. Nat. Hist., vol. XX, p. 128, fig. 21; Douglass, Ann. Carnegie Mus. vol. V, p. 467, pl. LXIII, figs. 1-3). Likewise the rib of the front lobe is much less prominent. They resemble the teeth of Douglass' figure 6, but are more rectangular in outline. Those teeth look as if they belonged to another species.

***Dromomeryx ? angustidens*, new species.**

In the collection made on the Garvin farm is a single right upper molar, apparently the hindermost, which appears to belong to an undescribed species of *Dromomeryx*, to be known as *Dromomeryx angustidens* (pl. II, figs. 6, 7). The tooth is little worn. The length at the middle of the width is 19 mm.; the width of the anterior lobe, 16.5 mm.; the height of the paracone 13 mm. There are prominent anterior and median styles, and rather prominent and narrow ribs. On the anterior and posterior faces are feeble cingula. There is no cusp between the lobes on the inner side. There are no folds of enamel projecting into the fossettes. At the rear of the hinder fossette is a groove which descends to the bottom of the fossette, and on the rear of the lobe, opposite the groove mentioned, is another.

This species seems to differ from others known in the relative narrowness of the molars, and it may belong to another genus.

***Blastomeryx vigoratus*, new species.**

In the collection made in the Garvin gully are 6 teeth which are thought to belong to hitherto undescribed species of *Blastomeryx*. The teeth included are as follows:

An upper right third molar unworn.

A lower right first molar in a fragment of the jaw.

Two lower left molars, the second and the third.

The two lower molars of the left side (pl. II, figs. 13, 14) are to be regarded as the type of the species. They are moderately worn. The right lower first molar (figs 15, 16) had just begun to be abraded; and it must have belonged to a younger animal than did the second and third.

Measurements of lower molars in millimeters.

	M ₁	M ₂	M ₃
Height of crown.....	6.	7.	6.3
Length of crown.....	10.	11.6	15..
Width of crown.....	6.3	7.6	7.

On the inner faces of the lower second and third molars the styles are feebly developed. The ribs are broad and projecting and they render the faces of the lobes strongly convex. On the outer faces the lobes are somewhat pointed, as seen on the worn surface. In the valley between the lobes

is a prominent cusp. On the anterior end of each of the molars is a distinct cingulum. The first molar presents no peculiarities. At the middle of this tooth the jaw is 7 mm. thick and 12 mm. high on the inner face; on the outer, 11.5 mm.

The upper molar (pl. II, figs. 17, 18) belongs on the right side and is believed to be the hindmost. It was just coming through the gum, and the roots were wholly unformed. The parastyle, mesostyle, and the intervening rib are prominent. The rib and the style on the metacone are feeble. The anterior lobe is pointed in horizontal section. The rear lobe is rounded. In the inner valley, between the lobes, is a small cusp. On the front end of the crown a cingulum crosses the anterior lobes and a feeble one is seen on the posterior lobe. The enamel of all these teeth is finely wrinkled.

The lower second and third molars of this species have nearly the size of those of *B. wellsi* (Matthew, Bull. Amer. Mus. Nat. Hist., vol. XX, 1904, p. 125, figs. 18, 19), found in the upper Miocene of South Dakota. The first molar is longer (11 mm.) and thicker (8 mm.) than in *B. vigoratus*. Matthew's species appears to differ from the Texas one also in having more hypsodont teeth. This difference does not seem to be wholly due to the greater wear of the Texas teeth. The two species are closely related.

In 1920, Matthew reported on a collection made in the Fleming formation, near Cold Spring, Jacinto County, Texas. Regarding a last lower molar he wrote as follows:

"This is apparently distinct from any known species, decidedly more progressive than those of the Lower Miocene, less so than the Upper Miocene species *B. wellsi*, more perhaps than the Middle Miocene species *B. gemmifer*."

It appears probable that the tooth thus described belonged to *B. vigoratus*.

***Merycodus grandis*, new species.**

In the collection made on the Garvin farm are three fragments of antlers (pl. III, figs. 9–11) which appear to have belonged to a hitherto undescribed species of *Merycodus*. On account of the size of the antlers it is called *Merycodus grandis*.

The largest fragment (fig. 9) consists of a part of the beam and of one of the two branches into which it had divided; the other branch having broken off. The fragment is somewhat water-worn. In the description it is assumed that it is a part of the left antler. The beam is flatter on the outer side than on the inner. The fore-and-aft diameter is 20 mm.; the side-to-side, 16 mm. The hinder prong appears to have a base not greater than 15 mm. in diameter. The front prong is a little larger. The tip of this is missing, but about 30 mm. from the fork the diameter is reduced to 11 mm. The surface of this fragment is mostly without grooves.

A second fragment 42 mm. long (fig. 10) is oval in section. On one side are two grooves, soon branching into three. Other grooves are not so deep and broad. One diameter at the larger end is 18 mm.; the other 14.5 mm. A third fragment (fig. 11) is 50 mm. long and has deep grooves on one side.

At the larger end one diameter is 17 mm.; the other 14.5 mm. A fourth fragment, 40 mm. long, is in the collection made on the Noble farm.

DESCRIPTION OF PLATES.

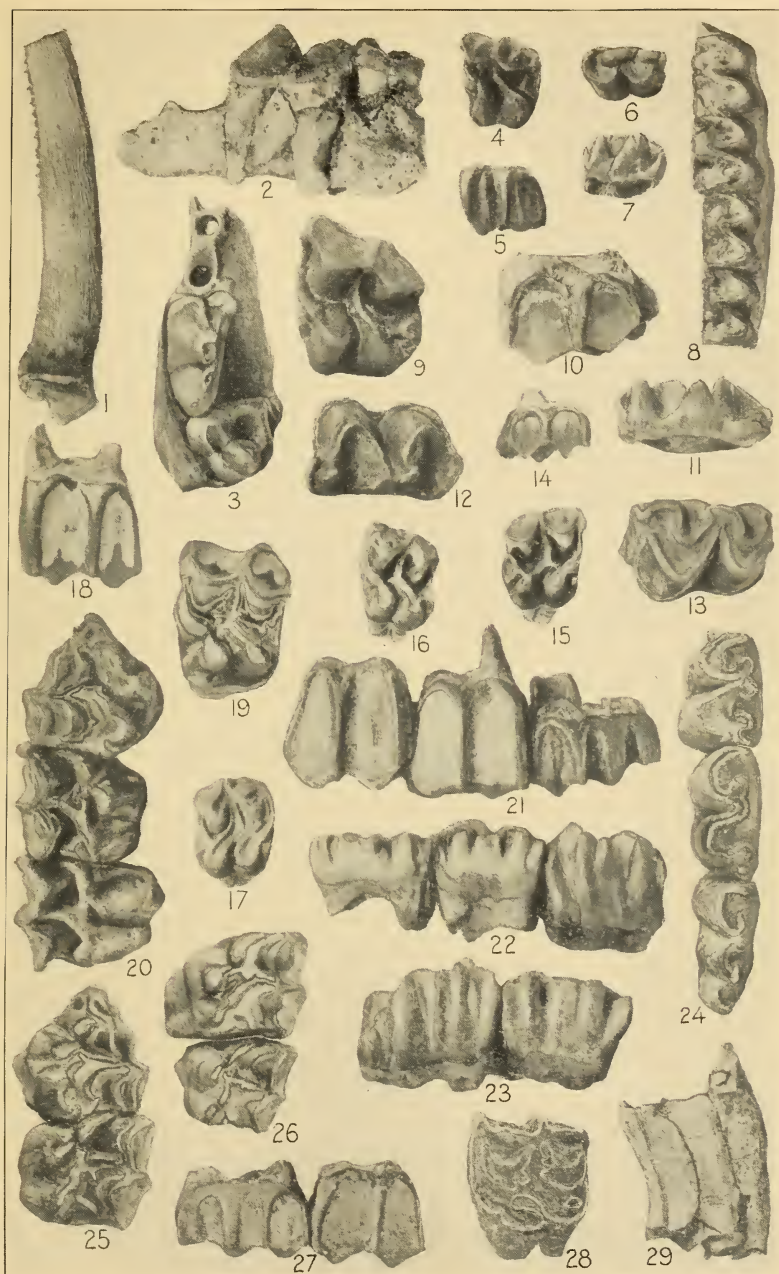
It is found that some of the figures vary slightly from the measurements given in the text.

PLATE I.

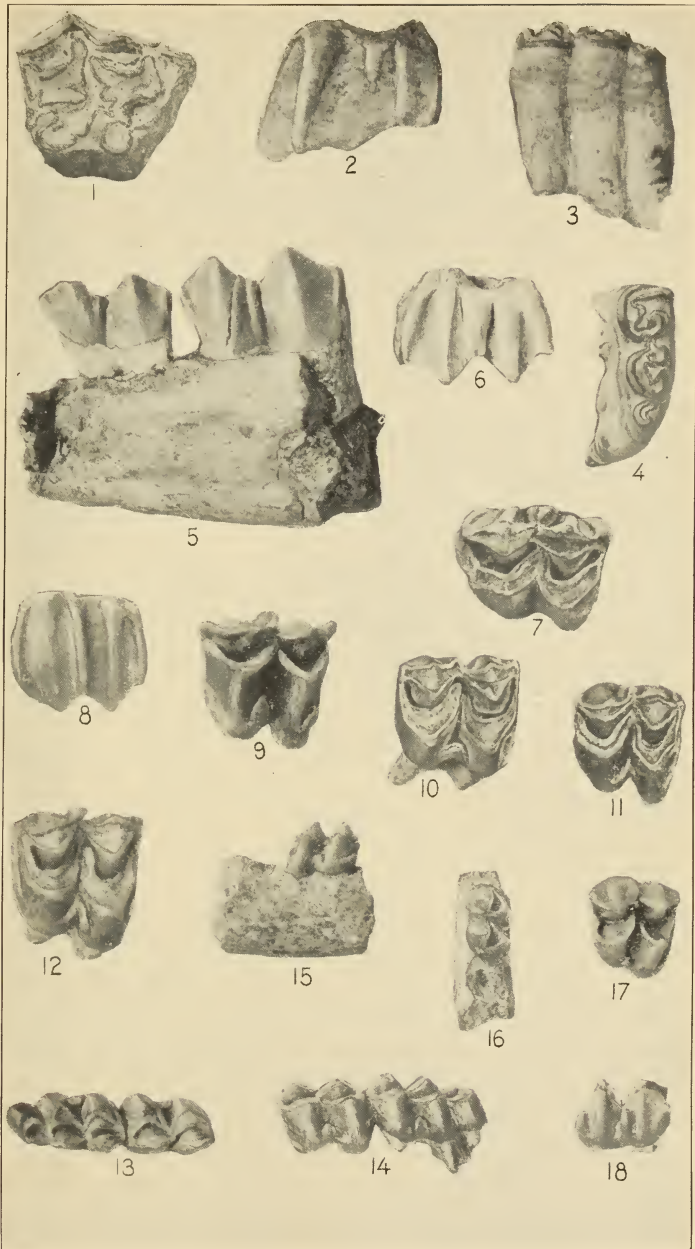
- Fig. 1. *Ameiurus? decorus*. Pectoral spine. Type. $\times 1$.
 Figs. 2, 3. *Tephrocyon scitulus*. Upper jaw. Type. $\times 1$.
 2. View from outside.
 3. View of occlusal face.
 Figs. 4-8. *Miohippus blackbergi*, $\times 1$.
 4. Upper molar, occlusal face. Type.
 5. Same molar. Outer face.
 6. Referred lower left first molar, occlusal face.
 7. Same tooth, inner face.
 8. Referred right ramus with lower teeth, occlusal face.
 Figs. 9-13. *Miohippus navasotae*, $\times 1$.
 9. Upper left molar, occlusal view. Type.
 10. Same tooth, outer face.
 11. Lower left molar. Inside view.
 12. Same tooth. Occlusal view.
 13. Lower premolar. Occlusal view.
 Figs. 14-17. *Parahippus minutalis*. Three upper teeth. Type. $\times 1$.
 14. Molar *b*. Outer face.
 15. Same tooth. Occlusal face.
 16. Molar *a*. Occlusal face.
 17. Premolar *c*. Occlusal face.
 Figs. 18-24. *Merychippus vellicans*.
 18. Upper left premolar. Outside view. Type. $\times 1$.
 19. Same tooth. Occlusal view.
 20. Referred upper right premolars. Occlusal faces.
 21. Same teeth. Outer faces.
 22. Referred lower right premolars, inner faces.
 23. Referred lower left second and third molars, inner faces.
 24. Same teeth, with first molar. Occlusal faces.
 Figs. 25-27. *Merychippus socius*. Type. $\times 1$.
 25. Second and third upper premolars. Occlusal faces.
 26. Second and third upper molars. Occlusal faces.
 27. Second and third premolars. Outer faces.
 Figs. 28-29. *Merychippus francisi*.
 28. Left upper molar. Occlusal face.
 29. Same tooth. Front face.

PLATE II.

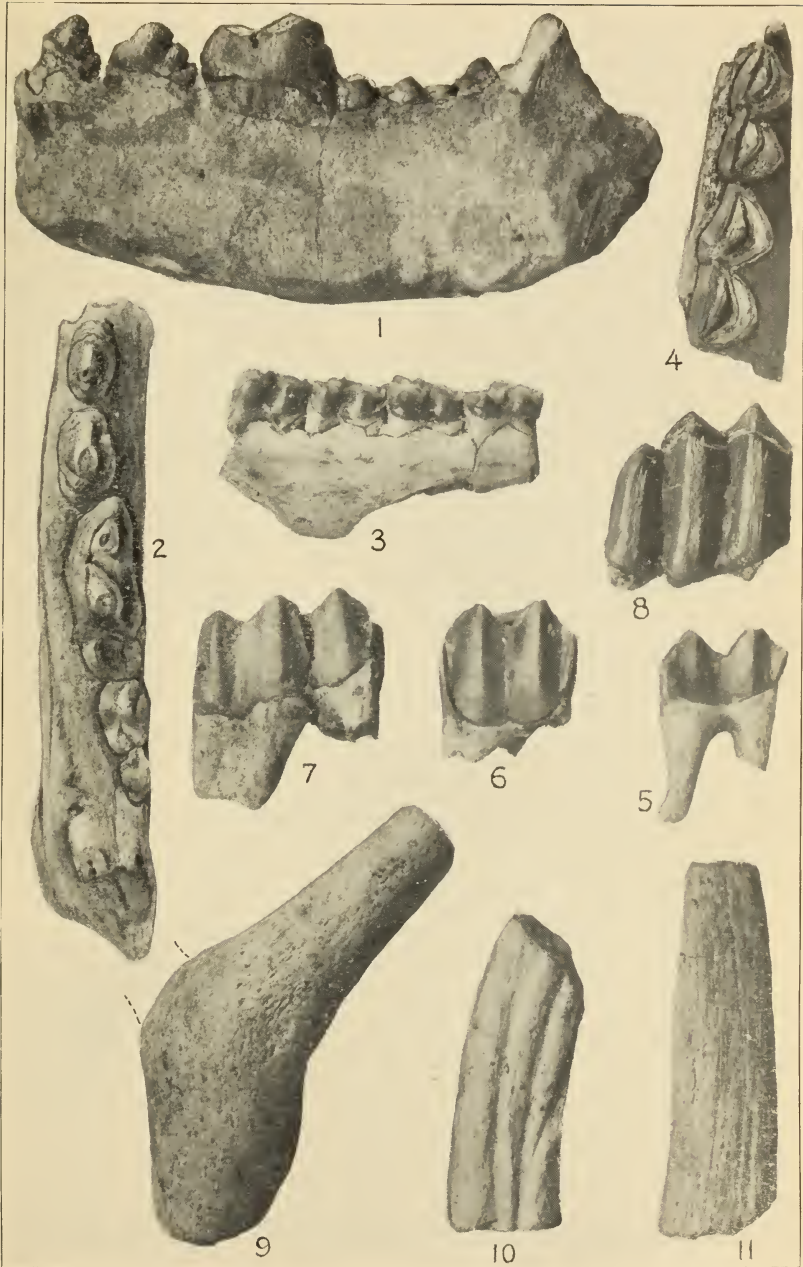
- Figs. 1-4. *Merychippus francisi*. $\times 1$.
 1. Second premolar. Occlusal face.



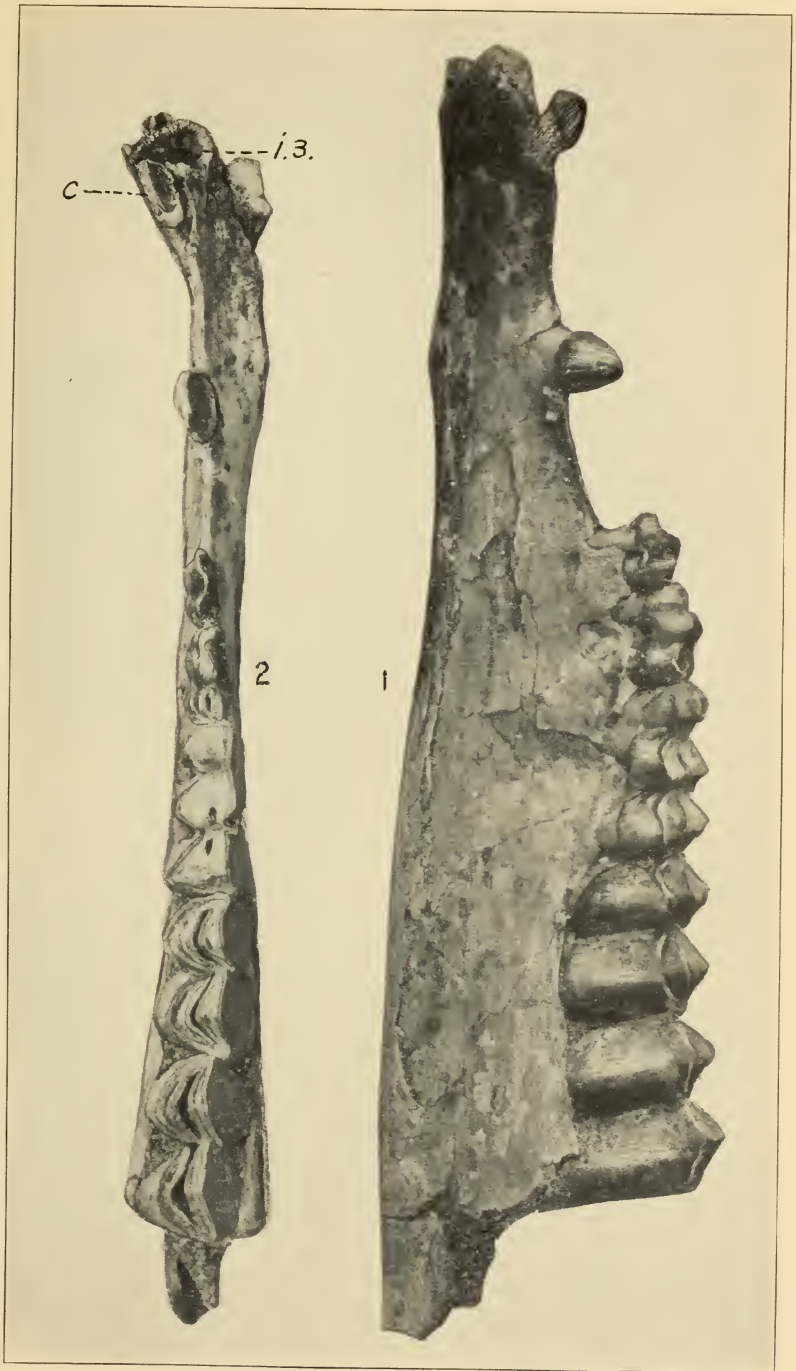
Upper Miocene Vertebrates from Texas.



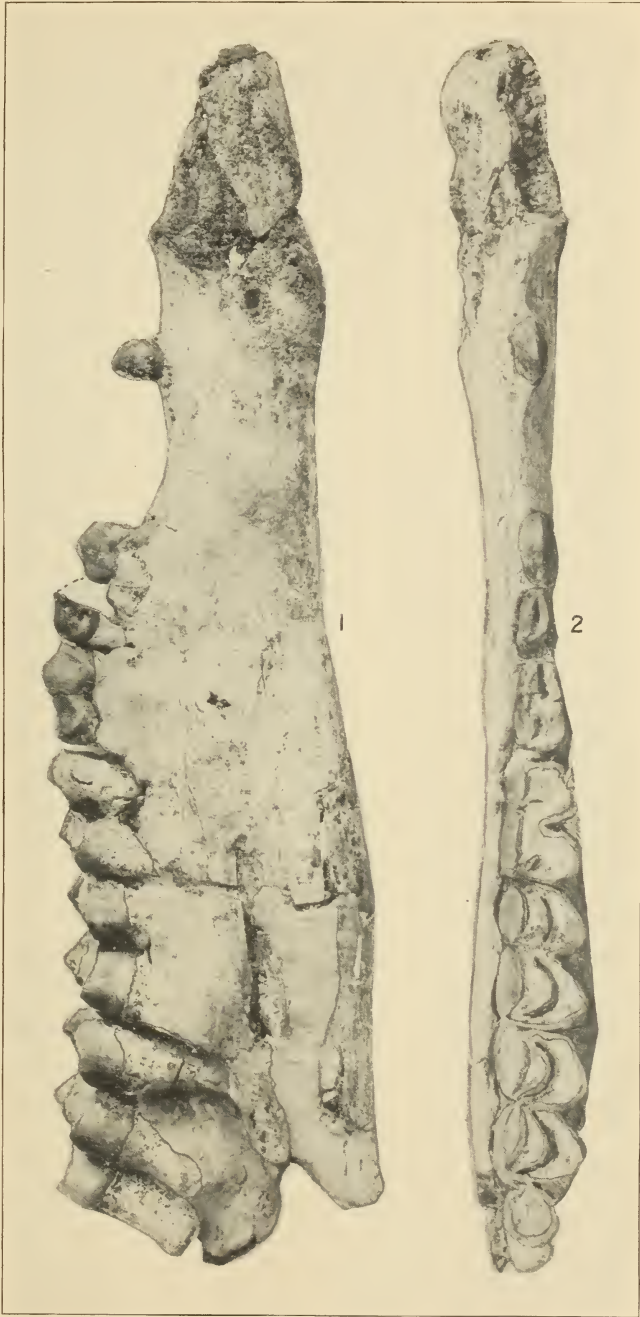
Upper Miocene Vertebrates from Texas.



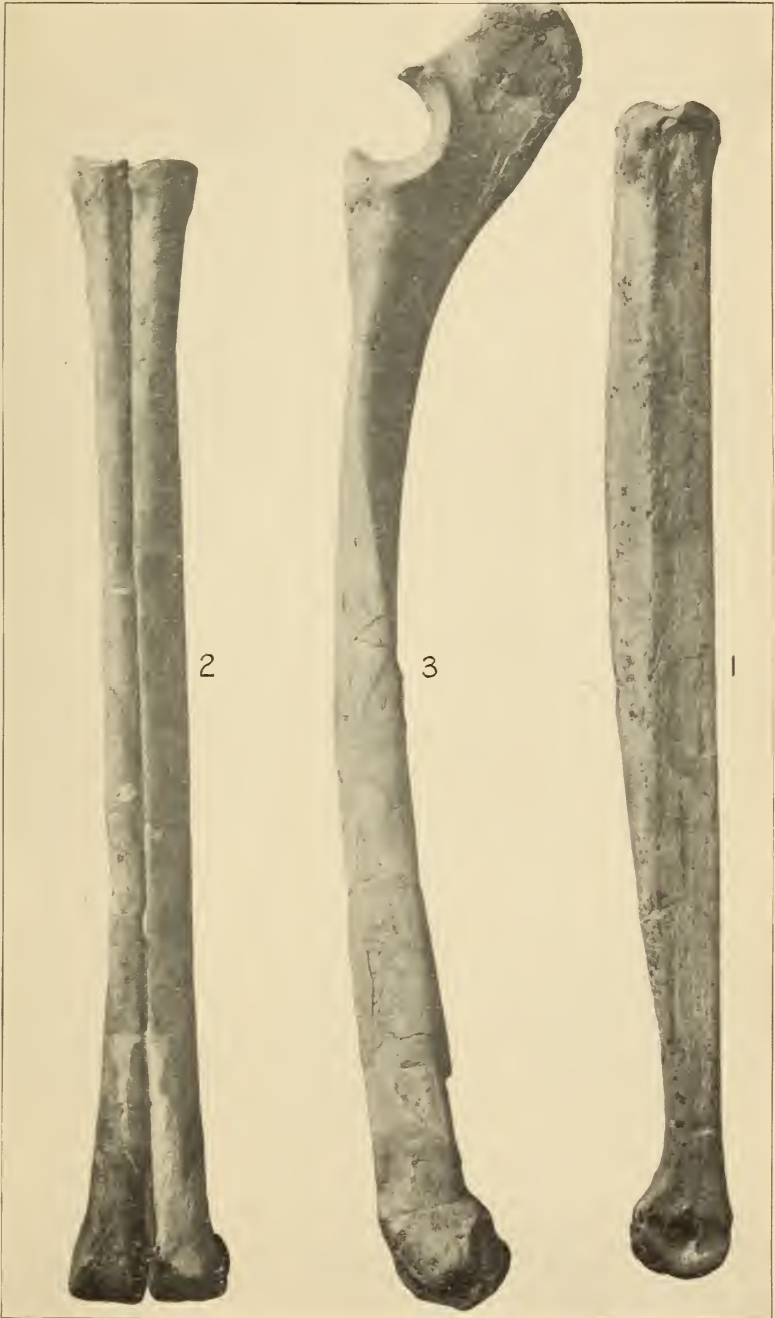
Upper Miocene Mammals from Texas.



Upper Miocene Camel from Texas.



Upper Miocene Camel from Texas.



Upper Miocene Camel from Texas.

2. Same tooth, outer face.
 3. Lower left third molar. Outer face.
 4. Same tooth. Occlusal face.
- Fig. 5. *Procamelus leptognathus*. Lower jaw with first and second molars. Outer face. $\times 1$.
- Figs. 6, 7. *Dromomeryx angustidens*. Type. $\times 1$.
 6. Upper right third molar. Outer face.
 7. Same tooth. Occlusal face.
- Figs. 8-12. *Dromomeryx texanus*. Upper teeth. $\times 1$.
 8. Upper third molar. Outer face. Type.
 9. Same molar. Occlusal face.
 10. Second molar. Occlusal face.
 11. First molar. Occlusal face.
 12. Upper second molar. Occlusal face.
- Figs. 13-16. *Dromomeryx vigoratus*. $\times 1$.
 13. Lower second and third molars. Occlusal view. Type.
 14. Same teeth. Outer face.
 15. Lower jaw with first molar. Outer face.
 16. Same jaw. Occlusal face.
 17. Upper right third molar. Occlusal view.
 18. Same tooth. Outer face.

PLATE III.

- Figs. 1-2. *Aelurodon francisi*. Left side, lower jaw. Type. $\times 1$.
 1. View from left side.
 2. Same jaw, occlusal view.
- Fig. 3. *Miohippus blackbergi*. $\times 1$. Referred lower jaw. Outer face.
- Fig. 4. *Procamelus leptognathus?* Occlusal view. $\times 1$.
- Figs. 5-7. *Protolabis francisi*. Lower molars 1, 2, 3. Inner faces. Referred teeth. $\times 1$.
- Fig. 8. *Protolabis francisi*. Lower right molar. Outer face. $\times 1$.
- Figs. 9-11. *Merycodus grandis*. Fragments of antlers. Type. $\times 1$.

PLATE IV.

- Figs. 1, 2. *Procamelus concerptus*. Left side lower jaw. Type. $\times 1$.
 1. View of outer face.
 2. View of occlusal border.

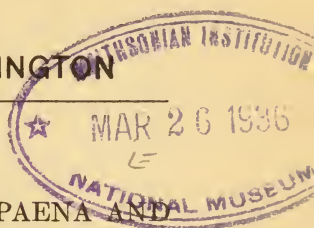
PLATE V.

- Figs. 1, 2. *Procamelus benedentatus*. Right side lower jaw. Type. $\times .8$.
 1. View of outer face.
 2. View of occlusal border.

PLATE VI.

- Figs. 1-3. *Protolabis francisi*. Limb bones. Type. $\times .5$.
 1. Right third metacarpal. Right face.
 2. Left third and fourth metatarsals. View of front face.
 3. Right ulno-radius. Inner face.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON



NEW GULF RACES OF A PACIFIC SCORPAENA AND
PRIONOTUS, WITH NOTES ON OTHER GULF OF
MEXICO FISHES.¹

BY J. T. NICHOLS² AND C. M. BREDER, JR.³

This paper completes a report on a collection of Gulf fishes the study of which Mr. W. W. Welsh of the U. S. Bureau of Fisheries had on hand at the time of his death. An earlier paper on its cusk eels has already appeared.⁴ The writers are indebted to the Bureau for permission to use the material.

***Polyipnus spinosus* Günther.**

A specimen 22 mm. in standard length was taken March 23, 1917, Grampus Station 10482, Gulf of Mexico, Lat. 28° 52' N., Long. 88° 36' W., at depth of from 500 to 0 m.

This appears to be the first North American record for this cosmopolitan deep sea fish, known from the Gulf of Guinea in the Atlantic; Northeast Africa, Philippines, Borneo, Sumatra, in the Indian Ocean; Hawaiian Islands in the Pacific.

Our specimen is apparently of minimum size to show adult characters, Brower's largest figured larval fish⁵ was about $\frac{1}{3}$ its length.

It is also noteworthy that our specimen has an unbroken caudal fin, 6 mm. in length, forked for about half that length; as this fin appears to have been broken in other material.

***Scorpaena russula atlantica*, new subspecies.**

Sub-specific characters. Deeper and with larger scales than described for *russula*, with which it agrees in other respects, including color. By courtesy of Barton A. Bean and the U. S. National Museum we have compared a paratype of *russula*, 41160 (101 mm. to b. c.) and another specimen from Panama (74 mm.). Depth 2.9 to 3.3 (average 3.1), versus 3.2-3.5. Scales about 40 (versus 45).

The type No. 86167 U. S. National Museum was collected at Grampus Station 10479, off Galveston, Texas, 28° 56' N., 94° 48' W., in 10½ fathoms of water, March 16, 1917, by the Grampus, by trawl. It is 78 mm. long to

¹Published by permission of the U. S. Bureau of Fisheries.

²American Museum of Natural History.

³New York Aquarium.

⁴Nichols and Breder, 1922, Proc. Biol. Soc. Wash., Vol. 35, pp. 13-16.

⁵Brower, 1908, Die Tiefsee-Fische, I, p. 121, Fig. 66 (in Valdivia Expedition).

base of caudal. Depth 3.0 in this length; head (from notch in center of snout), 2.3. Eye in head, 3.2; maxillary, 2.1; snout, 4.0; longest dorsal spines (6th to 8th) 2.9; longest dorsal ray (4th), 2.3; second anal spine, 2.3; longest anal ray (3d), 2.2; pectoral (from lower origin), 1.1; ventral, 1.7; caudal, 1.5. Depth of peduncle in eye, 1.3; interorbital in eye, 2.5. Dorsal XI, I 9½; anal III, 5½. Scales in 40 transverse series. Eye about even with profile; maxillary to just past posterior margin of pupil; mandible very slightly projecting, fitting into a small notch in the upper jaw; occiput without a pit. Spines on head somewhat variable, agreeing very well with typical *russula*. Scales cycloid, those on head little evident, a patch on the opercular flap and just appreciable below the suborbital stay. No prominent flaps anywhere. First pectoral ray simple, then 6 forked rays, the remainder simple. Pectoral reaches vertical over third anal spine; ventral to between vent and anal. First anal spine about ½ the second and third which are of almost equal length.

Color in alcohol pale, the upper part of the body to the level of the snout on the head a little darker, vinaceous; a faint vague dark mark on shoulder and peduncle. Membranes of center of spinous dorsal and base of both spinous and soft dorsals excepting those of the last ray, with dark longitudinal band. Rays of soft dorsal also irregularly spotted. Fins otherwise almost colorless.

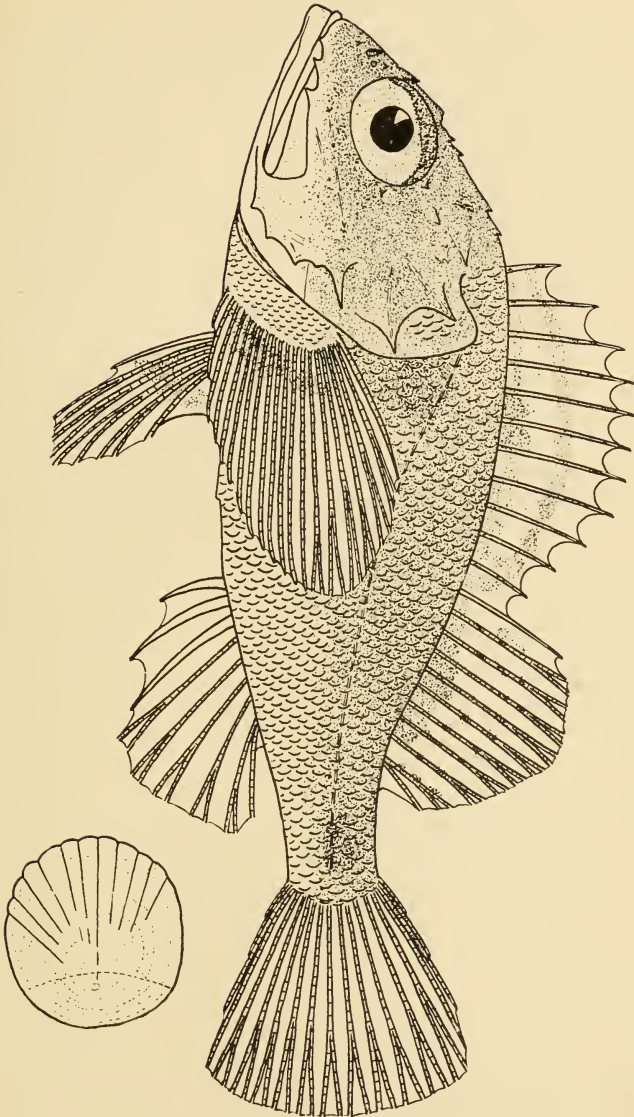
Besides the type there are 9 specimens with the same data, and a single specimen from Grampus Station 10472, in 64 m. of water, 28° 02' N., 94° 40' W., off the coast of Texas, March 2, 1917. Figure drawn from the type by C. M. Breder, Jr.

***Priononotus miles pectoralis*, new subspecies.**

Sub-specific characters. Caudal longer, 3.5 in (standard) length. Pectoral longer, extending beyond anal base by ½ the diameter of the eye.

The type, our only specimen, No. 86168 U. S. National Museum, was collected at Station 10476, Lat. 27° 48' N., Long. 97° W., off Aransas Pass, March 5, 1917 by the Grampus in a depth of from 6 to 7 fathoms over a bottom of sand and mud. It is 74½ mm. long to base of caudal. Depth 4.7 in this length; head (from notch in center of snout to margin opercular flap) 2.7. Eye in head, 4.3; snout, 2.2; longest dorsal spine (2d), 2.4; pectoral (from posterior axil), 1.8; ventral (from center of base), 3.3, reaches anal; caudal, 3.5. Depth of peduncle in eye, 1.0; interorbital, 1.5. Dorsal X-12; anal 11. Scales about 75. Spines and ridges on the head similar to those shown in the figure of *miles* except that there is a noticeable blunt postocular spine. There are two small sharp spines on the lateral ridge of the snout, one behind the serrate rostral lobe, the other further back, over the angle of the mouth—a very small negligible spinule at base of preopercular spine and in center of cheek radiation, and about 15 serrae on rostral lobe. First dorsal spine only distinctly serrate on anterior margin.

Color in alcohol pale brownish, whitish below and on snout forward of eye, fine indistinct, darker mottling on sides may have been more pronounced in life. Spinous dorsal black marginally between 2d and 5th spines. Soft dorsal edged with darker; anal plain; ventrals nearly plain with a few punctulations near their margins distally. Pectorals blackish



Scorpaena russula atlantica.
New subspecies, Nichols and Breder.

with a few irregular faint pale spots, edged with pale inside and outside. Caudal uniform greyish.

***Prionotus punctatus* (Bloch).**

Two specimens, respectively 116 and 90 mm. in standard length collected by the Grampus in the Gulf of Mexico, February 17 and March 5, 1917 (station 10452, Lat. 30° 10' N., Long. 87° 58' W., 9 to 9½ fathoms, mud bottom, T. T. 10748; station 10476, Lat. 27° 48', Long. 97° W., 6 to 7 fath., sand and mud bottom, T. T. 10747) apparently establish the first definite record for this species off the coast of the United States. We have compared them with a specimen so identified by the U. S. Bureau of Fisheries from Argentina, collected by Mr. J. W. Titcomb, and consider them identical with it, and thus representing a very wide ranging species. The type locality of *punctatus* is Martinique, and it is also recognized from Brazil and the east coast of Mexico by Jordan and Evermann.

***Prionotus beanii* Goode.**

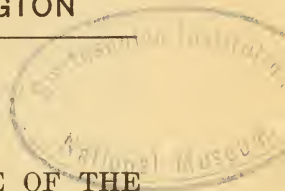
Three specimens, 85, 95, and 96 mm. in standard length, March 2, 1917, station 70472, tin tag 10774, are referable to the description of this species, the most noticeable disparity being in the color of the pectoral fin, which in general is dark, irregularly and obscurely banded with paler. We do not consider this a significant difference. This identification seems to be the first record of *beanii* from the coast of the United States.

***Gobiesox yuma* Nichols.**

Two specimens from Grampus Station, 10465, off Calcasieu Pass, La., 4½–5½ fath., Feb. 15, 1917, we place with *Gobiesox yuma* Nichols from west Florida. They are 65 and 50 mm. in length to base of caudal, and have the following measurements, respectively. Head 2.7 to 2.8 in this standard length; depth, 5.0 to 5.5; caudal fin 4.4 to 3.8. Breadth of head in its length, .8 to .9; interorbital 2.2; breadth of mouth 1.7 to 1.9; length of disk 1.0 to 0.9; eye in interorbital 3.7 to 3.0. Dorsal rays 11; anal 8.

This species is close to *virgatulus* Jordan and Gilbert, and we have compared our two specimens with several specimens of different sizes identified as *virgatulus* from Cape Lookout, N. C. These differ in one less dorsal ray, in having vertical fins and caudal (specimens 39–43 mm.) sharply barred, and in a proportionately longer caudal fin. We have reexamined the type of *yuma* with great care and find 8 instead of 7 anal rays thus checking up with present material in that particular. The smaller specimens of Carolina *virgatulus* have fins more or less parti-colored, and therein approach the type of *yuma*. They show a not dissimilar white cross-band on caudal, but less marked and placed proportionately further from the tip of the fin. The greater depth of the type of *yuma* is probably a youth character. We can not place this material with other rather imperfectly described species from the West Indian Fauna, but would note that the type locality of *virgatulus* is on the Gulf Coast, and if that name should possibly apply to the form here called *yuma* it would leave the one which we have from North Carolina unnamed. However, we have taken the type description of *virgatulus* into account, and it agrees with our Carolina (*virgatulus*) and not with our Gulf (*yuma*) material.

PROCEEDINGS
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FLIES OF THE FAMILY DROSOPHILIDAE OF THE DISTRICT OF COLUMBIA REGION, WITH KEYS TO GENERA, AND OTHER NOTES, OF BROADER APPLICATION.

BY J. R. MALLOCH AND W. L. McATEE.

The group of flies associated together in this paper under the family name Drosophilidae consists in large part of those genera so placed by other authors, and in smaller part of genera included in Geomyzidae by authors. Nowhere in the order is there so much diversity of opinion as to family limits, as is evident in the case of this and allied families of the Acalyptrata. In order to crystallize opinion in so far as this family is concerned we put forward the following list of characters as criteria for the recognition of Drosophilidae. Though it may be that some exotic forms will not come into entire alignment with this summary we believe that taken as a whole these characters will hold throughout the world.

Family characters: Vibrissae present, in the normal position; each orbit with at least two bristles, one of which is directed straight forward; wing with auxiliary vein present, usually incomplete, always very close to first vein; anal cell always present; anal vein present or absent, when present never complete; costa either distinctly or indistinctly broken just beyond humeral vein and again at apex of auxiliary (*i. e.*, just in front of apex of first vein); some or all of the tibiae with a weak preapical dorsal bristle or setula; spiracles of abdomen in membrane; postvertical bristles convergent; all North American genera with at most two pairs of distinct dorsocentrals, except in one species, *Scaptomyza vittata* Coquillett.

The larvae are very similar to those of Ephydriidae, possessing

the same protruded anal respiratory tubes but most of the species lack ventral pseudopods which are so far as we know a constant feature of Ephyridae. The normal position of these larvae, feeding as they do in liquid or semi-liquid matter with the head immersed, compels the almost exclusive use of the anal respiratory tubes for breathing purposes hence the extension of the anal segments and the faculty of protruding the tubes. After pupation, however, the position is reversed and the puparium floats with the cephalic extremity at or close to the surface. Consequently the prothoracic spiracular organs are brought into use and these are in many cases remarkably extended while the anal tubes are much aborted. This change is very striking in *Aulacigaster leucopeza* (Figs. 16-18) and in *Drosophila colorata*, both of which feed in exuding sap of elm trees.¹

The present list is based on material in the collections of the U. S. National Museum and Biological Survey. Forty-one species have been collected in the area usually included for the District of Columbia Fauna (all within a radius of 20 miles). The largest State list heretofore recorded is 28 species for New York in Sturtevant's 1921 paper (see bibliography). Twenty-six of the species here treated have been collected on Plummers Island, Md., and 13 additional species in the Great Falls-Little Falls section of the Potomac River Valley.

KEY TO THE NORTH AMERICAN GENERA OF DROSOPHILIDAE.

1. Mesopleura bare2.
- Mesopleura setulose16.
2. Discal and basal cells of wing separated by a distinct cross-vein²3.
- No distinct cross-vein between discal and basal cells5.
3. Arista microscopically pubescent; eyes higher than long; first posterior cell of wing not narrowed apically....*Sinophthalmus* Coquillett.
- Arista long-plumose; first posterior cell of wing much narrowed apically.....4.
4. Scutellum convex above, evenly rounded in outline, thick to apex; mid tibiae without outstanding setulae on posterodorsal surface basally; second vein gradually nearing costa apically, the angle formed by it and costa about 30 degrees; under side of costal vein beyond apex of second vein, without isolated warts.....

Amiota Loew.

¹For full information on biology of the family consult Sturtevant's 1921 paper.

²Sturtevant (1920) places *Gitonides* Knab as a synonym of *Gitona* Meigen, which last has the discal and second basal cells confluent. *Gitonides*, however, has a distinct cross-vein separating these cells and is generically distinct.

- Scutellum flattened above, not evenly rounded in outline, thinned at apex; mid tibiae with a series of distinct rather closely placed setulae on posterodorsal surface basally; second vein running parallel to costa almost to apex of former, joining costa more abruptly, at almost right angles; under side of costal vein beyond apex of second vein with about half a dozen isolated wartlike elevations each of which is surmounted by a minute curved spine (Fig. 1).....*Stegana* Meigen.
- 5. Arista microscopically pubescent; face not carinate6.
- Arista with one or more long hairs above, and usually also below.....7.
- 6. Ocellar bristles moderate, in longitudinal line with posterior ocelli, and in transverse line with anterior ocellus.....
Pseudiasata Coquillett.
- Ocellar bristles very long, situated well back of the anterior ocellus, and in line between it and the posterior pair.....
Tryptochaeta Rondani.
- 7. Anal vein absent; face without a central carina; two humeral bristles present.....8.
- Anal vein present at least at base.....9.
- 8. Arista with one very long hair at base above, otherwise bare; costal vein with some fine outstanding setulae from beyond apex of first vein to near apex, which are much longer than diameter of costal vein and rather widely spaced.....*Cladochaeta* Coquillett.
- Arista with several long hairs both above and below; costal vein without any outstanding setulose hairs as above.....
Clastopteromyia Malloch, new genus.
- 9. Thorax with but one pair of dorsocentral bristles
Mycodrosophila Oldenberg.
- Thorax with two distinct pairs of dorsocentral bristles.....10.
- 10. Lower orbital bristles reclinate, all 3 orbital bristles present and long
Chymomyza Czerny.
- Lower orbital bristle proclinate, the lower reclinate bristle usually small, sometimes absent, if large, situated above the proclinate bristle.....11.
- 11. Costal vein with wartlike elevations as in *Stegana*; lower orbital bristle about as long as upper and at least twice as far from it as from proclinate bristle; costa to apex of third vein
Leucophenga Mik.
- Costal vein without such elevations, extending to fourth vein.....12.
- 12. Frons strongly haired, lower orbital bristle well above middle of frons; prescutellar acrostichals strong.....*Rhinoleucophenga* Hendel.
- Frons weakly haired or bare, lower orbital usually well below middle of frons.....13.
- 13. Frons with a large, glossy, bare triangle that extends to or almost to anterior margin, covering most of interfrontalia; epistoma projecting much beyond vibrissal angle; proboscis elongated, about as long as height of head, straight.....*Zygothrica* Wiedemann.

- Frons entirely opaque or subopaque, without well defined shining triangle; epistoma not or very little projecting; proboscis normal.....14.
- 14. Only one reclinate orbital bristle present; anterior pair of dorso-central thoracic bristles before middle of dorsum; black costal setulae extending almost or quite to apex of fourth vein.....
Microdrosophila Malloch.
- Two reclinate orbital bristles generally present though the lower one is sometimes very small; anterior pair of dorsocentral thoracic bristles well behind middle of dorsum; black costal setulae ceasing a short distance beyond apex of third vein.....15.
- 15. Thorax with at least six series of setulae in front of dorsocentrals....
Drosophila Meigen.
- Thorax with at most four series of setulae in front of dorsocentrals....
Scaptomyza Hardy.
- 16. Disc of scutellum setulose.....*Curtonotum* Macquart.
- Disc of scutellum bare.....18.
- 17. Arista pubescent; ocellars minute.....*Aulacigaster* Macquart.
- Arista plumose; ocellars large.....*Diastata* Meigen.

Genus *Sinophthalmus* Coquillett.¹

The complete discal cell of wing, and microscopically pubescent arista of this genus distinguish it from any in the family occurring in this region. The face is conspicuously carinate, scutellum convex, first posterior cell of wing not narrowed at apex; sixth vein rudimentary, base present; costa to fourth vein, but attenuated apically. There is but one species, *pictus* Coquillett, which is recorded only from California.

Genus *Amiota* Loew.

The flies of this genus are frequently attracted by perspiration and cause considerable annoyance by buzzing around the face and getting into ears and eyes. This habit is met with in some other species in the family, notably *Sinophthalmus pictus*, and a few species of *Drosophila*, but so far as we know not in the genus *Stegana*. Several North American and European species of *Amiota* have conspicuous white marks on the face and pleura, but the specific distinctions are not well understood as yet. The immature stages are unknown. Whether *Amiota* is identical with *Phortica* Schiner or not we are at present unable to decide as we have not seen the genotype of the latter, but if they are congeneric then *Amiota* has priority as two species were described by Loew some months before Schiner described *Phortica*. That Loew did not define the genus, and merely described the species under the generic name *Amiota* without stating that it was a new genus, does not to our minds invalidate the use of the generic name.

¹For bibliography and synonymy the reader is referred in most cases to Sturtevant's 1921 paper.

KEY TO THE NORTH AMERICAN AND EUROPEAN SPECIES OF AMIOTA.

- 1. Thorax glossy black, with humeral angles and a spot on pleura below wing base milk-white; face with lower half milk-white.....2.
- Thorax shining brownish yellow with milk-white marks as above, or brown without such markings; face distinctly or indistinctly marked.....4.
- 2. Hind femur of male with some long yellow bristles below, which are much longer than diameter of femur*setigera* Malloch.
- Hind femur without such bristles in male or female.....3.
- 3. Thoracic and frontal bristles and hairs black; hypopygium of male as in Figures 12-13.....*alboguttata* Wahlberg.
- Thoracic and frontal bristles and hairs fulvous; hypopygium of male as in Figures 2-5.....*humeralis* Loew.
- 4. Large species, 3 mm. or over in length, with conspicuous milk-white marks on face, pleura, and humeral angles of thorax; hypopygium of male as in Figures 6-8.....*leucostoma* Loew.
- Smaller species, averaging 2 mm. in length, with no or very faint paler markings on face, pleura, and humeral angles of thorax; hypopygium of male as in Figures 9-11.....*minor* Malloch.

Oldenberg gives the following key to the European species of Phortica. The first species in the key is the genotype of Phortica and is very distinct from the others in color and distinct also in wing venation.

- 1. Thorax pale and dark marked; outer cross-vein about as long as the penultimate section of fourth vein, this at most one-third as long as last section.....*variegata* Fallen.
- Thorax unicolorous, with snow-white spots on shoulders and pleura; outer cross-vein much shorter than penultimate section of fourth, this only one-half or one-third shorter than last section.....2.
- 2. Thorax brownish, because of dense yellowish dusting entirely opaque in male or only slightly shining in the female.....*lacteoguttata* Portchinsky.
- Thorax glossy, only slightly dusted, black or reddish.....3.
- 3. Thorax black.....*alboguttata* Wahlberg.
- Thorax reddish.....*rufescens* Oldenberg.

A. alboguttata Wahlberg.—Loew stated that he had seen this species from North America. Judging from the description of the species we consider that he was probably correct though a comparison of the male hypopygia of North American and European specimens is essential to definitely decide the matter. The species is of general occurrence in the District of Columbia region and apparently fairly common. Adults have been collected at dates ranging from May 28 to September 18. P. I.

A. humeralis Loew.—This species has yellowish frontal and thoracic bristles according to Mr. Nathan Banks, who has examined the type at our request. This is very probably the species described by Oldenberg as *lacteoguttata* Portchinsky, though it may not be the species which Portchinsky had. Localities: Great Falls, Va., September 7, 1913, Frederick Knab;

Dead Run, Va., June 9, 1915; Plummers Id., Md., June 6, 1914, R. C. Shannon; Glen Echo, Md., July 10, 1921, June 10, 1923, Malloch; Mt. Vernon, Va., June 6, 1915, McAtee.

A. leucostoma Loew.—We believe this species is the same as that described from Europe by Oldenberg in 1914 as *rufescens*. It is common at least in up-river localities near Washington, and has been collected during a season extending from May 26 to September 12. P. I.

A. minor Malloch.—Originally described from Illinois. The lack of distinct milk-white spots and the small size of the species readily distinguishes it from its allies. It has been taken frequently in the vicinity of Glen Echo and Plummers Id., Md., at dates ranging from June 2 to August 30. P. I.

Genus *Stegana* Meigen.

Sturtevant in his paper on this family sunk *Phortica* (= *Amiota*) as a synonym of *Stegana*. This is an error as the genera are quite distinct. He also stated that Loew had reported *curvipennis* Fallen from North America but that he, Sturtevant, had been unable to discover any good reason for separating Loew's specimen from *coleoptrata* Scopoli. The same writer listed *vittata* Coquillett as a synonym of the latter. There are, however, two quite distinct species here and as they agree perfectly with descriptions of the two European species, both of which have already been recorded from America, we assign the European names to the insects. Nothing is known of the early stages of flies of this genus. The adults are common in woods, and are often seen sitting on leaves, where they appear to be of sedentary behavior. They are capable, however, of very rapid movement when disturbed.

KEY TO SPECIES.

1. Palpi black on apical half or more; third antennal segment yellow or very slightly infuscated at apex; head much higher than long, height of eye as compared with its length 11 : 7....*curvipennis* Fallen.
- Palpi pale yellow; third antennal segment black; head but little higher than long, height of eye as compared with its length 9.5 : 10....

coleoptrata Scopoli.

S. coleoptrata Scopoli.—Cabin John Bridge, Md., July 31, 1921; Glen Echo, Md., July 4, 1921, July 16, 23, 1922, Malloch.

S. curvipennis Fallen.—Glen Echo, Md., June 18, July 10, 17, 23, 1921, June 17, July 8, 1923; Chain Bridge, Va., May 7, 1922, Malloch; Maywood, Va., June 4, 1922; Glencarlyn, Va., May 7, 1922, McAtee. *Phortica vittata* Coquillett is a synonym of this species.

Genus *Pseudiastata* Coquillett.

A very distinct genus, with pubescent arista, ocellars of moderate size, situated directly in line with the posterior ocelli and in transverse line with anterior ocellus, all three orbitals long, the lower incurved, not directed forward, near anterior margin of frons, second about one-fourth as far from anterior as from posterior reclinate bristle; face not carinate.

P. nebulosa Coquillett.—Testaceous, the wings maculated with brown. This is the only known species of the genus and no other specimen than the type has been collected. Plummers Id., Md., August 1, 1902, at light, H. S. Barber.

Genus **Tryptochaeta** Rondani.

A slightly aberrant genus, usually placed in Geomyzidae. The frontal chaetotaxy, however, is the same as in *Drosophila*, the wing venation is the same as in *Clastopterymyia*, and the chaetotaxy of the thorax is similar. There is a series of minute black spinules on the apical half of antero-ventral surface of the fore femora similar to that in the genus *Curtonotum* and in *Drosophila immigrans* Sturtevant. The only species known from the United States, *micans* Hendel, occurs in Washington State and in New Mexico.

Genus **Cladochaeta** Coquillett.

This genus contains but one known species, *nebulosa* Coquillett, which occurs in Florida and the West Indies, and is rather closely related to the next genus, the distinguishing characters being noted under the latter.

Genus **Clastopterymyia** Malloch, new genus.

As in the preceding genus the sixth wing-vein is entirely absent, but the arista in *Cladochaeta* had but one long hair above while in this genus it has several both above and below; the costa has some outstanding fine setulose hairs in *Cladochaeta* that are absent in *Clastopterymyia*. The lack of the sixth vein and of a median carina on the face distinguishes it from *Drosophila* in which genus it has hitherto been placed.

Genotype.—*Drosophila inversa* Walker.

C. inversa Walker.—The larvae live in the so-called spittle masses of the homopterous genus *Clastoptera* which occur on alder and other plants, and are not at all uncommon at Glen Echo, Md., and elsewhere near and in the District of Columbia. Localities for adult specimens at hand: Cabin John Bridge, Va., July 31, 1921; Glen Echo, Md., August 2, 6, 1922, June 10, 1923; Chain Bridge, Va., September 11, 18, 1921, Malloch.

Genus **Mycodrosophila** Oldenberg.

There is but one known species of this genus in the United States.

M. dimidiata Loew.—A common species, often found sitting on the under side of fungi; is known to come to light. Has been collected in every month except those from February to May, and has been frequently taken in November, December, and January. P. I.

Genus **Chymomyza** Czerny.

The anterior reclinate bristle on orbits in this genus is situated in front of the proclinate bristle; the face is not carinate and is narrowed below; and the post-vertical bristles are absent in both the species occurring in our region.

KEY TO SPECIES.

1. Wing with a dark mark at apex of first vein and two fuscous fasciae, one at middle and the other between middle and apex; fore legs yellow.....*amoena* Loew.
- Wing hyaline, costal cell slightly yellowish, costal vein and base of third vein much darker than the other veins; fore femora, tibiae and basal segment of fore tarsi deep black, remainder yellow....
procnemis Williston.

C. amoena Loew.—An abundant species, often seen on windows and about garbage over the surface of which it walks with vibrating wings in similar manner to the next species which more often occurs about wounds on tree trunks, especially oaks. *C. amoena* has been collected at light and on sap and has been bred from walnut and butternut hulls, and from rotten corn. Adults have been collected from April 18 to November 23. P. I.

C. procnemis Williston. A very widely distributed species, originally described from the West Indies. Local records: Dead Run, Va., June 18, 21, 1914, at sap of tulip tree, R. C. Shannon; Glen Echo, Md., July 16, 1922, Malloch. Malloch found the larvae of this species in large numbers under oak bark in Illinois.

Genus *Leucophenga* Mik.

Sturtevant in his key to the genera of this family places this genus in the section in which the lower reclinate orbital bristle is as far from the proclinate bristle as from the upper reclinate. This is an error and we assume that his numbers 15 and 17 have been transposed.

KEY TO SPECIES.

1. Palpi not noticeably broadened, club-shaped; abdomen testaceous yellow, first visible tergite with a spot on each side, second with a central spot, third and fourth each with five spots, larger on third, fifth with two spots, black; a brown spot on costa of wing at apex of second vein and another at apex of first.....*varia* Walker.
- Palpi much broadened, leaflike; abdomen testaceous, with grayish pruinescence, and the following brown markings: two or three spots on first visible tergite and five spots on each of the others, all of these except on first connected along posterior margin of tergites by a band of same color leaving four pale grayish pruinose spots on anterior half of each tergite; wing marked as in *varia* but with a brown cloud on each cross-vein which is not noticeable in that species.....*maculosa* Coquillett.

L. maculosa Coquillett.—Stubblefield Fall, Va., October 23, 1921; Chain Bridge, Va., September 18, 1921, Malloch; Washington, D. C., July 6, 1896, on mushrooms.

L. varia Walker (*Opomyza signicosta* Walker).—An abundant and generally distributed species; season May 17 to October 21; comes to light; has been bred from fungi. P. I.

Genus *Rhinoleucophenga* Hendel.

We can find no characters more reliable than those mentioned in the key for distinguishing this genus from *Drosophila*. However, most species of that genus have two humeral bristles while in *Rhinoleucophenga* there is but one. The only known species of the genus, *obesa* Loew, may yet be found in our region as it has been taken in Florida and as far north as Ocean Grove, Virginia. Hendel described the genus *Rhinoleucophenga* in 1917, thus having priority over *Pseudophortica* Sturtevant which was described in 1918. Hendel's species *pallida* is a synonym of *obesa* Loew.

Genus *Zygothrica* Wiedemann.

A tropical genus unrepresented in this region. But two New World species are recorded by Sturtevant as belonging to this genus, *dispar* Wiedemann with the wings clear, and *aldrichi* Sturtevant with a conspicuous black mark along costa. There is however another species which should be included, namely *vittatifrons* Williston, described as a *Drosophila*. From the other two species it may be distinguished by the large apical spot on the wing, and the presence of six linear black vittae on dorsum of thorax, the outer one on each side being interrupted at the suture. We have seen this species, originally described from the West Indies, from Brazil.

The genus closely resembles *Drosophila* but the shining, well defined frontal triangle readily separates it from that genus. The head in the male of *dispar* is drawn out sideways and is much broader than the thorax, but in the female of that species and in both sexes of *aldrichi*, as well as in the specimen of *vittatifrons* examined the head is almost normal in structure.

Genus *Microdrosophila* Malloch.

Microdrosophila Malloch, J. R. Ent. News, 32, 1921, p. 312 [Genotype *Drosophila quadrata* Sturtevant].

M. quadrata Sturtevant.—A specimen of this, the only known species, was collected at Chain Bridge, Va., September 18, 1921, Malloch. The species occurs also in Alabama, Georgia, Indiana, and Illinois.

Genus *Drosophila* Meigen.

This is by far the largest genus in the family and the one in which most of the known species have been described. The great majority of the species feed in their larval stages in decaying fruits and other vegetable matter but the larval habits of most of the aberrant forms are unknown. The key given below contains those species known to occur in our region and a few, inclosed in brackets, may occur though so far not actually taken here.

KEY TO SPECIES.

1. Each forewing with about thirteen fuscous spots; yellow species, averaging about 2 mm. in length*guttifera* Walker.
- Wings if spotted, with at most the cross-veins and apices of longitudinal veins infuscated.....2.

2. Wings brown, paler towards inner or hind margin, usually with two subquadrate clear or dark marks on apical half, one between veins 2 and 3, the other between veins 3 and 4; outer cross-vein much bent, sinuate.....*sigmoides* Loew.
- Wings usually hyaline, sometimes with the cross-veins and apices of longitudinal veins infuscated; outer cross-vein not sinuate, usually straight.....3.
3. At least the basal segment of fore tarsus with a minute comb of stiff black bristles at apex (males).....4.
- None of the segments of fore tarsi with comb of bristles at apices.....7.
4. First and second segments of fore tarsi each with an apical comb....
[*obscura* Fallen].
- Only the basal segment of fore tarsi with an apical comb.....5.
5. Acrostichal setulae in front of the dorsocentral bristles in six series; facial carina narrow, rather sharp, not broadened below.....
affinis Sturtevant.
- Acrostichal setulae in front of dorsocentrals in eight series; facial carina broad below.....6.
6. Male hypopygium with a small beak-like central lateral process, about as large as clasper; cheek broader.....*ampelophila* Loew.
- Male hypopygium with a large broad central lateral process which is much larger than the clasper; cheek narrower.....
simulans Sturtevant.
7. Fore femur in both sexes with a series of minute strong black bristles on apical half of anteroventral surface (Fig. 14).....
immigrans Sturtevant.
- Fore femur without such bristles in either sex.....8.
8. Thorax with a pair of distinct though short, rather closely placed bristles about one third from anterior margin on disc; apices of wing-veins 2 to 4 more or less clouded.....*putrida* Sturtevant.
- Thorax with only the usual regular hairs on disc, no pair outstanding...9.
9. Mesonotum with five fuscous vittae, the outer one on each side along lateral margin; a broad vitta along upper part of pleura.....
buscki Coquillett.
- Mesonotum and pleura not marked as above.....10.
10. Mesonotum and scutellum grayish brown pruinulent, with dark brown spots at base of each bristle and hair, the spots sometimes aggregated in places.....11.
- Mesonotum either indistinctly vittate or unmarked.....12.
11. Abdominal tergites each with a pale yellowish spot on the lateral undercurved parts.....*repleta* Wollaston.
- No yellowish spots on lateral undercurved portions of tergites.....
[*hydei* Sturtevant].
12. Abdomen with four series of black spots at apices of tergites dorsally which are frequently connected posteriorly.....13.
- Abdomen without four series of black spots as above, sometimes with three such series, usually with a more or less distinct regular dark posterior fascia on each tergite.....15.

D. affinis Sturtevant.—Common and generally distributed; adults have been collected from March 13 to August 12; the species comes to sap, and to light, and has been taken on fungi, among them *Clitocybe illudens*. P. I.

D. busckii Coquillett.—Virginia near Plummers Id., Md., November 2, 1915, bred from butternut hulls, R. C. Shannon; Glen Echo, Md., June 11, July 12, 1922, Malloch.

D. colorata Walker.—This our largest species of the genus is a truly wild form, being confined to woodlands where it feeds on sap both in the larval and adult stages. Adults have been collected from March 24 to September 17, most of them, however, in April. P. I.

D. deflecta Malloch, new species.—Female: Shining rufous yellow. Abdomen with four series of small black spots on dorsum situated near hind margins of the tergites. Legs yellow. Wings clear, both cross-veins and apices of all the complete longitudinal veins clouded.

Head and thorax as in *quinaria* Loew. Legs normal. Inner cross-vein at middle of discal cell, outer at about three-fourths of its own length from apex of fifth, slightly curved and rather oblique; last section of fourth vein hardly longer than preceding section, deflected at tip, the cell in front of it much widened apically, section of costa between veins 3 and 4 as long as preceding section (Fig. 12). Length, 2 mm.

Type, Eastern Branch, near Bennings, D. C., August 20, 1915, McAtee.

There is at least one specimen of this species in the collection of Illinois Natural History Survey taken in Illinois.

D. funebris Fabricius.—Washington, D. C., August 9, October 10, 1906, March 24, 1907, McAtee; September 29, 1913, R. C. Shannon; Maryland near Plummers Id., May 5, 1915; Virginia near Plummers Id., November 2, 1915, bred from butternut hulls, R. C. Shannon; Maywood, Va., November 13, 1921, McAtee.

D. guttifera Walker.—Glen Echo, Md., August 2, 1922, Malloch.

D. immigrans Sturtevant.—Glen Echo, Md., August 30, 1923, Malloch.

D. lativittata Malloch, new species.—Female: Head yellowish testaceous, opaque, orbits and ocellar triangle slightly shining; third antennal segment pale brownish. Thorax glossy testaceous yellow. Abdomen highly polished, testaceous yellow, with a broad fuscous vitta along each side which almost obscures the dark lateral spot on each side of the hind margin of the tergites. Legs yellow. Wings yellowish hyaline, a small fuscous cloud at apex of each vein from 2 to 5 inclusive, and both cross-veins narrowly clouded.

Facial carina well developed, gradually broadened below, flat at lower extremity, rays of arista 5+3. Thorax as in *transversa*. Fore femur with 3 or 4 posteroventral and posterodorsal bristles. Section of costa from apex of first to apex of second veins about four times as long as preceding section, that between apices of second and third about one third longer than the section beyond it; outer cross-vein at less than its own length from apex of fifth vein, the latter quite conspicuously deflected at apex; last section of fourth vein about one-fifth longer than preceding section. Length, 2.5 mm.

Type, Chain Bridge, Va., September 10, 1922, Malloch.

There are some specimens of this species in the collection of Illinois Natural History Survey, from Illinois.

D. melanica Sturtevant.—Virginia near Plummerville Id., April 19, 1914, November 2, 1915, bred from butternut hulls, R. C. Shannon; Plummerville Id., Md., June 8, 1914, at light, E. A. Schwarz and H. S. Barber; August 3, 1915, at light; Maryland near Plummerville Id., August 5, 8, 1914, at sap of tulip tree, R. C. Shannon.

D. ampelophila Loew.—This is the most common "fruit fly" seen indoors but from the records of collection evidently it has not altogether given up life in the open. Adults have been collected from May 4 to November 2; and have been bred from butternut hulls. P. I.

D. pseudomelanica Sturtevant.—Dead Run, Va., April 14, 1914; Cabin John Bridge, Md., March 15, 1914, R. C. Shannon.

D. putrida Sturtevant.—Common, all collections so far being in Piedmont localities; season, March 25 to November 18; comes to light, and has been bred from fungi. P. I.

D. quinaria Loew.—About as common as last and more generally distributed. Adults have been collected from March 24 to October 29; comes to light, and has been found feeding on squash. P. I.

D. repleta Wollaston.—Common, seen more often than any other species about urinals; however, it lives also in a state of nature, and has been bred from butternut hulls, and from the stem of a waterlily. A record, needless to say, of some years standing, notes that the species is attracted to beer. Adults have been collected from July 17 to November 30. P. I.

D. robusta Sturtevant.—Fairly common in Piedmont localities; season April 19 to September 29. P. I.

D. sigmoides Loew.—Rather scarce, all records in September and October; Stubblefield Fall, Va., October 23, 1921; Chain Bridge, Va., September 10, 18, 1921, Malloch; Chain Bridge, D. C., September 12, 1913, R. C. Shannon; Plummerville Id., Md., October 26, 1906, A. K. Fisher; Beltsville, Md., October 22, 1915; Washington, D. C., October 14, 1906, McAtee.

D. simulans Loew.—Maywood, Va., June 9, 1922, McAtee.

D. sulcata Sturtevant.—Fairly common and generally distributed; adults have been collected from March 24 to July 7; they frequent sap, having been taken here at sap of birch, maple, and grape. P. I.

D. transversa Fallen.—Common; season April 8 to November 23; frequently comes to light. P. I.

D. tripunctata Loew.—Fairly common; adults have been collected from June 6 to November 26; the species comes to light, and to sap; and has been bred from mushroom and squash. P. I.

Genus *Scaptomyza* Hardy.

A rather poorly differentiated genus; however, the slender form of the species and the presence of but two or four series of short hairs between the anterior dorso-centrals are characters that enable one to recognize the known species with comparative certainty.

KEY TO THE SPECIES.

1. Palpi largely black; apical pair of scutellar bristles very noticeably shorter than the basal pair; mesonotum with three pairs of dorso-centrals, the anterior pair short.....*vittata* Coquillett.
- Palpi entirely yellow; mesonotum with but two pairs of distinct dorso-centrals.....2.
2. Apical pair of scutellar bristles much shorter than the basal pair; humeri each with one strong bristle; four series of acrostichals between anterior pair of dorsocentrals; wing usually with a blackish apical spot.....*adusta* Loew.
- Apical pair of scutellar bristles as long as basal pair.....3.
3. Each humerus with two long bristles; four series of acrostichals between anterior dorsocentrals; wing usually with a blackish apical spot....
terminalis Loew.
- Each humerus with one strong bristle; two series of acrostichals between anterior dorsocentrals; wing without a black apical spot
graminum Fallen.

S. adusta Loew.—Common; season May 19 to November 30; comes to light; the larvae have been found mining turnip leaves. P. I.

S. graminum Fallen.—Abundant; adults have been collected in every month but January; they come to light; and have been bred from butternut hulls. P. I.

S. terminalis Loew.—Rosslyn, Va., May 1, 1913, R. C. Shannon.

S. vittata Coquillett.—Rosslyn, Va., April 28, 1913; Plummerville, Md., June 8, 1914, at light; Maryland near Plummerville, August 17, 1914, R. C. Shannon; Glen Echo, Md., August 21, 1921, Malloch.

Genus *Curtonotum* Macquart.

Handel (Deutsch. Ent. Zeitschr., 1917, p. 43) proposed the subfamily Cyrtotonotinae for this and one other genus and at the same time he used the subfamily Diastatinae, including *Diastata*, *Tryptochaeta* and one other genus in it. We deprecate the multiplicity of subfamilies for the reception of one or a few aberrant genera, believing that such a course does not tend to improve the classification nor make it more understandable to the average student, and unless the divisions are based upon characters of more fundamental significance than the comparative completeness of the auxiliary vein and the presence or absence of certain bristles that are admittedly unstable we consider the recognition of numerous subfamilies inadvisable.

In *Curtonotum* the very long costal spines and the large size of the species remind one of the family Helomyzidae in which the genus has sometimes been placed. It finds its closest affinities, however, in the Drosophilidae, but differs from all the genera herein included, except two, in having the mesopleura setulose. There is but one species recorded from the United States.

C. helvum Loew.—Locally common in moist, shady situations; season, July 1 to August 20.

Genus *Aulacigaster* Macquart.

A rather aberrant genus so far as the adult characters are concerned, but undoubtedly belonging to this family judging from the larval and pupal characters and habitat. The larvae and puparia (Figs. 16–18) are found in sap exuding from wounds in tree trunks and the adults breed there also, sometimes in large numbers, their steady flight and deliberate actions closely resembling those of many other members of the family.

The presence of pseudopods on the ventral surface of the larva is worthy of note in this genus but there are certain species belonging to the genus *Drosophila* that also possess pseudopods, one of the latter occurring in sap along with this genus. This *Drosophila* larva can jump though larvae of *Aulacigaster* observed did not manifest such ability. The larva of *Aulacigaster* can protrude the anal respiratory tubes in a remarkable manner, becoming exceptionally attenuated posteriorly in doing so.

There is but one species in our region, which is found also in Europe. Sturtevant is in error in stating that the ocellar bristles are absent; they are present but minute; the postverticals are absent.

A. leucopeza Meigen.—Common; season March 13 to October 23; adults frequent sap and have been reared from larvae found in sap. P. I.

Genus *Diastata* Meigen.

There are six species recorded from North America as belonging to this genus. Only one of these has been taken in our region but two others possibly may occur and a key is given to facilitate their identification.

KEY TO SPECIES.

1. Only the outer cross-vein and costa slightly infuscated; inner cross-vein about one-fourth from base of discal cell and almost directly below or but little beyond apex of first vein.....[*vagans* Loew].
— A much larger portion of wings blackened.....2.
2. Wing hyaline, with a large spot over outer cross-vein and another over inner, dark brown, subcostal cell blackish.....[*nebulosa* Loew].
— Wing blackish, with five or six hyaline spots.....*decemguttata* Walker.

D. decemguttata Walker (*pulchra* Loew).—Found in damp places, usually in woods. Plummerville Id., Md., July 4, 21, 1907, October 5, 1915; Maryland near Plummerville Id., July 26, 1914, McAtee; Glen Echo, Md., July 16, August 2, 22, 1922, Malloch.

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COQUILLET, D. W.

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Ent. News. 12, No. 1, Jan. 1901, p. 18.

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New genera and species of diptera. *Proc. Ent. Soc. Wash.* 9, 1907, p. 148.

Pseudiasata nebulosa described from Plummrs Id., Md.

HOWARD, L. O.

A contribution to the study of the insect fauna of human excrement. *Proc. Wash. Ac. Sci.* 2, pp. 589-590, Dec. 1900.

Drosophila ampelophila Loew and *D. funebris* Meigen recorded from our region.

LOEW, H.

Diptera americanae septentrionalis indigena.

Centuria secunda, 1862, pp. 99-101 *Amiota humeralis*, *Drosophila amoena*,

D. tripunctata, and *D. adusta* described from the District of Columbia.

Centuria septima, 1866, p. 110. *Drosophila multipunctata* (= *guttifera* Walker) similarly described.

STURTEVANT, A. H.

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Ann. Ent. Soc. Am. 9, No. 4, Dec. 1916, pp. 323-343.

Drosophila sulcata, *D. melanica*, *D. pseudomelanica*, and *D. modesta* (= *tripunctata* Loew), described in part from local material.

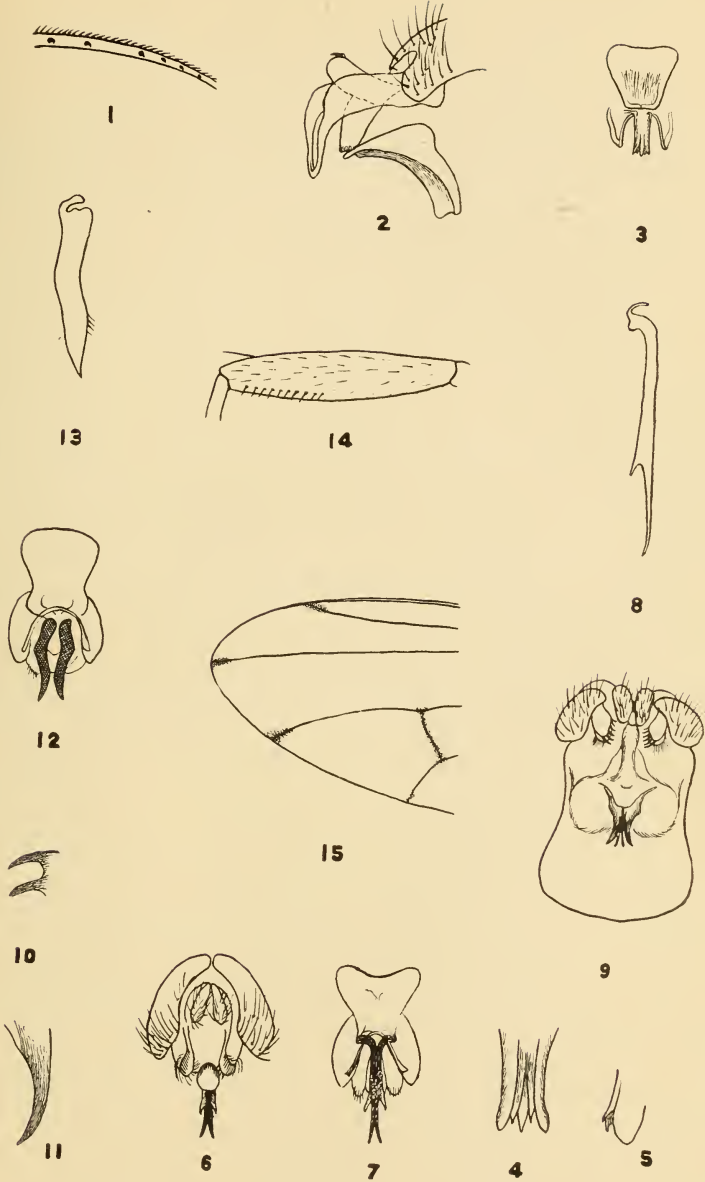
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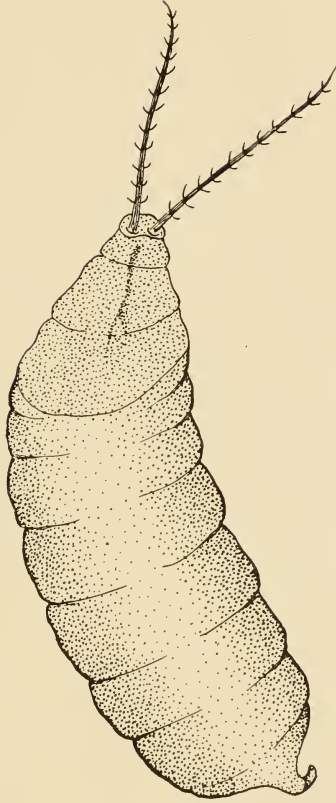
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Scaptomyza vittata Coq. and *S. graminum* Fall. recorded from our region (Arlington, Va.).





16



18



17

Larva and Puparium of *Aulacigaster leucopeza*.

EXPLANATION OF PLATES.

Plate VIII.

- Fig. 1, *Stegana*. Apex of costal vein from below, showing spiniferous warts.
 " 2, *Amiota humeralis*. Male hypopygium from side.
 " 3, " " Same from below, in part.
 " 4, " " Same, central processes.
 " 5, " " Same, tip of central processes from side.
 " 6, " *leucostoma*. Same from behind.
 " 7, " " Same from below.
 " 8, " " Same, one of central processes.
 " 9, " *minor*. Same from below.
 " 10, " " Same, apices of central processes from side.
 " 11, " " Same, one of central processes.
 " 12, " *alboguttata*. Same from behind.
 " 13, " " Same, one of central processes.
 " 14, *Drosophila immigrans*. Fore femur from in front.
 " 15, " *deflecta*. Apex of wing.

Plate IX.

- Fig. 16, *Aulacigaster leucopeza*. Larva, side view.
 " 17, " " Same, ventral view.
 " 18, " " Puparium, dorsal view.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

EIGHT NEW SPECIES OF PLANTS FROM MEXICO.¹

BY PAUL C. STANDLEY.

The species of plants described here are with one exception either trees or shrubs. Most of them have been collected by Mr. J. G. Ortega of Mazatlan, Mexico, who has obtained a comprehensive series of Sinaloa plants during the past few years.

The two plants described below are referred to the genus *Hyperbaena* with considerable hesitation, since the material upon which they are based is incomplete. It may well be that they belong to some other genus of the Menispermaceae, or that they represent an undescribed genus. The writer has had them upon hand for several years without being able to place them satisfactorily, but he is now convinced that they are members of the Menispermaceae, and it seems best to describe them tentatively as species of *Hyperbaena*, the only closely related group of the family thus far reported from Mexico.

Hyperbaena (?) *ilicifolia* Standl., sp. nov.

Tree, 6-10 m. high, the branchlets subterete, minutely cinereous-tomentulose or glabrate; leaves alternate, the petioles stout, 8-12 mm. long, cinereous-puberulent or glabrate; leaf blades oval or elliptic in outline, about 9 cm. long and 5.5 cm. wide, acute at apex and pungent-mucronate, broadly cuneate at base, rounded at the point of attachment, the marginal nerve continued across the upper surface of the petiole, thick-coriaceous, glabrous above or puberulent along the elevated costa, the nerves inconspicuous, beneath densely and finely pubescent, the costa very prominent, the lateral nerves 4 or 5 pairs, the lowest pair arising above the base of the blade, the ultimate nerves prominent and very closely reticulate, forming a dense network, the margin of the blade coarsely dentate, with 3 or 4 teeth on each side, these broadly triangular, divaricate, acute, terminating in a stout spinose tip; fruiting peduncles axillary, solitary, apparently 1-fruited,

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4-7 mm. long, tomentulose; fruit oval, about 2 cm. long and 1.5 cm. broad, slightly compressed, glabrous, the flesh very thin, the scar of attachment lateral near the base, the apex broadly rounded; seed about as large as the fruit.

Type in the U. S. National Herbarium, no. 399,281, collected at Cayaco, Michoacán, Mexico, March 29, 1903, by E. W. Nelson (no. 6962).

The fruits are so immature that the structure of the embryo can not be determined with any certainty, but there is no indication of the presence of endosperm. In his monograph of the Menispermaceae¹ Diels states that the species of *Hyperbaena* are scandent shrubs. Two species, *H. tonduzii* Diels and *H. phanerophlebia* Standl., common in Salvador, are trees of medium or large size, with no indication of a climbing habit, and the same is probably true of many other species of the genus.

***Hyperbaena* (?) *denticulata* Standl., sp. nov.**

Shrub 2.5 m. high, with numerous stems, the young branchlets densely yellowish-tomentose, the leaf scars very large and elevated; leaves alternate, the petioles stout, 2-2.5 cm. long, densely tomentose or finally glabrate; leaf blades oval or ovate-oval, 10-13.5 cm. long, 7-9 cm. wide, rounded or very obtuse at apex and spinulose-mucronate, truncate or shallowly cordate at base, thick-coriaceous, slightly lustrous on the upper surface, puberulent when young but later glabrate, the costa salient but the other venation not conspicuous, beneath paler, densely puberulent, 5-nerved or quintuplinerved at base, the venation salient, the lateral nerves 3 or 4 pairs, arcuate, irregular, the ultimate nerves closely reticulate and forming a dense network, the margin cartilaginous-thickened, a few of the nerves extending to the margin and ending in a pungent mucro; fruits borne on axillary inflorescences, these apparently cymose or racemose, the rachis very thick, tomentose, the pedicels very short; fruit oval, about 2 cm. long and 1.5 cm. wide, slightly compressed, rounded at apex, smooth, glabrous, the scar of attachment lateral near the base.

Type in the U. S. National Herbarium, no. 209,172, collected at base of mountains, Manzanillo, Mexico, December, 1890, by Edward Palmer (no. 1029). A specimen of the same collection is mounted upon sheet 567,700.

In his notes Dr. Palmer states that the vernacular name is *chilillo*, and that the fruit is reported to be black at maturity. The fruits collected are too immature for determination of the structure of the embryo.

The two plants described above are evidently congeneric. They differ from the known species of *Hyperbaena* in having denticulate or coarsely dentate leaves, the leaves of the other species being entire.

***Capparis mollicella* Standl., sp. nov.**

Branchlets stout, sparsely pilose with very short whitish hairs; petioles slender, 6.5-11.5 cm. long, very sparsely short-pilose; leaf blades elliptic or narrowly elliptic, 16-22 cm. long, 9-10 cm. wide, obtuse at base and apex, thin, with cartilaginous margin, glabrous on the upper surface, beneath rather densely and very finely pubescent with white simple hairs, the lateral

¹In Engl. Pflanzenreich IV. 24. 1910.

nerves about 6 pairs; inflorescence terminal, racemose, short and few-flowered, the rachis thick, pubescent; pedicels slender, 4–5 cm. long; sepals ovate-oval, 6–7 mm. long, rounded at apex, doubtless imbricate in bud, glabrous or nearly so, thin; petals oblong or narrowly oblong, 2–2.5 cm. long, rounded at apex, glabrous, apparently spreading; stamens very numerous, about 5 cm. long; ovary narrowly oblong, glabrous, borne on a long slender stipe.

Type in the U. S. National Herbarium, no. 1,111,324, collected at La Bajada, Nayarit, Mexico, altitude 80 meters, in 1923, *J. G. Ortega* 103.

A striking plant, apparently not closely related to any species previously reported from Mexico.

***Pithecollobium caesalpinoides* Standl., sp. nov.**

Tree or shrub, the smaller branches stout, geniculate-tortuous, grayish, conspicuously lenticellate, armed with stout, divaricate or ascending stipular spines 6–10 mm. long; leaves sparse, the petioles slender, 13–18 mm. long, minutely white-hirtellous with ascending or subappressed hairs, bearing at the apex a stipitate crateriform gland; pinnae 3 or 4 pairs, 1.5–3.5 cm. long, the leaflets 4–7 pairs, oblong, 5–8 mm. long, 2.5–3.5 mm. wide, obtuse or rounded at apex, very oblique at base, appressed-ciliate but otherwise glabrous, 2 or 3-nerved at base; flowers in very dense headlike spikes about 1 cm. long and 8 mm. in diameter (excluding the stamens), these sessile or short-pedunculate on old wood; calyx 1 mm. long puberulent, shallowly dentate; corolla greenish, 3 mm. long, glabrous below, puberulent on the short obtuse teeth; stamen tube slightly exerted beyond the corolla, the stamens very numerous; fruit apparently sessile, the valves oblong, 15–18 cm. long, 4.5 cm. wide, 5 mm. thick or more, very hard and woody, incurved, strongly convex; seeds (not seen) 10 to 12.

Type in the U. S. National Herbarium, no. 1,111,319, collected at El Zapote, Municipalidad de Mazatlán, Sinaloa, Mexico, in 1923, by Sr. J. G. Ortega (no. 5218). This specimen consists of flowering material. Fruiting specimens are mounted on sheet 1,111,327.

The vernacular names are given as *tempisque* and *guaypinole*, the latter probably being the more accurate. *Pithecollobium caesalpinoides* is related to *P. flexicaule* and *P. confine*, but differs from both in its very large fruit. In *P. confine* the inflorescence is capitate.

***Jatropha malacophylla* Standl., sp. nov.**

Shrub or small tree, the young branchlets very thick, densely tomentose at first; petioles slender, 1.5–2.5 cm. long, densely short-pilose; leaf blades rounded-ovate in outline, about 4 cm. long and broad, cordate at base with broad open sinus, shallowly 3-lobate or sometimes entire, the lobes broad, abruptly acute or acuminate or sometimes gradually acuminate, entire, densely pubescent on both surfaces with short spreading whitish hairs; staminate inflorescence cymose, about 6–10-flowered, 1.5–2 cm. broad, the peduncle 3–15 mm. long, the pedicels 3–5 mm. long; sepals oblong or elliptic-obovate, 3 mm. long, obtuse or rounded at apex, glabrous but ciliate;

corolla 4–4.5 mm. long, the petals united to above the middle, rounded at apex, glabrate.

Type in the U. S. National Herbarium, no. 1,111,320, collected at El Zapote, Municipalidad de Mazatlán, Sinaloa, Mexico, in 1923, by Sr. J. G. Ortega (no. 5208).

Related to *J. cinerea* (Ortega) Muell. Arg., but in that species the leaves are entire or nearly so, and their pubescence is closely appressed. The vernacular name of *J. malacophylla* is *sangregado*.

Malache ortegiana Standl., sp. nov.

Branches stout, terete, glabrous; petioles of the larger leaves 13 cm. long or more, glabrous, the blade rounded in outline, about 28 cm. long and wide, deeply cordate at base, with rounded overlapping lobes, 5-lobate about one-third the distance to the base, the lobes broadly triangular, acute, irregularly and shallowly crenate, very finely and closely stellate-pubescent on the upper surface, beneath densely stellate-tomentose with spreading hairs; uppermost leaves much reduced but similar to the lower ones; inflorescence racemose, the racemes about 28 cm. long, naked or (abnormally?) sometimes leafy above; pedicels stout, ascending, 1.5–3 cm. long, solitary, sparsely or densely stellate-hispidulous; bractlets about 10, linear, equaling or slightly exceeding the calyx; calyx campanulate, 8–10 mm. long, densely stellate-hispidulous, the lobes broadly triangular, acute; petals erect, probably white, 12–14 mm. long, puberulent outside; pistil about equaling the petals; fruit subglobose, 1 cm. in diameter, 5-carpellate, the carpels with an acute incurved apex, glabrous on the back, smooth but with a median ridge, the edges of the carpel very acute.

Type in the U. S. National Herbarium, no. 1,111,326, collected in the State of Nayarit, Mexico, in 1923, *J. G. Ortega* (no. 68).

A very distinct species, apparently with no close Mexican relatives.

Parathesis prionophylla Standl., sp. nov.

Branchlets stout, subterete, densely brown-tomentose with stellate hairs; petioles stout, 1–1.5 cm. long, densely brown-tomentose; leaf blades elliptic or oblong-elliptic, 13–14.5 cm. long, 5.5–7 cm. wide, acute or acuminate, cuneate-attenuate at base, chartaceous, closely and finely punctate, glabrous above or nearly so, beneath thinly and minutely stellate-tomentulose, the costa salient beneath, the lateral nerves slender, about 14 pairs, the margin coarsely serrate-dentate, the teeth 7–11 on each side, broadly triangular, obtuse, 4–5 mm. long; inflorescence terminal, many-flowered, rather openly pyramidal, 10 cm. long, the corymbs few-flowered, the pedicels 2–5 mm. long, stellate-tomentose; flowers before anthesis 5–6 mm. long, stellate-tomentulose with brown hairs; sepals oblong-lanceolate, united at base, acuminate, 2–2.5 mm. long; petals short-connate, narrowly lance-oblong, attenuate to the apex; stamens shorter than the petals, the filaments very short, the anthers yellow, 2.5 mm. long; ovary ovoid, sparsely short-pilose at apex.

Type in the U. S. National Herbarium, no. 1,111,322, collected in Arroyo de Jalio, Nayarit, Mexico, altitude 540 meters, in 1923, *J. G. Ortega* 52.

Among Mexican species of the genus this may be recognized at once by the coarsely toothed leaves. The vernacular name is *capulincillo de faisán*.

***Ruellia konzattii* Standl., sp. nov.**

A large coarse herb, densely short-villous with white hairs, many of the hairs gland-tipped; petioles slender, 10–13.5 cm. long, pubescent like the stems; leaf blades ovate to rounded-ovate, 18–30 cm. long, 12–21 cm. wide, rather abruptly acuminate, deeply cordate at base with narrow sinus, thin, closely undulate-crenate, thinly short-villous on the upper surface, more densely short-villous beneath with white hairs; inflorescences axillary, on slender peduncles 17–20 cm. long, consisting of a pedicellate central flower and of two lateral 3-flowered cymes, these on peduncles about 4 cm. long, the pedicels 6–7 mm. long, viscid-villosulous; calyx lobes broadly linear, about 5 cm. long, 3–4 mm. wide, tapering gradually from the base to a blunt tip, densely short-villous with white hairs and more or less viscid; corolla 7–9 cm. long, obliquely funnelform, the tube about 2 cm. long and 6 mm. thick, the throat 2.5–3.5 cm. long, with a large inflated sack at base, white-villosulous outside, the lobes broadly ovate-oval, rounded or obtuse at apex; anthers 12 mm. long; capsule narrowly oblong, 4 cm. long, sessile, slightly narrowed at base, acute at apex, glabrous; seeds (immature) rounded-ovate, flat, 6 mm. long, glabrous, narrowly winged.

Type in the U. S. National Herbarium, no. 1,082,979, cultivated at Oaxaca, Mexico, from seeds gathered at Pochutla, October 31, 1921, *C. Konzatti* 4240.

The only closely related species is *R. bourgaei* Hemsl., in which the leaves are not cordate at base but are long-decurrent upon the petiole, while the calyx lobes are shorter and much broader, and the corolla is glabrous outside.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

NINE NEW SPECIES OF PLANTS FROM CENTRAL
AMERICA.¹

BY PAUL C. STANDLEY.

The trees and shrubs described in the present paper were collected mostly by the writer during a visit to Quiriguá and Puerto Barrios, Guatemala, during the early summer of 1922. There are included also descriptions of a new species of *Psychotria* obtained by Mr. William R. Maxon during a recent visit to Costa Rica, and of two representatives of the genus *Coussapoa* from Costa Rica.

***Podocarpus guatemalensis* Standl., sp. nov.**

Branchlets rather slender, the leaves distant; terminal buds small, the outer scales acute, the inner obtuse; leaves thin-coriaceous, lance-linear and elongate, 9.5-15 cm. long, 8-12 mm. wide, long-attenuate to the apex, acute or short-attenuate at base and sessile, somewhat lustrous, green above, slightly paler beneath, the costa slender, prominent on both surfaces, not sulcate above.

Type in the U. S. National Herbarium, no. 1,150,683, collected in wet thicket at Puerto Barrios, Guatemala, at sea level, June, 1922, by Paul C. Standley (no. 25090).

Of all the numerous interesting plants collected by the writer on the north coast of Guatemala in 1922, this is doubtless the most interesting, important, and perplexing. The species of *Podocarpus* are inhabitants of the high mountains, and so far as may be learned from consultation of literature, including the monograph of the genus published in Engler's *Pflanzenreich* by Pilger in 1903, they are never found in tropical regions at sea level. Three species are known from Central America, all occurring in Costa Rica (one also in Panama) at elevations of 1,700 to 2,400 meters. The Guatemalan plant, consequently, represents a considerable extension of range for the genus northward upon the continent, but it is much more remarkable because of its occurrence in a coastal thicket or swamp.

The specimens obtained were taken from a shrub of two meters, which, of

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course, was sterile. The writer did not recognize its genus at the time of collection, but took the specimens because it seemed probable that the distinctive form of the leaves would make them easy of determination. No other individual was seen, but the collecting trip upon which the specimens were obtained was a hurried one, and it is likely that careful search might have revealed other plants.

It scarcely seems probable that the coastal thickets at Puerto Barrios can be a natural habitat for a species of *Podocarpus*, yet it is not easy to explain the accidental occurrence of a plant of the genus there, if it be accidental. No species is known from the mountains of Guatemala, from which seeds might have been carried. Although the land about Puerto Barrios consists largely of swamps, these swamps are not connected with the Río Motagua, which empties into the sea some miles away, in such a fashion that seeds might have been brought from some higher elevation. The occurrence of the plant in this region thus remains a botanical anomaly, which it may be possible some day to solve, and perhaps not.

In view of the fact that the type material of *P. guatemalensis* was taken from a juvenile plant, it is probable that the leaf characters are somewhat different from those of the mature plant, although this is not necessarily the case. The leaves are most like those of *P. coriaceus* Rich., which occurs in Porto Rico, the Lesser Antilles, Trinidad, Venezuela, and Colombia, but in that the costa of the leaf is conspicuously sulcate on the upper surface. The leaves resemble also those of *P. oleifolius* Don, which grows in the high mountains of Costa Rica and Panama, and also in Peru, but they are somewhat longer and narrower, and in that species also the costa is sulcate on the upper surface.

It may be that when better material of the Guatemalan plant is obtained, it will be found that it is identical with one of the species mentioned. It is not a good policy to describe new species from such incomplete material, but the occurrence of the present plant offers so many features of interest that it is desirable to give it a name for purposes of reference.

***Coussapoa nymphaeifolia* Standl., sp. nov.**

Young branchlets very thick, glabrate; stipules about 2 cm. long, densely covered with brown subappressed hairs; petioles stout, 8–12 cm. long, finely puberulent; leaf blades oval or ovate-oval, 23–28 cm. long, 18–21 cm. wide, broadly rounded at apex, cordate at base, with a narrow sinus 2–3 cm. deep, slightly roughened above, pubescent beneath with short spreading hairs, the lateral nerves 10 or 11 on each side, nearly straight; staminate heads 6–8 mm. broad, about 6 in each pedunculate cyme, borne on stout peduncles; pistillate heads mostly geminate, sessile, solitary in the leaf axils, in fruit about 2 cm. broad, with very numerous flowers.

Type in the U. S. National Herbarium, no. 473,945, collected at Buena Vista, road to San Carlos Valley, Costa Rica, altitude 600 meters, April 16, 1903, by O. F. Cook and C. B. Doyle (no. 157). Also collected in Panama by Sutton Hayes (no. 354).

The nearest relative is *C. brevipes* Pittier, of the San Blas Coast of Panama, but in that the leaves are rounded at base.

Coussapoa parviceps Standl., sp. nov.

Branchlets stout, glabrous; stipules about 1 cm. long, oblong-lanceolate, sparsely and minutely appressed-pubescent, acute; petioles slender, 2-3.5 cm. long, glabrous; leaf blades oval, about 16 cm. long and 10 cm. wide, rounded and abruptly short-pointed at apex, rounded or obtuse at base, coriaceous, glabrous, with usually 6 pairs of lateral nerves; pistillate heads numerous, cymose-paniculate, 3-4 mm. in diameter, few-flowered, the peduncles 12 mm. long or less, stout, obscurely puberulent.

Type in the U. S. National Herbarium, no. 799,413, collected in the Valle de Agua Buena, Cafias Gordas, Costa Rica, altitude 1,100 meters, February, 1897, by H. Pittier (no. 11166).

Related to *C. latifolia* Aubl., of French Guiana, as which the type material was determined, but Aublet's plate shows a plant with much larger pistillate heads.

Only one species of *Coussapoa*, *C. rekoii* Standl., has been reported from Mexico. There is, however, in the National Herbarium a specimen of a second species, *Purpus* 5996, from Zacuapan, Veracruz, distributed as "*Brosimum?*" This specimen is in very poor condition, with immature leaves and staminate inflorescence. So far as may be told from the specimen, the Mexican plant may well be the same as *C. parviceps*. It seems probable that the Mexican tree may belong to a distinct species, but until better material has been obtained, it does not seem advisable to give it a name.

Neea stenophylla Standl., sp. nov.

Shrub, about 1 m. high, the branchlets slender, terete, glabrous, or when very young obscurely and sparsely puberulent; leaves mostly opposite but part of them ternate, the petioles stout, 2-4 mm. long, the blades narrowly lance-oblong, usually widest at the middle but sometimes widest above the middle, 5-10 cm. long, 1-2.3 cm. wide, long-acuminate, acute or obtuse at base, chartaceous, glabrous, the margins plane, the lateral nerves about 7 pairs but nearly obsolete; pistillate cymes about 8-15-flowered, on slender peduncles 12-18 mm. long, lax, very sparsely ferruginous-puberulent, the flowers red-brown, sessile or on pedicels 1 mm. long or less, the bracts minute; pistillate perianth tubular, 3 mm. long, sparsely and very minutely ferruginous-puberulent or glabrate.

Type in the U. S. National Herbarium, no. 1,150,653, collected in wet thicket at Puerto Barrios, Guatemala, at sea level, June, 1922, by Paul C. Standley (no. 25059).

The most closely related species is *N. psychotrioides* Donn. Smith, common in many parts of Central America, in which the leaves are usually much larger and comparatively broader, and on longer petioles.

Sparattanthelium guatemalense Standl., sp. nov.

Shrub or tree, 3-6 m. high, the branchlets slender, glabrous, terete; petioles very slender, 1.5-3.5 cm. long, glabrous; leaf blades oblong-lanceolate, herbaceous, 11-13.5 cm. long, 3-4.5 cm. wide, very long-acuminate, obtuse at base, glabrous, somewhat lustrous, 3-nerved, the two lateral nerves extending about two-thirds the distance to the apex and there

anastomosing with the 2 or 3 arcuate lateral nerves, the latter arising well above the middle of the blade; panicles axillary, slender-pedunculate, about 7 cm. long, many-flowered, the branches very slender, very minutely gray-puberulent, the pedicels puberulent, often twice as long but sometimes shorter than the calyx; calyx 4-parted, about 0.5 mm. long, minutely gray-puberulent.

Type in the U. S. National Herbarium, no. 1,150,660, collected in wet thicket at Puerto Barrios, Guatemala, at sea level, June, 1922, by Paul C. Standley (no. 25066).

The flowers are only in bud, although apparently about ready to open. The genus *Sparattanthelium*, of the family Hernandiaceae, has not been reported previously from North America. The seven or eight species are chiefly natives of Brazil, although some of them occur also in Peru, Bolivia, and French Guiana. The Guatemalan tree is closely related to the Brazilian species, but seems to differ in some character from each of them.

Capparis quiriguensis Standl., sp. nov.

Shrub or tree, 3-6 m. high, with a dense spreading crown, the branchlets terete, green, puberulent or finally glabrate; petioles slender, 3-12.5 cm. long, glabrous or sparsely puberulent; leaf blades mostly elliptic, sometimes oblong-elliptic, 11-23 cm. long, 4.5-14 cm. wide, acuminate, obtuse or rounded at base, thin, shining, bright green above, glabrous, with prominent venation, beneath paler, hirtellous along the nerves, at least when young, later glabrate; flowers greenish white, in terminal racemes 4-10 cm. long, the rachis stout, densely puberulent, the flowers few or numerous, on puberulent pedicels 2-4 cm. long; sepals imbricate in bud, oval or rounded-ovate, 5 mm. long, minutely puberulent and ciliolate-denticulate; petals broad, about 1 cm. long, glabrous; stamens numerous, white, about 3 cm. long; fruit (immature) subglobose or oblong, 3.5 cm. long or larger, narrowed or rounded at apex, smooth, many-seeded, borne on a stipe 2.5 cm. long.

Type in the U. S. National Herbarium, no. 1,139,713, collected in swamp at Quiriguá, Departamento de Izabal, Guatemala, altitude about 75 meters, May, 1922, by Paul C. Standley (no. 24048). No. 24598 from the same locality also represents this species.

Capparis tuerckheimii Donn. Smith, of Baja Verapaz, Guatemala, is closely related, but in that there is no pubescence, the sepals are narrower, the leaves relatively narrower, and the pedicels much longer.

Maieta glandulifera Standl., sp. nov.

Shrub, 2-3 m. high, the young branchlets glandular-hirsute, becoming glabrate; leaves of a pair somewhat unequal, the petioles stout, 3-5 cm. long, glandular-hirsute, bearing at the apex an inflated sack 1-2 cm. long, this glabrous or nearly so; leaf blades broadly elliptic to broadly oval, 21-25 cm. long, 12-15 cm. wide, cuspidate-acuminate, rounded at base, 5-nerved, finely and evenly serrate-dentate, each tooth ending in a stiff bristle, above deep green, thinly hispid with yellowish hairs, beneath much paler, rather densely hispidulous with short spreading hairs; inflorescence axillary, laxly paniculate, many-flowered, about 9 cm. long, the rachis glandular-hirsute and minutely puberulent, the flowers partly sessile and partly on pedicels

3–5 mm. long; fruit black, subglobose, 6 mm. in diameter, thinly glandular-hirsute; calyx lobes 5, broadly rounded and nearly obsolete; apex of the ovary bearing a broad lacerate-dentate flat spreading crown.

Type in the U. S. National Herbarium, no. 1,150,604, collected in swamp at Puerto Barrios, Guatemala, at sea level, June, 1922, by Paul C. Standley (no. 25002).

Very few specimens of this genus have been collected in Central America, except for the widely distributed *M. setosa* (Triana) Cogn. The present species is related to *M. guianensis* Aubl., but the relationship does not appear to be a close one.

***Hamelia longipes* Standl., sp. nov.**

Shrub, 2.5–3 m. high, glabrous throughout, the branches slender, with elongate internodes; stipules deltoid-acuminate, 3–4 mm. long; leaves opposite, the petioles slender, 2–3.5 cm. long, the blades elliptic or oval, 15–24 cm. long, 7–10.5 cm. wide, rather abruptly short-acuminate, rounded or obtuse at base, sometimes short-decurrent, thin, somewhat lustrous, concolorous, the lateral nerves about 10 pairs, arcuate; inflorescence terminal, cymose-corymbose, laxly many-flowered, the rachis and pedicels bright red, the pedicels slender, 6–11 mm. long; calyx and hypanthium 3 mm. long, the calyx lobes nearly obsolete, short and broadly rounded; corolla pale buff, 16–17 mm. long, tubular, very slightly ampliate above, the lobes very short, ovate-deltoid, erect.

Type in the U. S. National Herbarium, no. 1,150,447, collected in deep forest at Escoba, on the bay opposite Puerto Barrios, Guatemala, altitude about 150 meters, June 2, 1922, by Paul C. Standley (no. 24829).

Related to *H. chrysantha* Swartz, of Jamaica, in which the leaves are only half as large and the flowers only short-pedicellate.

***Psychotria maxonii* Standl., sp. nov.**

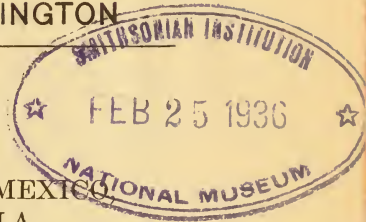
Epiphytic, the stems simple or sparsely branched, 12–25 cm. long, slender, glabrous, in age pale and lustrous, the internodes 5–17 mm. long; stipules intrapetiolar, united and forming a scarious persistent truncate sheath 1–1.5 mm. long; petioles 1–1.5 mm. long; leaf blades narrowly oblong-lanceolate, 13–18 mm. long, 2.5–4 mm. wide, acute or acuminate, acute at base, thick and succulent, glabrous, green above, pale beneath, the nervation obsolete; inflorescence glabrous, cymose, terminal and axillary, 6–8-flowered, the pedicels slender, 2–3 mm. long; hypanthium oval, 1 mm. long; calyx about 0.75 mm. long, 4-dentate, the teeth triangular-ovate, acute, erect; corolla tube 2.5–4 mm. long, the 4 lobes obtuse, about 1.5 mm. long; bracts minute and inconspicuous.

Type in the U. S. National Herbarium, no. 1,180,093, collected on mossy tree trunk, Santa Clara de Cartago, Costa Rica, altitude 1,950 meters, July 20, 1923, by William R. Maxon and Alfred D. Harvey (no. 8250).

Only two other species of epiphytic *Psychotrias* have been reported previously from continental North America, *P. parasitica* Swartz and *P. peperomia* Standl., both of which occur in the mountains of Panama.

Psychotria maxonii is strikingly different from both these in its diminutive size and in the small narrow leaves.

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EIGHT NEW ASTERACEAE FROM MEXICO,
GUATEMALA, AND HISPANIOLA.

BY S. F. BLAKE.

The new composites described in this paper have been found among collections recently received at the National Herbarium or in older material hitherto not critically examined.

Erigeron ortegae Blake, sp. nov.

Herbaceous, 30 cm. high and probably much more (the lower part not seen), essentially glabrous throughout; stem branching, striate-angled, pale green, whitish-dotted; stem leaves alternate, 1.5 to 3 cm. apart, elliptic-linear to linear-oblongate or linear-lanceolate, 3 to 4.8 cm. long, 5 to 8 mm. wide, acute, sessile or gradually narrowed into a short petioliform base, obscurely repand, rather firm, dull green on both sides, very narrowly pale-margined and when young somewhat spinulose-ciliate, quintuplennerved with translucent veins, sometimes obscurely pubescent above; branch leaves similar but much smaller, usually oblongate and narrowed into a petiole-like base, sometimes with a few teeth toward apex; heads hemispheric, about 1.5 cm. wide, numerous, loosely paniced, the flowering branches minutely bracteate, erect, the sparsely subulate-bracted monocephalous peduncles 3 to 9 cm. long; disk 7 to 10 mm. high, about 1 cm. wide; involucre strongly graduate, about 4-seriate, 4 to 6 mm. high, the phyllaries all appressed, the outermost ovate-oblong, the others oblong, 1.5 to 1.8 mm. wide, obtuse or rounded, obscurely subherbaceous with subscarios ciliate margins, glabrous dorsally, 3-nerved or nerveless; receptacle rounded, alveolate; rays about 18, 1-seriate, white, fertile, the tube hirsutulous, 2.5 mm. long, the lamina linear-cuneate, tridenticulate, revolute in drying, 6-veined, 6 mm. long, 1.6 mm. wide; disk flowers numerous, fertile, their corollas pale yellow, hirsutulous on tube and lower part of throat, 5 mm. long (tube 2 mm., throat funnelform, 2.2 mm., teeth 5, ovate, 0.8 mm.); achenes of ray and disk similar, oblong, scarcely compressed, 5-nerved, glabrous, 2.5 to 2.8 mm. long; pappus of about 70 somewhat unequal, stiffish, barbellate, whitish bristles 3.5 mm. long; anther tips lance-subulate; style branches short, with short, deltoid, obtuse, externally papillose appendages.

Type in the U. S. National Herbarium, no. 1,084,210, collected at Balboa, Sinaloa, Mexico, Jan. 1923, by J. G. Ortega (no. 4974).

Erigeron ortegae is not closely related to any other species with which I am acquainted. It is somewhat similar in appearance to the smoother forms of *Erigeron bonariensis* L., but very different in the characters of the involucre and rays. The plant is more or less intermediate in character between *Aster* and *Erigeron*, but is referred to *Erigeron* on the basis of its short blunt style tips.

***Guardiola stenodonta* Blake, sp. nov.**

Suffrutescent, oppositely branched, slender, glabrous throughout except for the somewhat pubescent pedicels and tips of the phyllaries; upper internodes 1 to 2 cm. long; leaves opposite; petioles slender, margined only toward apex, 1 to 1.5 cm. long; leaf blades lanceolate or elliptic-lanceolate, 5 to 8 cm. long, 1.5 to 2.2 cm. wide across the basal lobes, 8 to 12 mm. wide near middle, acuminate to an acute apex, often falcate, hastately bilobed just above the acutely cuneate base (the lobes linear-subulate, attenuate, often falcate, wide-spreading, entire or sparsely toothed, 5 to 12 mm. long, about 1 mm. wide at base), abruptly contracted and cuneate above the lobes (there 2 to 4 mm. wide), acutely serrate with about 13 to 16 pairs of teeth 1 mm. high or less, slightly paler green beneath than above, weakly triplinerved above the base, finely reticulate with translucent veins and veinlets; heads about 4 to 8, clustered at tips of branches, about 1.2 cm. wide, on sparsely pubescent pedicels about 8 mm. long; disk thick-cylindric, 1.2 to 1.5 cm. high, 3 to 5 mm. thick; involucre 2-seriate, 8 to 9 mm. high, the outer phyllaries 4, subequal, oval-oblong, obtuse, about 4 mm. wide, scarious-margined, not at all carinate, many-nerved, sparsely pubescent toward apex, the inner (subtending the rays) membranous, similar to the pales; rays about 3, apparently white, fertile, the lamina oval, tridenticulate, 5.5 mm. long, 3.2 mm. wide; disk flowers about 13, sterile, their corollas whitish or perhaps cream-color, glabrous, becoming 11.5 mm. long (tube slender, 8 mm., throat campanulate, 1 mm., teeth oblong, acutish, 2.5 mm.); pales membranous, obtuse, ciliolate above, few-nerved, about 11 mm. long; ray achenes oblong, thickened, somewhat obcompressed, striate, sparsely pubescent, blackish, 5 mm. long, 2.2 mm. wide, epappose; anthers greenish, the filaments densely pilose; style (of hermaphrodite flowers) 2-parted, the branches linear-subulate, acuminate, hispidulous, without stigmatic lines.

Type in the U. S. National Herbarium, no. 1,084,211, collected at Balboa, Sinaloa, Mexico, Jan. 1923, by J. G. Ortega (no. 4986).

Related to *Guardiola mexicana* Humb. & Bonpl. and *G. arguta* (A. Gray) Robinson, but easily distinguished by the leaves, which are hastate with extremely long and narrow basal lobes and are abruptly contracted just above the lobes.

***Montanoa pteropoda* Blake, sp. nov.**

Suffrutescent; stem stout, erectish-branched above, subterete, striatulate, sordidly pilose-subtomentose with mostly appressed hairs, glabrescent; leaves opposite except in the inflorescence; petioles 1 to 3 cm. long, broadly

winged throughout, 7 to 18 mm. wide including the wings, these crenate-serrate, cordate-clasping at base, scarcely auriculate; blades rhombic-ovate, 8 to 10.5 cm. long, 4 to 9 cm. wide, trilobate about to middle, the terminal lobe acuminate, crenate-serrate, the lateral lobes acute, crenate-serrate and usually weakly 2 or 3-lobed on the outer side, the blade papery, deep green above, minutely and rather softly hispidulous-puberulous with incurved hairs, in age somewhat harsh, beneath rather densely griseous-puberulous (the hairs along the veins rufidulous) and somewhat gland-dotted, triplinerved at base of blade and densely prominulous-reticulate beneath; leaves of the inflorescence ovate, unlobed, 2.5 to 4.5 cm. long; heads rather numerous, cymose-panicled, 2.2 to 2.5 cm. wide, on sordidly pilose-tomentose straight or at length hooked peduncles 1.5 to 3 cm. long; disk in flower about 7 mm. high, 9 mm. thick, in fruit 1.7 to 2 cm. thick; outer phyllaries 5, oblong-ovate, 4 mm. long, obtusish, callous-apiculate, sordid-pilosulous; rays 10, white, pistillate, the lamina elliptic, bidentate, 8 to 10 mm. long; disk flowers numerous, their corollas white, puberulous with short few-celled hairs, 3.1 mm. long (tube 0.8 mm., throat broadly campanulate, 1.5 mm., teeth 0.8 mm.); pales at maturity thin and much inflated, wedge-obovate in lateral view, 1 cm. long, 5 mm. wide (when folded), somewhat repand at the broad truncate apex, abruptly spinose-mucronate (mucro straight, 0.5 mm. long), stipitate-glandular on the upper half and pilose on the costa; achenes obovoid, somewhat compressed, blackish, 2.8 mm. long, 1.8 mm. wide, 1-ridged on the sides, glabrous, epappose.

Type in the U. S. National Herbarium, no. 252,752, collected between San Martín and Todos Santos, Guatemala, altitude 2,135–2,590 meters, 25 Dec. 1895, by E. W. Nelson (no. 3616).

A species of the subgenus *Acanthocarpha*, nearest *M. purpurascens* Robins. & Greenm., but readily distinguished by its three-lobed leaves with the petioles broadly winged to the very base.

Hymenostephium superaxillare Blake, sp. nov.

Herbaceous at least above, opposite-branched, the branches divergent, superaxillary (1 to 4 mm. above the axils); stem slender, striatulate, somewhat flattened at the nodes, glaucescent, sparsely tuberculate near the nodes with short incurved 1-celled conic hairs, these usually deciduous; internodes 8 to 12 cm. long; petioles slender, naked, similarly tuberculate, 5 to 15 mm. long; blades ovate, or the uppermost lance-ovate, 8 to 13 cm. long, 2.5 to 6 cm. wide, falcate-acuminate, at base narrowly or broadly cuneate, serrate nearly throughout (teeth about 18 pairs, depressed, mucronulate), thin-papery, above deep green, evenly but not densely scabrous-tuberculate with incurved conic hairs with lepidote bases, beneath somewhat lighter green, evenly but not densely tuberculate-hispidulous on veins and veinlets and sometimes minutely so on surface, triplinerved from near the base and weakly prominulous-reticulate beneath; heads 2.5 to 4 cm. wide, solitary at apex of stem and in the uppermost axils, on slender glabrous peduncles 2.5 to 8 cm. long; disk hemispheric, 8 to 10 mm. high, 8 to 13 mm. thick; involucre 3-seriate, somewhat graduate, 5 to 6 mm. high, the phyllaries ovate (1.8 to 2.5 mm. wide), acute or acuminate, with indurate, ribbed and

vittate base and subequal, usually spreading, herbaceous apex, tuberculate-hispidulous-ciliolate, on back glabrous or sparsely tuberculate-hispidulous; receptacle convex; rays 12, neutral, golden-yellow, the lamina elliptic-oblong, bidenticulate, about 15 mm. long, 4.5 mm. wide, 13-nerved; disk corollas very numerous, yellow, slender-cylindric, hispidulous on tube and lower half of throat, 5 mm. long (tube 0.8 mm., throat 3.5 mm., teeth 0.7 mm.); pales acuminate, many-striate, somewhat hispidulous, about 6 mm. long; achenes obovate-oblong, compressed, glabrous, epappose, 2.5 mm. long.

Type in the U. S. National Herbarium, no. 1,083,277, collected at La Bajada, Tamazula, Durango, Mexico, altitude 300-600 meters, Nov. 1921, by J. G. Ortega (no. 4437).

This species has the largest heads of any known *Hymenostephium*, and is further distinguished by its phyllaries, which are broader than in any other species and do not have the attenuate or very narrowly acuminate tips found in practically all the others. It is nearest to the epappose form of *H. cordatum* (Hook. & Arn.) Blake.

The conspicuously superaxillary branches from which the name is derived are shown by all the six or eight specimens of the type collection examined, and by no others in a large series of specimens representing the other species of the genus.

Verbesina peninsularis Blake, sp. nov.

Suffrutescent or fruticose, 60 cm. high and more; stem rather slender, subterete, striatulate, wingless, white, rather densely hispidulous-pilosulous with mostly incurved or spreading hairs with subtuberculate bases; lowest leaves (of incomplete specimen examined) opposite, the others alternate; petioles 5 to 10 mm. long, cuneately winged to base by the decurrent lamina; blades triangular-ovate or sometimes lanceolate, the larger 9 to 11 cm. long, 4.5 to 5.8 cm. wide, acuminate, cuneate at base and decurrent on the petiole, coarsely and irregularly dentate (the teeth triangular, callous-tipped) and usually somewhat hastate-lobed at base, firm-papery, above dull green, densely incurved-hispidulous with tuberculate-based mostly deciduous hairs, scabrous, beneath slightly paler green, rather densely and somewhat harshly hispidulous with antrorse tuberculate-based hairs and somewhat gland-dotted, triplinerved about 1 cm. above the base and loosely prominulous-reticulate, the secondary veins few; heads 2.5 to 3 cm. wide, in a terminal short-pedunculate cyme of about 5 and on 1 or 2-headed peduncles from the upper axils, the pedicels 1 to 8 cm. long, pubescent like the stem; disk campanulate-hemispheric, 1.1 to 1.3 cm. high, about 1.5 cm. thick; involucre 2-seriate, subequal, 7 to 8 mm. high, the phyllaries oblong-ovate or oval-oblong, subappressed, the outer herbaceous, obtuse or acutish, hispid-pilose with glandular-tuberculate-based hairs and ciliate, 2 to 3.5 mm. wide, the inner thinner, subscarios, obtuse, less pubescent or nearly glabrous; rays about 10, pistillate, yellow, the tube pilose, 1.8 mm. long, the lamina linear-elliptic, 9 to 12 mm. long, about 2.8 mm. wide; disk flowers numerous, their corollas yellow, pilose on tube and base of throat, 6.7 mm. long (tube

1.5 mm., throat cylindrical, 4 mm., teeth 1.2 mm. long); pales narrow, acuminate to obtuse, loosely pilose-ciliate above, 7 to 8 mm. long; disk achenes (submature) obovate, compressed, 4.5 mm. long, 1.8 mm. wide, glabrous on the faces or sparsely pilosulous above, very narrowly 2-winged, the wings ciliate; awns 2, slender, unequal, 3 to 4 mm. long.

Type in the U. S. National Herbarium, no. 565,313, collected 32 kilometers east of San Ignacio, Baja California, Mexico, altitude 365–610 meters, 19 Oct. 1905, by E. W. Nelson and E. A. Goldman (no. 7227).

A member of the section *Sonoricola*, related to *V. leptochaeta* A. Gray and *V. erosa* T. S. Brandeg. The latter has much narrower phyllaries and chiefly opposite leaves which are densely antrorse-hirsute or hirsute-pilose beneath. The former, a Chihuahuan species known to me only from description, is said to have opposite serrate leaves, narrowly oblong wide-spreading outer phyllaries, and small rays.

Perityle macromeres Blake, sp. nov.

Herbaceous, 60 cm. high and more, the base not seen; stem stout (8 mm. thick below), somewhat branched, striate, sparsely villous near the nodes and very sparsely between them with several-celled hairs, obscurely glandular; lower internodes 14 cm. long; lower leaves (2 or more pairs) opposite, the others mostly alternate; petioles 1 to 3 cm. long; blades ovate-suborbicular in outline, 2 to 4 cm. long, 2 to 5.5 cm. wide, 3-nerved, deeply 3-lobed, the lateral lobes with 2 oblong lobes on the lower side, the terminal lobe rather deeply 3 or 5-lobed, the primary lobes all lacinate-lobed or toothed with acute or acutish teeth and rounded sinuses, thinnish, sparsely villous chiefly on the veins and margin; heads several, about 2.5 cm. wide, solitary on densely stipitate-glandular, sparsely villous, naked or bracteate peduncles 6 to 12 cm. long; disk rounded, 9 to 10 mm. high, 1.3 to 1.8 cm. wide; involucre sub-2-seriate, equal, 5 mm. high, the phyllaries lanceolate, acuminate, 2-ribbed, villous and stipitate-glandular; rays 13, fertile, apparently white, the lamina oblong, bluntly 3-toothed, 8 to 9 mm. long, 2.5 to 3 mm. wide; disk flowers very numerous, their corollas apparently whitish, 4-toothed, densely stipitate-glandular on tube, sparsely so on limb, pilosulous on teeth with several-celled hairs, 2.8 to 3.2 mm. long (tube 1.3 to 1.6 mm., throat funnellform-campanulate, 1 to 1.3 mm., teeth 0.3 to 0.5 mm.); achenes linear-obovate, 3 mm. long, very flat, blackish, densely ciliate on the narrow callous margins, glabrous on the faces; pappus awn 1, setiform, weak, retrorse-hispid above the middle, 2.2 mm. long; squamellaceous corona minute, ciliate; style branches with rather short, lanceolate, hispidulous tips.

Type in the U. S. National Herbarium, no. 565,548, collected at La Paz, Baja California, altitude 3 meters, 3 Feb. 1906, by E. W. Nelson and E. A. Goldman (no. 7483).

Related to *Perityle crassifolia* T. S. Brandeg. and *P. robusta* Rydb., and agreeing with them in the single, weak, retrorsely hispid pappus awn and the clavellate cilia of the achene, but differing in its much larger and thinner leaves and longer peduncles, as well as in its much scantier pubescence and

glandularity. *P. crassifolia* is very densely viscid-villous, almost arachnoid, and *P. robusta*, which is doubtfully distinct from *P. crassifolia*, is densely stipitate-glandular throughout and densely villous to middle, less densely so above.

***Perityle trichodonta* Blake, sp. nov.**

Suffruticulose, branched, many-stemmed, 10 cm. high, the stems glabrate; branches, peduncles, and leaves densely griseous-pilosulous with several-celled mostly spreading hairs; internodes of branches 3 to 5 mm. long; leaves opposite essentially throughout; petioles 2 to 3 mm. long, griseous-pilosulous; leaf blades ovate or rhombic-ovate, 3 to 5 mm. long, 2.5 to 5 mm. wide, obtuse, at base cuneate to subtruncate, entire or hastately 1-toothed on each side at base, thickish, densely impressed-punctate especially beneath; heads 7 mm. wide, solitary at apex of stem and in the uppermost axils, on peduncles 5 to 7 mm. long; disk subglobose-campanulate, 5 mm. high, 5 to 6 mm. thick; involucre sub-2-seriate, equal, 4 mm. high, the phyllaries about 24, linear, acute, double-ribbed, rather densely griseous-pilosulous on their exposed surface; rays 8, fertile, the lamina white, 1.5 to 1.8 mm. long, about 1.5 mm. wide, bluntly 3-toothed, gland-dotted on back; disk flowers very numerous, their corollas white, stipitate-glandular throughout, somewhat hirsute-pilose on tube, barbate-tufted on teeth outside near apex, 3 mm. long (tube 1 mm., throat funnellform-campanulate, 1.5 mm., teeth 4, ovate, 0.5 mm. long); achenes obovate-oblong, 1.8 to 2.2 mm. long, flat, blackish, ciliate on the whitish callous margins, sparsely hirsutulous on the faces above; awns 2, setiform, minutely hispidulous, equal or unequal, 1.5 to 2.2 mm. long; squamellae lacerate, 0.4 mm. long; style branches with rather short, subulate, hirsutulous tips.

Type in the U. S. National Herbarium, no. 301,934, collected in the Sierra Madre west of Bolaños, Jalisco, Mexico, 15-17 Sept. 1897, by J. N. Rose (no. 2978).

The type sheet has been identified as *Perityle jaliscana* A. Gray, a related species with much larger leaves, discoid heads, merely glandular corolla-lobes, and much shorter awns and squamellae. *P. trichodonta* is nearer *P. hofmeisteria* Rydb., a finely puberulent plant with petioles mostly much longer than the blades, and with the disk corollas merely glandular on the teeth.

***Anaethia enneantha* Blake, sp. nov.**

Shrub or small tree, leafy, the leaves closely crowded on the short lateral branches; young branchlets angulate, closely ochroleucous- or cinereous-tomentose, the older ones glabrate, gray-barked; leaves alternate; petioles cinereous-tomentose, 2 to 3 mm. long; leaf blades cuneate-obovate or obovate, 2 to 3.5 cm. long, 1 to 2 cm. wide (excluding the teeth), acute to subtruncate, spinose-tipped, acutely cuneate at base, spinose-dentate (teeth 3 to 5 pairs, 3 to 6 mm. long including the brownish spines), coriaceous, above deep green, glabrous from the first, somewhat shining, finely reticulate, beneath closely cinereous- or ochroleucous-tomentose, somewhat reticulate, the chief lateral veins about 4 pairs, prominulous

beneath; heads 9-flowered, turbinate-campanulate, solitary, sessile at tips of branches; involucre 2.1 to 2.3 cm. high, about 7-seriate, the phyllaries erect, indurate, at maturity essentially glabrous or slightly lanulose, or the outermost somewhat tomentose, all ciliolate below the apex, the outermost very small, deltoid-ovate, the middle triangular, the innermost lance-linear, all acuminate, scarcely mucronate; corollas tubular, somewhat hispidulous and glandular, at maturity 16.5 mm. long (tube 4.5 mm., throat 2 mm., teeth 10 mm., revolute at apex); achenes densely short-pilose, 5 mm. long; pappus brownish-tinged, 1.5 cm. long, the slender bristles stiff, spreading, somewhat paleaceous-connate at base; anthers and style long-exserted; style branches very short.

Type in the U. S. National Herbarium, no. 1,079,231, collected at Lajana, Samaná Peninsula, Santo Domingo, altitude about 100 meters, 30 April–2 May 1922, by W. L. Abbott (no. 2287).

Among the species of *Anastraphia* hitherto known from the island of Hispaniola the closest ally of this species is apparently *A. oligantha* Urban, which is readily separated by its 5-flowered heads. *A. enneantha* seems to be distinct from any of the numerous Cuban and Bahaman species, all of which, as well as the species of Hispaniola, have been listed and keyed by Britton.¹

¹Bull. Torrey Club 42: 379–387. 1915.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

A THIRD SPECIES OF ATALOPTERIS.¹

BY WILLIAM R. MAXON.



Atalopteris, a new genus of dryopteroid ferns from the West Indies, was described jointly² by Dr. Carl Christensen and the writer in 1922 to include two species: *A. aspidioides* (Griseb.) Maxon & C. Chr., the genotype, from Cuba (*Wright* 1827), and *A. maxoni* (Christ) C. Chr., from Jamaica (*Maxon* 2228). The taxonomic history, characters, and relationship of this extremely interesting small group were discussed at some length.

While the paper was in the printer's hands word was received from Dr. Christensen that Dr. Erik L. Ekman had collected specimens of the new genus in Haiti also, and that these tended to invalidate the supposed distinctions between the two species recognized. At the time, only brief mention of this was practicable.³ Recently, however, the Haitian specimen (*Ekman* 124) has been lent from the Berlin Botanical Museum for study by the writer. Although nearer the Jamaican than the Cuban form, it proves to have characters distinguishing it from both, and may therefore be described as follows:

***Atalopteris ekmani* Maxon, sp. nov.**

Rhizome woody, about 2 cm. long, 1 cm. thick, upcurved, densely pale-aceous, the outer scales 8 to 11 mm. long, narrowly lance-attenuate, hair-pointed, castaneous, lustrous, entire, with a few distant weak caducous moniliform cilia. Sterile fronds 4 or 5, ascending, 17 to 20 cm. long; stipes 5 to 8 cm. long, shaggy with close-set, spreading or retrorse scales, these mostly 3 to 4 mm. long, paler and narrower than those of the rhizome; blades ovate-oblong, acuminate, about 12 cm. long, 6 to 8 cm. broad, sub-bipinnate, the rachis densely divaricate-paleaceous like the stipe, bearing

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²Contr. U. S. Nat. Herb. 24: 55. 1922.

³Op. cit. 63.

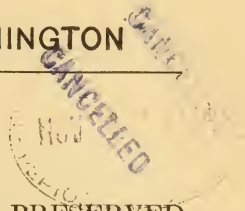
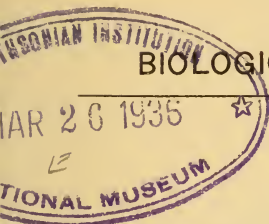
also a thick covering of flattish septate hairs, these extending also along the upper side of the midribs of the pinnae; pinnae about 10 pairs below the deeply and regularly pinnatifid apex, spreading, subdistant, sessile or nearly so, symmetrical, the middle ones the longest, 3 to 4 cm. long, 9 to 13 mm. broad, oblong to linear-oblong, abruptly obtuse, evenly and obliquely pinnatifid nearly to the midrib, the midrib sparsely divaricate-paleaceous beneath, the scales similar to those of the stipe; segments 10 or 11 pairs, oblique, oblong, distally acutish, the margins closely revolute in drying, subentire or, in the basal segments, distantly serrate, bearing a few weak jointed cilia; veins 5 or 6 pairs, very oblique, simple, slightly arcuate, not quite attaining the margin, minutely strigillose beneath with turgid 1 or 2-celled whitish glandular hairs (these extending to the leaf tissue), glabrous above; leaf tissue thin-herbaceous, brownish green in drying, glabrous above at maturity. Fertile fronds 2 or 3, greatly exceeding the sterile ones, about 30 cm. long, nonfoliose; stipes 15 cm. long, like those of the sterile fronds; blades lance-linear in outline, acuminate, 15 cm. long, 4 cm. broad, bipinnate; pinnae 10 or 12 pairs, distant, fully pinnate, the segments narrow, flattish, distant; sori distant, terminal on the veins, submarginal, globose, naked, the sporangia spreading in all directions.

Type a single complete plant in the herbarium of the Berlin Botanical Museum, collected near Aux Cayes, Département du Sud, Haiti, altitude about 800 meters, in rocky situations, June 10, 1917, by Erik L. Ekman (no. 124).¹ Fragments are in the U. S. National Herbarium (no. 1,069,217).

From *A. aspidioides*, of Cuba, *A. ekmani* is separated by several obvious characters, that species having the fertile frond much shorter than the sterile, the sterile blades about twice as long and broad as in *A. ekmani*, the pinnae distinctly acuminate, and the segments 12 to 14 pairs per pinna. In most respects *A. ekmani* is nearer *P. maxoni*, of Jamaica, which also has the fertile fronds greatly surpassing the sterile ones, and the sterile blades small, with rounded-obtuse pinnae; but in *P. maxoni* the pinnae are much broader and are mostly stalked, and the segments are fewer (7 or 8 pairs per pinna), broader, unequal, and distinctly serrate, the basal ones mostly constricted and subsessile. From both species *A. ekmani* is at once distinguished by the glabrous upper surface of the sterile fronds, both the others having not only the veins but the leaf tissue strongly glandular-strigillose above, as beneath.

¹Mounted on the same sheet is a single detached broken frond, which very evidently came from another plant; it is obviously atypical, some of the pinnae being greatly developed at the expense of those broken off or malformed. Characters that could be drawn from it as to dissection and venation are, therefore, omitted in the above description.

PROCEEDINGS
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SOME NEOTROPICAL BATRACHIANS PRESERVED
IN THE UNITED STATES NATIONAL MUSEUM
WITH A NOTE ON THE SECONDARY SEXUAL CHAR-
ACTERS OF THESE AND OTHER AMPHIBIANS.

BY G. K. NOBLE.

Among the neotropical Amphibia contained in the collections of the U. S. National Museum, and kindly loaned to me for study by Doctor L. Stejneger, there are included two new species and several other rare or interesting forms. The greater number of these specimens come from Panama. As several of the species were not hitherto recorded from that country, I have included below a list of the rarer forms, together with the localities from which they were obtained. The abbreviations given below refer to the names of the collectors.

- (B) August Busck.
- (C) E. D. Christopherson.
- (G) E. A. Goldman.
- (H) S. F. Hildebrand.
- (M & H) S. E. Meek and S. F. Hildebrand.
- (N) G. W. Nelson.
- (P) C. H. Van Patten.

PANAMA.

Eleutherodactylus longirostris (Boulenger).

Rio Mamoni (M & H), Pedro Miguel (M & H), Miraflores (M & H), Arrijam (M & H), Caña (G), Rio Chilibrillo (G).

Eleutherodactylus brocchi (Brocchi).

Cerro Brujo (G).

Eleutherodactylus goldmani, new species.

Cerro Brujo (G).

Leptodactylus bolivianus (Boulenger).

Caña (G), Miraflores (M & H), Rio Morte Arnade (M & H), Rio Mamoni (M & H), Rio Chorrera (M & H).

Centrolene prosoblepon (Boettger).

Cabima (B).

Centrolenella fleischmanni (Boettger).

Canal Zone (B).

Eupemphix pustulosus (Cope).

Porto Bello (B), Upper Trinidad River (M & H), Panama (N), Canal Zone (C), Tobago Island (B), Rio Mamoni (M & H).

Hyla gabbii Cope.

Rio Calobre (M & H), Caña (M & H).

Hyla rosenbergi Boulenger.

Rio Bayano (M & H), Arrijam (G).

Hyla chica Noble.

Rio Calobre (H).

Agalychnis spurrelli Boulenger.

Cabima (B).

Agalychnis moreletii (Dumeril).

Panama (P).

Atelopus varius Stannius.

Caña (G), Miraflores (G), Rio Jappe, Darien (M & H).

Phyllobates latinasus (Cope).

Caña (G).

Bufo granulosus Spix.

Rio Calobre (M & H).

Bufo valliceps Wiegmann.

Porto Bello (B).

SOUTH AMERICA.

Leptodactylus bolivianus Boulenger.

La Guaira, Venezuela; Lyon and Robinson.

Borborocoetes stejneri, new species.

Organ Mts.; J. N. Rose.

Centrolenella fleischmanni (Boettger).

Quevedo, Ecuador; J. B. Rorer.

The Panama collections include two specimens, one adult and one juvenile, of an apparently undescribed *Eleutherodactylus*. I would hesitate very much adding one more species to the long list of forms already included in this difficult genus were it not for the fact that the present species is strikingly different from any form previously recorded from Panama. It may be known as

Eleutherodactylus goldmani, new species.

Diagnostic characters.—Allied to *E. sallaei* and *E. rhodopis*; agreeing with them in the pointed snout and dark face stripe; differing from these species in the dense, spiny granulations of the back. Loreal region concave, a pronounced supratympanic fold, continued posteriorly about half the length of the body as a dorsolateral fold; tympanum nearly as large as the eye; interorbital space $1\frac{1}{2}$ times as broad as the upper eyelid. Uniform brown above, a black streak on each side of the head extending from the tip of the snout to the tympanum and curving ventrally to follow the dorsolateral fold.

Type.—U. S. N. M 54033, adult ♂; Cerro Brujo, June 7, 1911, E. A. Goldman, collector.

Description of Type.—Head much longer than broad, broader than body; distance between nostril and eye equal to the interorbital width, greater than the diameter of the eye; distance between nostril and tip of snout contained just twice into the distance between nostril and eye; snout pointed, the internostril width two-thirds the interorbital width; portion of snout anterior to nostrils rounded, nearly truncate; canthus rostralis very sharp, the loreal region concave and very abrupt; tympanum pronounced, nearly as large as the eye, separated from the eye by a space equal to one-half its diameter. Tibio-tarsal joints of either side strongly overlap when the legs are folded at right angles to the body; tibio-tarsal articulation reaches well beyond the snout; digital dilations well defined, pointed, only a seventh as large as the tympanum; digits free except for the barest indication of a web between the outer toes; two well defined metatarsal tubercles, the inner very pronounced, a tarsal fold present. Vomerine teeth in two small transverse series well behind the choanae; the groups separated from one another by a space equal to the greatest length of either; tongue large, truncate but not emarginate behind. Skin of the whole dorsal surface and of the sides of the body between the lateral folds shagreened or covered with dense, spiny warts of a small size; side of the head and body below fold, as well as the entire ventral surface, smooth; no granulations on the belly; posterior surfaces of the thighs granular.

Color (in alcohol) dark purplish brown above, whitish below; a black streak on each side from the tip of the snout, through the eye and tympanum to the middle of the body; a black spot on the humerus, an irregular dark blotch at the distal end of the femur, some indication of three cross bars on the femur, and five on the tibia; ventral surfaces of the hind limbs suffused with purplish brown.

Measurements.

Tip of snout to vent	42 mm.
Tip of snout to posterior border of tympanum	18 mm.
Greatest breadth of head	15 mm.
Distance from axilla to tip of longest finger	27 mm.
Distance from vent to tip of longest toe	83 mm.
Tibia	28 mm.

Among the batrachians included in the South American collections there is a single specimen of a species collected by Doctor J. N. Rose in the Organ Mts. of Brazil. On preliminary examination I thought it an aberrant species of *Zachaenus*. But the tongue of this species is not fully adherent behind, and I am forced to refer it to the genus *Borborocoetes*. No specimens of *Zachaenus* are available for study. From the descriptions it would appear that the only character separating *Zachaenus* from *Borborocoetes* is the adherent tongue. This is certainly a feature of little consequence. The tongues of the various species of *Telmatobius* differ enormously in their degree of adherence. The recognition of a monotypic genus upon such a feature is not consistent with present-day custom. On the other hand, *Z. parvulus*, *B. miliaris* and the species described below do not seem very closely related. Until the structure of *Zachaenus* is better known, it is perhaps most conservative to consider the genus as valid. Nevertheless, it should be pointed out that the species described below stands intermediate between *Zachaenus* and such a typical form of *Borborocoetes* as *B. quixensis*. The species may be known as

***Borborocoetes stejnegeri*, new species.**

Diagnostic characters.—Head short, sharply pointed, the eyes directed forward; no tympanum; vomerine teeth in two slightly oblique series in contact with each other and behind the choanae; tibio tarsal articulation reaching only to the angle of the jaw; skin granular above, smooth below; uniform reddish brown above, whitish below, throat pale brown spotted with white.

Type.—U. S. N. M. 52608, adult ♂, Organ Mts., Brazil, 1500 meters, August 15, 1915, J. N. Rose, collector.

Description of type.—Head a trifle broader than long, sub-triangular; about as broad as the body; eyes directed forward; internasal space two-thirds the interorbital space, distance between nostril and eye equal to the greatest diameter of the eye; canthus rostralis rounded; loreal region sloping gradually; no tympanum, but a fold present in the position of a supratympanic fold; tibio tarsal joints of either side in contact when the legs are folded at right angles to the body; tibio tarsal articulations reach

the angle of the jaw. First finger not extending beyond second, no digital dilations; no web between the toes; subarticular tubercles pronounced, no tarsal fold, two metatarsal tubercles, the inner about three times as long as the outer. Vomerine teeth in two slightly oblique series, behind the choanae and in contact with each other; tongue ovate, entire, scarcely free behind, the posterior edge finely crenated (possibly abnormally so). Skin finely granular above; a curved fold from the eye to the shoulder; a suggestion of one or two other folds in the shoulder region.

Ground tone dull reddish brown above, spotted or marbled on the sides; ventral surface white, throat brownish spotted with white, limbs brownish spotted with whitish, the spots varying in size, nearly absent from the ventral surface of the femurs.

Measurements.

Tip of snout to vent	42	mm.
Tip of snout to angle of jaw	20	mm.
Greatest breadth of head	21	mm.
Distance from axilla to tip of longest finger	24	mm.
Distance from vent to tip of longest toe	59	mm.
Tibia	17.5	mm.

It will be noted from the above list that the collections under discussion include representatives of the two rare bufonid (leptodactylid) genera *Centrolene* and *Centrolenella*. Some time ago when I was describing the latter genus, I suggested that *Hyla prosoblepon* Boettger would probably be found referable to *Centrolene*, and certain species of "*Hylella*" to *Centrolenella*. Both of these prophesies are now substantiated. The two specimens of *Hylella fleischmanni* Boettger in the collections possess the T-shaped terminal phalanges, reduced pectoral girdle and other distinctive features of *Centrolenella*. (See Noble 1920 Bull. Amer. Mus. Nat. Hist. 42, p. 441.) *H. fleischmanni* must be referred to that genus. The National Museum collections include a single specimen of *H. prosoblepon*. This specimen and two additional ones in the American Museum from Bocas del Toro, Panama, substantiate my other guess that the species should be referred to *Centrolene*. A well developed humeral spine is present in both sexes (although better developed in the male). In other internal structures the specimens agree fully with *Centrolene*. In the paper referred to above, I was at a loss to attribute any functional significance to the humeral spine of the female. It seemed remarkable that a secondary sexual character apparently functioning in only the male sex to insure amplexus should be present in both sexes. I suggested in my earlier paper that the spine might conceivably assist the female in retaining its position on a tree. In an earlier paper (Noble 1920 Copeia No. 79, p. 16) I had the occasion of discussing another secondary sexual character well developed in both sexes. This is an enlarged prepollex found in the "Dagger Frog," *Babina*. Unfortunately, Procter (1920 Proc. Zool. Soc. London, pp. 421-422) has misunderstood my use of the word "dagger." As I pointed out in the paper mentioned, it is a matter of little consequence whether or not the terminal phalanx of the prepollex actually

perforates the skin. Hence, I chose to use the name "dagger"—a word I put in quotation marks—for the whole structure both dermal covering and bony core. The fact that a female frog should possess an enlarged prepollex (with dermal covering) seemed to me of considerable interest.

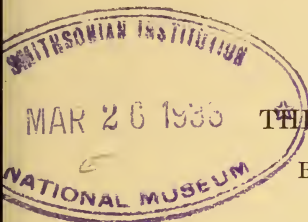
The enlarged prepollex of *Babina* and the humeral spine of *Centrolene* may be called pseudo-secondary sexual characters, since they are well developed in both sexes (although larger in the male). The structures may be compared with the horns of the White Goat (*Mazama*) or even the horns of some cattle. They are obviously not dependent for their formation upon the secretion from the gonads—as in the case of the horns of the deer. It is important to bring out this comparison. In no vertebrates below Amphibia do we find secondary sexual characters, at least male structures primarily concerned in insuring fertilization, well developed in the female where they can have no such significance. The ultimate analysis of the nature of all secondary sexual characters may be determined only by experiment. Recent work on cock and hen feathering of fowl has shown how complicated the analysis may become. In the absence of experiment, it seems to me important to draw a sharp distinction between nuptial asperities or the fluctuating structures of the breeding season and copulatory organs present in both sexes and apparently not dependent for their formation upon any endocrine system. The humeral spine of *Centrolene* and the prepollex of *Babina* seem to be examples of elaborate somatic characters carried along from generation to generation but functional only in one sex, and then during only a limited period.

I may add in passing that recent field work prevents me from believing that the "dagger" of *Babina* can have any functional significance outside of the breeding season. The recently discovered *Hyla heilprini* Noble, although equipped with an exposed prepollex in the male, does not use this structure to inflict wounds as the breeding *Babina* is capable of doing. Although the "dagger" of *H. heilprini* is not as large as in *Babina*, it is an example of a pseudo-secondary sexual character since it is present in both sexes, although to be sure, smaller and covered by the integument in the female. The prepollex is a vestigial structure in most Salientia and its enlargement is a secondary specialization. This has been pointed out elsewhere. (Gregory, Miner and Noble, 1923 Bull. Amer. Mus. Nat. Hist. XLVIII, pp. 279-288).

Lastly, a word may be said in regard to the nature of the humeral spine of *Centrolene*. I have not had the opportunity of examining a male *C. gekoideum*, but a breeding pair of *C. prosoblepon* are now in the collections of the American Museum of Natural History. The spine is covered in both sexes by the integument of the shoulder. On dissection the spine is found to be an elongate, distally directed process of the *crista ventralis*. The *portio epicoracoidea* and the *portio abdominalis* of the *pectoralis* insert on the base of this spine. In the male *C. prosoblepon*, having a head and body length of 26.5 mm., the spine projects free from any muscular attachment for a distance of 2.2 mm. In a female of 29.5 mm., head and body length, 1.5 mm. of the spine is exposed. The spine is broader in the male than in the female.

It should be pointed out that in no other vertebrates, fossil or recent (excepting only another species of tree frog described from New Guinea, Boulenger 1912, Zool. Jahrb., Suppl. 15, 1, p. 211), is the humerus modified in this extraordinary fashion. The *crista ventralis* serves for the attachment of an extensive musculature in all frogs. Further, in most frogs (*Hyla*, *Leptodactylus*, etc.), this crest is entirely covered by the *deltoides*. It is, in fact, the last part of the appendicular system that one would imagine could be modified in correlation with factors other than muscular stresses. The pectoral musculature of *C. prosoblepon* agrees closely with that of *Hyla*. There is the same division of the *pectoralis*, *portio epicoracoidea* found in that genus. It is difficult to understand how this modification of the humerus could have been brought about. Whether or not the remarkable humeral spine of *Centrolene* arose suddenly in the phylogeny of the genus, it seems likely that it disappeared in this way. I have already suggested (Noble 1920 Bull. Amer. Mus. Nat. Hist. 42, p. 441) that *Centrolenella* has been derived from *Centrolene*. Zoogeographic considerations allow us to infer that this change probably took place recently. Nevertheless, there is no indication of a humeral spine in *Centrolenella*. The question of the origin of the spine can not be answered definitely. It would be interesting to know more of the exact stock from which *Centrolene* has evolved.

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THE WOODFROGS OF JAPAN.

BY LEONHARD STEJNEGER.

When treating of the woodfrogs, or grassfrogs, in the Herpetology of Japan (Bull. U. S. Nat. Mus., No. 58, 1907), I doubted the occurrence of *Rana japonica* in Yezo (p. 111) and there was then no suspicion of *Rana temporaria* occurring in Hondo. At the same time I referred Werner's *Rana japonica* var. *ornativentris* as a synonym to *R. japonica*, chiefly for the reason that I had before me similarly colored specimens among the specimens brought home by myself from Yokohama, which were undoubtedly *R. japonica* and others, apparently identical, from Mt. Fuji, obtained through Mr. Allan Owston. As to the status of Boulenger's *Rana martensi* from Tokyo, I confessed (p. 108) my inability to separate it from true *R. japonica* from the same vicinity on account of the vagueness of the characters ascribed to it.

A recent study of the related forms occurring in China has thrown new light on the difficult question of the various species and subspecies of woodfrogs in the Far East and led to a reexamination of my Japanese material.

The fact that the Old World frogs of the so called *temporaria* group again fall into two subgroups, each typified by *R. temporaria* and by *R. dalmatina* (= *agilis*) respectively, has long been vaguely felt and more recently definitely recognized, but the main character relied upon, namely the relative length of the hind legs has been found to be so lacking in definiteness and subject to so much overlapping variation as to be almost useless in practical application, unless reenforced by additional characters. As far as the European species are concerned, Boulenger's key in his Tailless Batrachians of Europe, pt. 2, 1898, pp. 263-264, gives satisfactory results, but with the East Asiatic forms the problem was still unsolved, as evidenced by the fact that such an experienced herpetologist as Dr. Boettger, though with many

misgivings, identified the frogs from Chinhai, northeast of Ningpo, China, as *Rana amurensis*, *martensi* and *japonica*. Similarly the statement regarding these frogs by Dr. Wolterstorff (Abh. Mus. Magdeburg, vol. 1, 1906, p. 126) indicates the same uncertainty.

During my study of the Chinese woodfrogs I was equally puzzled until I discovered that the anterior course of the dorsolateral fold seemed to be different in the two subgroups. In *R. temporaria* and its nearest allies these glandular folds anteriorly flare outward so as to head almost directly for the center of the tympanum and meeting above the latter at an angle the fold coming from the posterior angle of the upper eyelid. These relations are strikingly apparent in plates 19 and 21 of Boulenger's Tailless Batrachians of Europe. In *R. dalmatina* (*agilis*) and its allies, as far as I have been able to examine them, the glandular ridges proceed straight or almost straight from the scapular region to the upper eyelid without an angular dip toward the tympanum. The contrast between the two styles is easily appreciated by comparing figures 1 and 3 on pl. 11 of my Herpetology of Japan (Bull. 58, U. S. Nat. Mus., 1907). In museum specimens too soft or too hard or otherwise distorted, it is sometimes difficult to come to a definite conclusion as to the actual relation, but this difficulty is encountered with the application of most characters in the case of such closely allied and variable batrachians as these.

Reexamining my Japanese material with this distinction in mind, it was at once demonstrated that—apart from the typical *R. temporaria* in Yezo—there were two distinct species of woodfrogs represented in the material from Hondo, the main island. Tested by the dorso-lateral gland the specimens enumerated on pp. 111–113 of the Herpetology of Japan fell into two groups: Nos. 11336–11344, from "Japan" and Nos. 34448, 34449 and 34451 from Mount Fuji had glands like *temporaria* or *amurensis* and all the rest had them like the figured specimen of *japonica* and specimens of *dalmatina*. Another striking feature disclosed was that all the Hondo specimens of the *temporaria* style had large black spots on throat and other parts of the underside, while the others were either entirely unspotted or had only more or less faint dusky markings.

Having settled that we have to deal with two species of woodfrogs in Hondo, the next question is as to their names.

Three names present themselves: *R. japonica*, *martensi* and *ornativentris*. Of these the types of the first two are in British Museum, of the last in Munich in the zoological collection of the Bavarian state. Letters with sketches illustrating the points mentioned above were written to Miss Joan B. Procter and Prof. Lorenz Mueller respectively who very courteously furnished me with the desired information for which I herewith wish to express my thanks.

Rana temporaria var. *japonica* was credited by Guenther in 1858 (Cat. Batr. Sal. Brit. Mus., p. 17) to "Schlegel, l. c.", and the "l. c." is "Schlegel, Faun. Japon., pl. 3, f. 2," quoted on the previous page. However, Schlegel nowhere indicates a "var. *japonica*," but unquestionably the name should be applied to the form agreeing with pl. 3, fig. 2, reproduced in my Herpetology of Japan, 1907, pl. 11, fig. 1. It seemed likely to me that among the

specimens in British Museum received from Leiden (Boulenger's Cat. Batr. Sal. Brit. Mus., 1882, p. 47, specimens *a-c*) there might be one corresponding close enough to Schlegel's figure, as quoted above, to serve as lectotype. Miss Procter writes "I looked up the *a-c* bottle labeled *Rana japonica* and it now contains only two specimens. One agrees closely with the figure you give in Herp. Jap. pl. 11, fig. 1, and I labeled it 'lectotype' as you suggest." Her examination of this specimen reveals that the tibio-tarsal articulation reaches beyond the tip of the snout; throat immaculate; lower lip very faintly spotted; anterior part of lateral glandular fold practically straight. The name *Rana japonica* therefore belongs to the Japanese woodfrogs of the *dalmatina* (*agilis*) subgroup.

The name *Rana martensi* was given by Boulenger, (Proc. Zool. Soc. London, 1886, p. 414) to several specimens, Nos. 4410 and 4411, in the Berlin Museum brought by Professor E. von Martens from Tokyo. One of these, a female, greatly distended with eggs, was presented to the British Museum. Of the cotypes this one may now be designated as lectotype, and Miss Procter's examination gives the following result: Tibio-tarsal articulation reaches eye; throat immaculate; lower lip brown spotted; anterior part of lateral glandular fold practically straight.

It will be seen that the only difference between the lectotypes of the two names is the relative length of the hind legs, the tibio-tarsal articulation reaching beyond the tip of the snout in that of *R. japonica*, but only to the eye in the lectotype of *R. martensi*. I wish, however, to call attention to the fact that in the original description of the entire type material, Boulenger says that the tibio-tarsal articulation reaches the eye or *the nostril*. The vertical distance between the tip of the snout and the nostril is so slight, however, and the variation of the leg measurements in these frogs so great¹ that it is of no value whatever in distinguishing two forms *occurring in the same locality*. The straight course of the anterior portion of the dorso-lateral gland in the lectotype of *R. martensi*, on the other hand, plainly indicates that this specimen belongs to a form of the *dalmatina* subgroup. Under these circumstances I regard it as settled that *R. martensi* is a synonym of *R. japonica*.

Rana ornativentris was originally indicated, rather than described, as a variety of *Rana japonica* (Abh. Bayer. Akad. Wiss., II Kl., vol. 22, pt. 2, 1903, p. 383) from a single specimen collected by Professor Haberer at Nikko, Hondo. Professor Lorenz Mueller, custodian of the reptile collection in Munich, has kindly examined the unique type and sent me a sketch and full description of it, which in view of the scantiness of the original diagnosis, I reproduce in condensed translation as follows:

Description of type of *Rana japonica* var. *ornativentris*: General outline of snout and body that of *R. temporaria*; tibio-tarsal articulation reaches scarcely to the anterior angle of eye; the moderately excised web of hind feet reaches tip of toes except on the fourth toe where it reaches the base of the distal phalanx; the anterior end of the dorsal fold bends outward in the scapular region towards the tympanum, proceeds above the latter and then bends inward again towards the posterior angle of the eye, thus forming

¹See notes under *Variation*, Herp. Japan, p. 110.

a double angle. Color above rather dark brown (like coffee with a little milk); between the eyes an indistinct dark cross-bar indistinctly edged with lighter; on the middle of the back from the scapular region backwards an ill-defined, paler, more grayish-yellow area; on the throat, fore neck, sides of breast, distal end of under side of femur and on tibia near the edges numerous larger, distinct, blackish brown (almost black) spots; ear patch, a line along the edge of the upper lip, and spots on the lower lip likewise blackish brown.

<i>Dimensions.</i>	<i>mm.</i>
Snout to vent.....	75
Snout to posterior rim of tympanum.....	22
Snout to anterior angle of eye.....	8.5
Longitudinal diameter of eye.....	8
Width of head in tympanic region.....	23
Foreleg.....	40
Hindleg from loin to tip of longest toe.....	125
Femur from loin to knee.....	35
Tibia.....	42
From tibio-tarsal joint to tip of longest toe.....	57
From posterior edge of inner metatarsal tubercle to tip of longest toe.....	41

From the description of the anterior course of the dorso-lateral ridge, it is evident that we have to deal with a form of the *temporaria* subgroup. Professor Mueller in his letter clearly points out this relationship to typical *Rana temporaria* basing his conclusions chiefly on the robustness and habitus of the whole body as well as the outline of the snout.

We have consequently come to the conclusion that the name proposed by Professor Werner belongs to the species of the *temporaria* subgroup already demonstrated to occur in the main island of Japan by the material in the National Museum. The strongly spotted underside of this form is alone sufficient to separate it from the typical form occurring in Yezo, and I propose to recognize the Hondo form as *Rana temporaria ornativentris* (Werner).

The type was collected in the mountains about Nikko; the three large specimens in the National Museum which agree so closely with the type are from Mount Fuji, where they may have been collected at a greater elevation than the numerous examples of typical *Rana japonica* which hail from the same general region. It is therefore quite likely that Professor Mueller is right when he suggests that *R. ornativentris* may be more or less characteristic of the mountainous regions and *R. japonica* of the lower altitudes of Hondo.

Rana tsushimensis was described by me in the Herpetology of Japan, 1907, p. 116, as probably nearest related to *R. amurensis*. Reexamined in the light of the additional character of the dorso-lateral gland the above statement is found to be correct, the anterior end flaring out as in typical *R. temporaria*. Miss Procter in examining the Tsushima woodfrogs in British Museum, noticed one specimen in which the ridge is "almost

straight on the right and flared on the left" side. In view of the general distribution of *Rana japonica*, it would not be surprising to find both species represented on Tsushima, and an occasional hybrid might perhaps be expected.

Rana longicrus, described by me in 1898 from Formosa, has dorso-lateral glandular ridges straight anteriorly and consequently belongs to the *dalmatina* subgroup, of which it is the most extreme member.

The Japanese woodfrogs may then be characterized summarily as follows:

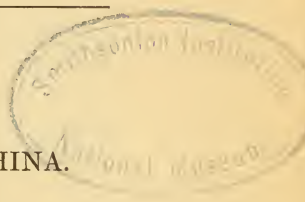
- a¹ Dorso-lateral glandular ridge anteriorly flaring out towards the tympanum, forming an angle with the continuation to the upper eyelid (*temporaria* subgroup).
 - b¹ Vomerine teeth between the choanae, only their posterior end projecting backwards beyond them; webs large.
 - c¹ Underside without large blackish spots on throat and breast
Rana temporaria (Linnaeus).
(Yezo; Sakhalin)
 - c² Underside with large blackish spots on throat and breast
Rana temporaria ornativentris (Werner).
(Hondo, mountains only)
 - b² Vomerine teeth behind level of choanae; webs small
Rana tsushimensis Stejneger.
(Tsu-shima)
- a² Dorso-lateral glandular ridge anteriorly proceeding straight to the upper eyelid (*dalmatina* subgroup).
 - b¹ Hind legs much less than twice as long as head and body
Rana japonica (Guenther).
(Hondo, Kiushu, Shikoku, etc.)
 - b² Hind legs twice as long as head and body
Rana longicrus Stejneger.
(Formosa)

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A NEW FRESHWATER NEREID FROM CHINA.

BY RALPH V. CHAMBERLIN.



It is well known that certain marine polychaetes of the European and American coasts are often found in the brackish waters of estuaries or even in the fresh water of the lower part of rivers but apparently without being able to breed in these locations. There are, however, certain forms so extremely adaptable that they seem to live and breed equally well in marine brackish and fresh water, such being notably the South American *Namanereis ouanaryensis* (Gravier) and *Namanereis quadraticeps* (Gay). Other species of this same genus *Namanereis* (*Lycastis* of most authors) are found only in fresh water, and representatives of several other genera of Polychaeta, mostly monotypic, are likewise restricted to fresh water.

Of the numerous families of Polychaeta only four have fresh-water representatives; and of all the truly fresh-water forms nearly two-thirds belong to the family Nereidae. A species of the latter family apparently not hitherto recorded lives in the fresh water of the rice-fields about Canton, China. The writer is indebted for a gravid female of this species, which represents an apparently new generic type, to Mr. Arthur S. Campbell, formerly of the Canton Christian College. Mr. Campbell supplies the following note on this nereid: "The worm was taken in great numbers at Canton, China, during the spring and summer months of the last year. Specimens are frequent in the rice-fields surrounding Canton and in the low-lands as far as Hongkong. The natives use them as an article of food after suitable preparation. The worms are caught in nets or baskets set as traps at the outlets of the rice-

fields and the worms are washed into these in great quantities. They are then either sold fresh or, oftener, laid out in flat baskets in the sun and dried. After thorough dehydration in the tropical sun-light for several days, they are reduced to a fine meal or flour. The flour is kept in bags against the winter months when food is scarce. The worms are locally known as 'woh-chung,' meaning literally 'rice' or 'field worm.' They are well known to all Cantonese villagers.

"It is to be presumed from its general habitat that the worms breed during the rainy spring when the fields are full of water and sunshine is at its maximum, and food is abundant in the shallow water, which is seldom over a foot in depth. Mature worms have been found always in fields or, more rarely, in the shallow canals, but never in the deeper water of the rivers. There is no doubt that the worms are strictly fresh-water forms, closely associated with growing rice-plants which can not withstand any degree of saltiness."

Chinonereis, gen. nov.

Prostomium, antennae, palpi and tentacular cirri as in the genus *Nereis*. Four eyes present, arranged in a trapezium. Proboscis wholly lacking chitinous paragnatha, only soft paragnatha being present and these, in the genotype, wholly absent from areas I and II. Parapodia distinctly biramous. Notopodium with a dorsal lamella which bears the cirrus and with a subfascicular lamella. Notopodium with setae in one or two groups, the cirrus not elevated on a tubercle or special lobe. Setae all composite heterogomphs of a single type.

Genotype.—*Chinonereis edestus*, sp. nov.

Undoubtedly this form is closely related to *Tylorhynchus* Grube, the type of which, *T. chinensis*, occurs at Shanghai. The parapodia are similar in general character; but in the present form all setae are of a single type, whereas in *Tylorhynchus* they are of three different forms. In the latter genus also the soft paragnatha are present on all areas and are apparently in general more strongly developed than in the present form. In *Tylorhynchus* the parapodia of the twenty-one anterior segments are conspicuously different in size and in some details of structure, as in the setae, from those of the posterior region, whereas in *Chinonereis* there is only a very gradual change in size and form in going caudad.

Chinonereis may be separated from other genera of the Nereidae lacking chitinous paragnatha by means of the following key:

- a. Proboscis with no paragnatha
 - b. With dendritic branchiae.....*Dendronereis* Peters.
 - b. With no dendritic branchiae.
 - c. Notopodium rudimentary.

- d. Prostomium anteriorly deeply incised; tentacular cirri on each side arising from a common basal article.....
Lycastoides Johnson.
- d. Prostomium not thus incised; tentacular cirri on each side not thus arising from a common basal article.....
Namanereis Chamberlin.
- c. Notopodium well developed.
 - d. Peristomium with parapodia and setae.....*Micronereis* Claparède.
 - d. Peristomium without parapodia and setae.....
Leptonereis Kinberg.
- a. Proboscis with soft paragnatha.
 - b. Setae of two or three kinds.
 - c. Setae of two kinds; eyes none.....*Chaunorhynchus* Chamberlin.
 - c. Setae of three kinds; four eyes present*Tylorhynchus* Grube.
 - b. Setae all of one kind.
 - c. Setae homogomphs; dorsal cirrus free, attached above the lamella to the surface of the somite.....*Tylonereis* Fauvel.
 - c. Setae heterogomphs; dorsal cirrus attached to the dorsal lamella apically.....*Chinonereis* gen. nov.

***Chinonereis edestus*, sp. nov.**

The general color of the body is a pale buff, darker, more brownish at anterior end; the parapodia lighter, they and the adjacent part of segments showing a slight greenish tinge. Eyes black. Setae colorless.

Length, 75 mm. Greatest width, exclusive of parapodia, 5.6 mm. Body behind the three or four anterior segments, which are narrower and darker, of nearly uniform width to the middle of the length, behind which it narrows uniformly and decidedly to the caudal end.

Prostomium subquadrate in dorsal view. Bearing anteriorly a pair of conical tentacles. Each palpus attached at an anterolateral corner in front of the anterior eyes. Eye-area trapeziform, the anterior eyes being larger and more widely separated than the posteriors. Eyes of each pair connected by a distinct furrow; a deep median longitudinal furrow extending from anterior margin to the first transverse furrow, less pronounced caudad of this furrow.

Proboscis with basal ring encircled with a single series of large contiguous elevations or papillae which above are simply rounded (areas V and VI) but are more pointed below (areas VII and VIII) with the apices turned more or less proximad. In the maxillary ring there are no papillae or paragnatha above (areas I and II), but there is a double transverse series of small, rounded, papilliform paragnatha on the ventral side near middle of division (areas III and IV).

Peristomium dorsally of nearly the same length as the succeeding somite. Extending forward on each side of the prostomium where it bears the anterior tentacular cirri almost directly laterad of the anterior eye. Anterior dorsal cirrus slenderly conical, smooth, longer than the ventral cirrus. Posterior ventral cirrus about equal to the anterior ventral. Posterior

dorsal cirrus much longer than the others, reaching to the fourth segment behind the peristomium; more or less ringed over proximal half.

Metastomial somites in general about equally convex above and below. Longest near the twentieth segment where they are about 2.75 times wider than long. Pygidium missing from type specimen.

In the notopodia of the anterior region the dorsal lamella is longer than broad and is only about twice as wide as is the cirrus which it bears distally. The notopodial fascicle single and of moderate size, the acicula ordinarily two in number. Below the fascicle a conical lamella. The neuropodium with the fascicle double, the upper group being the larger. Aciculum shorter than the notopodials. Ventral cirrus free. In the posterior region the dorsal lamella becomes very much broader and somewhat bilobed, with the upper of the lobes the shorter and bearing the cirrus. The fascicles are much larger with the setae longer, those of the neuropodial fascicle not in two distinct groups. Ventral cirrus at base of neuropodial lobe long and subulate.

Shafts of setae strongly cross-striate. Tips, or blades, long and finely pointed, finely toothed along one edge as usual. Varying somewhat in size, but all of the same type.

Type in M. C. Z.

574.0673

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

AN EXTRAORDINARY NEW RHINOTERMES FROM
PANAMA.

BY T. E. SNYDER.

The major soldier caste in the genus *Rhinotermes* Hagen possesses excellent specific characters; the soldier has powerful mandibles with marginal teeth and a relatively short and broad labrum. The minor soldier, on the other hand, has an elongate, slender labrium, forked at the apex ("gabel nasutus") and fairly long, slender, pointed or vestigial mandibles. Recently, however, several new species have been collected, the major soldiers of which have elongate labrums, as well as well-developed mandibles. The following is a description of one of the most striking of these new species.

***Rhinotermes longidens*, new species.**

Soldier (Large). (Plate X, fig. 1).—Head straw yellow, labrum yellow-brown, mandibles yellow at base but castaneous-brown towards the apex and marginal teeth; head narrows anteriorly, rounded posteriorly, scattered long hairs on head. Labrum elongate as in small soldier, broadest at base, with long hairs at apex. Mandibles elongate, slender, sharply pointed and incurved at apex; prominent marginal teeth—as in figure.

Antennae white with tinge of yellow, 15 segments, with long hairs; third segment slender, subclavate, shorter than second but longer than fourth segment; segments bead-like, become longer and broader towards apex; last segment narrower, subelliptical.

Pronotum straw yellow, margins darker, saddle-shaped, posterior margin nearly a straight line, anteriorly sharply raised up, narrowed and rounded; few scattered long hairs on posterior margin, few fairly long and more numerous short hairs on anterior margin.

Legs white with tinge of yellow, fairly elongate, slender, pubescent (hairs fairly long).

Abdomen pale straw yellow, with dense long hairs at base of tergites, cerci prominent.

Measurements (Large Soldier):

- Length of entire soldier: 3.60 mm.
- Length of head with mandibles: 1.65 mm.
- Length of head without mandibles: (to anterior) 1.00 mm.
- Length of left mandible: 0.80 mm.
- Length of labrum: 0.60 mm.
- Length of pronotum: 0.27 mm.
- Length of hind tibia: 0.76 mm.
- Width of head (at widest point): 1.00 mm.
- Width of labrum at apex: 0.15 mm.
- Width of labrum at base: 0.22 mm.
- Width (average) of labrum at center: 0.15 mm.
- Width of pronotum: 0.55 mm.

R. longidens Snyder is smaller than *R. longilabius* Emerson¹ from British Guiana, but has a longer mandible with larger marginal teeth, narrower labrum and smaller pronotum; on the right mandible the upper marginal tooth is larger and is parallel to the margin of the mandible; the antennae have 15 segments, whereas there are 16 in *longilabius*. Only three species of *Rhinotermes* are known from America where the major soldier has an elongate labrum; in addition to the two species mentioned, *R. intermedius* Snyder occurs in Bolivia.

Soldier (Small). (Plate X, fig. 2).—Head pale straw yellow, paler posteriorly, labrum yellow-brown; broadest at posterior of antennal socket, sides slope roundedly to posterior, where rounded, conical at apex; head and labrum convex in profile; head with three rows of long hairs. Labrum elongate, slender, slightly constricted at base, with a long hair and short hairs on each fork at the apex. Mandibular points vestigial—hardly visible.

Antennae yellow, 14 segments, with long hairs; third segment subclavate, longer than second or fourth segments; fourth segment short, bead-like; segments bead-like, become broader and longer towards apex; last segment pointed at apex.

Pronotum pale yellow, darker on margins, saddle-shaped, anterior margin sharply turned up, narrowed and rounded, sides rounded, posterior margin slightly roundedly emarginate, with few long hairs on margins.

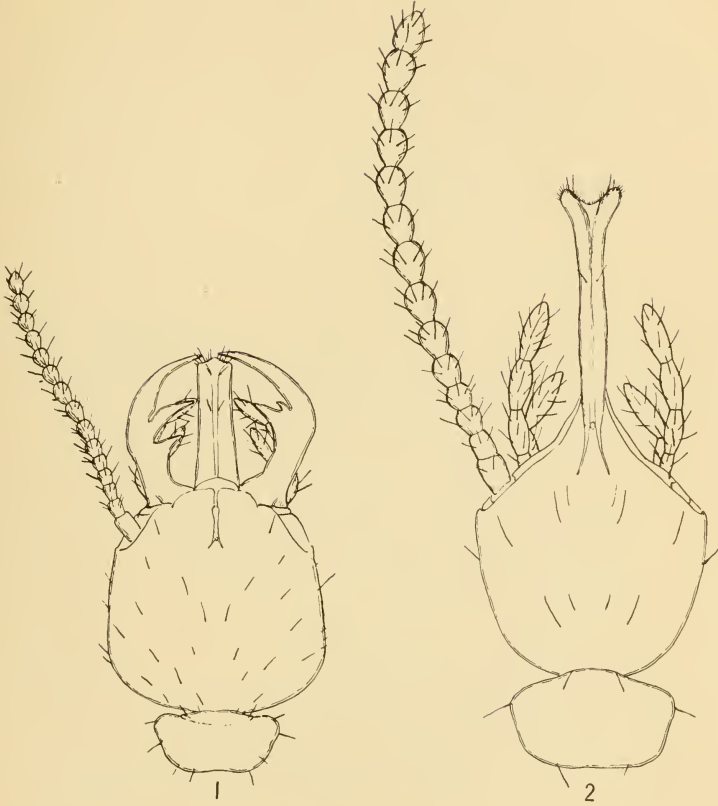
Legs white with tinge of yellow, elongate, slender, with long hairs.

Abdomen pale yellow with rows of long hairs at base each tergite, cerci prominent.

Measurements (Small Soldier):

- Length of entire soldier: 2.20–2.40 mm.
- Length of head with labrum: 1.05 mm.
- Length of head without labrum (to anterior): 0.57 mm.
- Length of labrum: 0.50 mm.
- Length of pronotum: 0.22 mm.
- Length of hind tibia: 0.57–0.60 mm.

¹The characterization of *R. longilabius* is by A. Emerson of the University of Pittsburgh.



Rhinotermes longidens Snyder.

Width of head (at widest point): 0.50 mm.
Width of labrum (at forks at apex): 0.12 mm.
Width of labrum (at base and center): 0.05 mm.
Width of pronotum: 0.35 mm.

R. longidens Snyder is lighter colored, smaller and has a narrower labrum than *R. longilabius* Emerson; it has fewer hairs on the head and has not the long slender sharp pointed mandibles of *longilabius*.

Type locality.—Rio Chinilla, C. Z., Panama.

Described from one large soldier and a series of small soldiers collected with workers at the type locality on June 8, 1923, by I. Molino and J. Zetek in a dry branch off an old tree trunk on the ground.

Type, large soldier.—Cat. No. 26533, U. S. N. M.

EXPLANATION OF PLATE.

Plate X.

Fig. 1. *Rhinotermes longidens* Snyder, Major Soldier.

Dorsal view of head and pronotum; note long labrum. Greatly enlarged.

Fig. 2. *Rhinotermes longidens* Snyder, Minor Soldier (Gabel-Nasutus).

Dorsal view of head and pronotum. Greatly enlarged.

Drawings by Miss E. T. Armstrong.

594-0373

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

NOTES ON MOLLUSCAN NOMENCLATURE.

BY WILLIAM HEALEY DALL.



As several manuscript reports and memoirs, containing incidentally some changes in and additions to molluscan classification by the writer, have been for some time completed and are likely to be still further delayed before publication it is thought best to print a brief preliminary note on the more important nomenclatorial items.

Genus *Admete* Kroyer, new section **Microcancilla** Dall; type *Admete microscopica* Dall, 1889.

Genus *Astyris* H. & A. Adams, new section **Fluella** Dall; type *Astyris* (*Fluella*) **vidua** Dall, n. sp. Shell like *Astyris* but spirally sculptured without conspicuous axial sculpture. The type is white and thin with an inflated smooth nucleus and about three subsequent well rounded whorls. Length 4 mm. U. S. Nat. Mus. Cat. No. 108002. Deep water off Florida.

New section **Plectaria** Dall, type *Astyris* (*Plectaria*) **crumena** Dall, n. sp. Shell small, like *Astyris* but with predominant axial sculpture, smooth inflated nucleus, and very fine spiral lineation. The type is white, with three well rounded whorls, 4 mm. long. U. S. Nat. Mus. Cat. No. 108006. With the last. *Astyris albella* C. B. Adams, may be referred here.

New section **Parasagena** Dall; type *Astyris* (*Parasagena*) **georgiana** Dall, n. sp. Shell like *Astyris* but with a sharply cut open reticular sculpture. The type is translucent white, biconic, with a smooth inflated nucleus and about four moderately convex subsequent whorls. Length 5 mm. U. S. Nat. Mus. Cat. No. 108311. Deep water off Georgia.

This species has a vitreous aspect and wide shallow reticulation.

Genus *Laskeya* Iredale. New section **Onchodia** Dall; type *Laskeya* (*Onchodia*) **benthica** Dall, n. sp. Deep water forms with a swollen nuclear whorl, the next whorl more constricted, usually axially ribbed with or without spiral lines, the following whorls strongly axially ribbed. The type is glassy white, with about seven subsequent whorls, fourteen ribs and two spiral cords, beaded at the intersections. Length 6 mm. U. S. Nat. Mus. Cat. No. 108344. Off Georgia in deep water, common.

Genus *Trichotropis* Sowerby. New section **Iphinopsis** Dall, type *Iphinoë kelseyi* Dall, 1908, San Diego, Cal. Shell small, without the hairy periostracum of *Iphinoë*, but of similar form; deep water species.

Genus *Megasystropha* Lea, Jan. 1864; type *Planorbis newberryi* Lea, 1858+*Carinifex* Binney, Sept., 1865.

Genus *Vorticifex* Meek (*Vortifex* by typographical error), 1870, sole example *Carinifex (Vorticifex) tryoni* Meek.

New section **Paradines** Dall, type *Carinifex binneyi* Meek, 1870. Pliocene.

Genus *Orygoceras* Brusina, 1882. No type selected.

Section *Orygoceras* s. s. Type *O. cornucopiae* Brusina. Balkan Pliocene.

New section **Ibicicornu** Dall. Type *O. fistula* Brusina.

New section **Bovillina** Dall. Type *O. corniculum* Brusina.

New section **Incilicornu** Dall. Type *O. leptonema* Brusina.

New Genus **Payettia** Dall. Type *Latia dalli* C. A. White, 1882. Pliocene lake beds of the Snake River valley, Idaho.

Genus *Rochefortia* Vélain.

New subgenus **Rochefortina** Dall. Type **R. semele** Dall, n. sp. Beaks subcentral; external sculpture radial and concentric; a small prodissoconch;

hinge formula $\frac{L\ 1.0\ r\ 1.0}{R\ 0.1\ r\ 0.1}$ Type small, oval, with a minute escutcheon but no lunule; pallial line obscure; length 3.2 mm. U. S. Nat. Mus. Cat. No. 333070. Oahu, H. T.

Genus *Tellina* Linné.

New subgenus **Scissulina** Dall. Type *T. dispar* Conrad. 1837. Hinge of *Macoma*, the oblique sculpture only on one valve. Hawaiian Islands.

Genus *Crassispira* Swainson.

New subgenus **Ceritoturris** Dall. Type **C. ? bittium** Dall, n. sp. Shell minute, recalling one of the minute brackish water species of *Bittium*. Nucleus blunt, the second whorl with a peripheral keel and seven subsequent moderately rounded, axially and spirally sculptured whorls, the canal almost obsolete. Length 7 mm. U. S. Nat. Mus. Cat. No. 338625. Hawaiian Ids.

Genus *Daphnobela* Cossmann.

New subgenus **Carinapex** Dall. Type *Drillia minutissima* Garrett, 1873. Hawaii.

Genus *Turricula* Schumacher, 1817.

Subgenus? **Mordica** Dall. Type **M. brunonia** Dall, n. sp. Minute shell with an absurdly accurate resemblance to the large species of *Turricula*; with inflated whorls, constricted suture and relatively long canal. Type with slender brown nucleus of four long axially ribbed whorls and three and a half subsequent inflated whorls; seven axial ribs, and a deep anal sulcus close to the suture. Length 3 mm. U. S. Nat. Mus. Cat. No. 338671. Hawaiian Islands.

Tritonoturris n. g. Dall. Type *Clathurella robillardi* Barclay, 1869. Mauritius. This has obviously nothing in common with *Clathurella*.

Turhyssa n. g. Type *Clathurella bicarinata* Pease. Hawaiian Islands. Questionably pleurotomoid. It has much the aspect of a minute *Peristernia*.

Cryptomitra n. subg. Type *Pleurotomella? climacella* Dall, 1895. Hawaiian Islands. Shell with obsolete plaits on the pillar in the earlier whorls but none in the last whorl.

Genus *Pisania* Bivona.

Prodotia n. subg. Type *Pisania billeheusti* Souverbie, 1865. Nukahiva. This is said to have the operculum like *Fusinus*. Another species from the Hawaiian Islands is destitute of an operculum according to the experience of Mr. Thaanum, who has taken two alive.

Genus *Murex* Linné.

Langfordia, n. subg.? Type *Murex (Langfordia) cuspidifera* Dall, n. sp. Hawaiian Islands. Shell of moderate size, biconic, somewhat of the form of *Trichotropis*, spirally sculptured, with about a dozen peripheral spines, the outer lip internally lirate, the siphonal fasciole imbricate, surrounding a conspicuous umbilical pit. Height 18 mm. U. S. Nat. Mus. Cat. No. 339422.

This combines features of *Favartia*, *Trophon*, and *Murex*.

Neptunea Boltén. Type selected in 1918 by Dall is *Neptunea clathrus* Boltén, = *Murex clathratus* Linné. *Chrysodomus* Swainson, 1840, is therefore retained for *Murex antiquus* Linné. *Boreotrophon* Sars. is synonymous with *Neptunea*.

Cythna Carpenter, 1864, is perhaps to be regarded as homonymous with *Cithna* A. Adams, 1863. In that case the name *Cythnoa* is suggested for the later name.

Genus *Gyrineum* Link.

New section **Gyrinella** Dall. Type *G. pusillum* Broderip.

The minute species with no sutural canal can hardly be appropriately placed in the same section as the enormous type of the genus.

Genus *Triphora* Blainville.

Strobiligera n. subg. Type *Triphora (inflata* var.) *ibex* Dall.

Antilles in deep water. Protoconch larger than the succeeding whorl, swollen, smooth; sutural sulcus feeble, canal short, open. There are numerous species in the deep water of the Antilles. *Sychar* Hinds is of an entirely different type.

Litharium n. subg. Type *Triphora oceanida* Dall, n. sp. Hawaiian Ids. Shell dark brown, acute, rapidly increasing, Nucleus concentrated, with no obvious nepionic stage, blunt, with 12 subsequent whorls with three rows of beaded spiral sculpture, suture narrow and deep, sulci feeble. Length 5 mm. U. S. Nat. Mus. Cat. No. 333276.

Genus *Bittium* (Leach) Gray.

Bittinella n. subg. Type *Bittium hiloense* Pilsbry and Vanatta, 1908. Hawaiian Islands.

Genus **Capulella** nov. Type *C. microceras* Dall, n. sp. Hawaiian Islands. Shell minute, recalling the much larger *Capulus liberatus* Pease, from the Paumotu, in which the whorls are separated. In the present species there are two and a half whorls not separated, but the circular aperture is entirely free though there is no umbilical perforation.

Height 1, diameter 1.5 mm. Bishop Museum Cat. No. 65040.

Genus *Eunaticina* Fischer.

New section **Heliconatica** Dall, Hawaiian Islands. Type **E. margaritaeformis** n. sp. Shell small, like *Margarites umbilicalis* Sowerby in form, white, with a brown nucleus, sculpture of sharply incised spiral lines, the pillar lip straight with a small callosity on its edge near the body. Height 8; diameter 12 mm. U. S. Nat. Mus. Cat. No. 339171.

Genus *Solariella*.

New section **Suavotrochus** Dall. Type *Solariella lubrica* Dall, 1881. Antilles in deep water. The shell is nearly or quite destitute of sculpture.

574-087

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

NEW FLOWERING PLANTS OF THE PACIFIC COAST.

BY C. V. PIPER.

Collectors continue to find undescribed plants in all the Pacific Coast States. The new species here described are based on specimens recently collected or else long in the United States National Herbarium. The new *Iris* is particularly noteworthy.

***Iris gormanii*, n. sp.**

Rootstocks slender; base of old plants covered with dead leaves of previous seasons; stems slender, 1-flowered, 30-40 cm. high, each bearing two or three leaves; leaves pale green, linear, 2-4 mm. wide, strongly veined, the earliest short, some of the later ones exceeding the stems; cauline-leaves scarious-margined, the upper exceeding the stem; bracts three, 8-10 cm. long, scarious margined, none exceeding the flower; flowers short-peduncled, cream color to pale yellow; perianth tube above the ovary short, 4 mm. long; sepals ascending, spatulate-oblongate, not bearded or crested, thin, 3-3.5 cm. long; petals erect, spatulate-oblongate, 2.5 cm. long; capsule oblong, obtusely 3-angled, sharp-beaked, 2-2.5 cm. long, straw-color when mature; seeds globose, brown, the outer coat much wrinkled.

Scoggin's Creek, east slope of Coast Mountains, Washington County, Oregon, *M. W. Gorman*, June 25 and August 13, 1922. Only about 5 per cent of the plants produced fruit in 1922.

***Iris tenuis* Watson Proc. Am. Acad. 17:380. 1882.**

This was found in 1881 by Prof. L. F. Henderson on Eagle Creek, a branch of Clackamas River, Oregon, in Clackamas County, about 40 miles east of Portland, but no later collections seem to exist. Mr. M. W. Gorman has recently visited the type locality and finds the plant abundant in patches along Eagle Creek. His specimens are quite like those of the type collection.

***Arabis elata*, n. sp.**

Biennial, erect, 1 m. high, leafy below, a few ascending branches above; stem purplish, terete, densely and finely stellate-canescens below, glabrous or nearly so above; basal leaves thickish, entire, oblongate, acutish, 1-nerved, narrowed at base and petiolate, 2-3 cm. long, densely and finely

stellate-canescens on both sides; cauline leaves oblanceolate, similarly canescent, sessile, conspicuously auriculate at base, 3–4 cm. long; racemes in fruit 30–50 cm. long, the divaricate pedicels 5–7 mm. long, 10–15 mm. apart; pods linear, glabrous, curved upwards, 2–3 cm. long, 1 mm. wide, the valves 1-nerved nearly the whole length; stigma white, sessile; seeds orange, much compressed, narrowly wing-margined.

Along Emigrant Creek near its junction with Silvie's River, Harney County, Oregon, June 23, 1912, *M. E. Peck* No. 5539. Nearest to *A. tri-chopoda* Greene.

***Cardamine oregana*, n. sp.**

A slender glabrous perennial rooting at the nodes and tuberiferous; stems slender, weak, terete, branching, procumbent, 30–40 cm. long; leaves simple or trifoliolate, glabrous, thin, the blade of the basal ones suborbicular or sinuately pentagonal, 3-nerved from the base, about 1 cm. long, the slender petiole 3–4 times as long; upper leaves very similar but with one, rarely two, pair of rounded to elliptic leaflets close to the terminal one; flowering branches erect or ascending 10–15 cm. long; racemes 2–7 flowered; petals white, 5 mm. long; sepals oblong, pale, thin-edged, 2 mm. long; pods ascending, linear, glabrous, 16–20 mm. long, each tipped with a stout style 1.5 mm. long, the pedicel less than half as long as the pod; seeds about 20, oblong, compressed, dull, dark brown, 1 mm. long.

Near Little Meadows of the Des Chutes River, Oregon, alt. 1500 meters, *J. B. Leiber* 2614, August 25, 1896; type sheet 280753 in U. S. National Herbarium. Allied to *C. occidentalis* (Wats.) Schulz but differing in the fewer leaflets and longer style.

***Astragalus* (§*Homalobus*) *peckii*, n. sp.**

Perennial from a vertical root, branched from the base, leafy, the whole herbage minutely cinereous pubescent; branches erect or ascending, slender, terete, pubescent, the internodes 5–20 mm. long; leaves pinnate with 3 to 5 pairs of leaflets; stipules scarious, united for half their length, triangular, acute, ciliate; lateral leaflets oblong, acutish, puberulent on both sides, mostly folded, 2–5 mm. long, very shortly petiolulate; terminal leaflet rudimentary or not at all developed, the tip of the rachis sharp and often bent; inflorescence axillary, shorter than the leaves, about 6-flowered; corolla ochroleucous, 6–7 mm. long; calyx puberulent with white somewhat appressed hairs, the tube campanulate, 2 mm. long, equalled by the slender subulate lobes, these more or less curved; pods sessile, oblong-linear, compressed, minutely white puberulent, 5–7 mm. long, tipped with the recurved slender style.

Dry ground, McKenzie Pass, 10 miles northwest of Tumalo, Crook County, Oregon, *M. E. Peck* 9768, August 3, 1920.

***Godetia brevistyla*, n. sp.**

Strigulose throughout with white hairs; stems slender, erect, simple or branched from near the base, 20–30 cm. high; leaves sessile, linear, acute and apiculate, 1–3 cm. long; buds erect, narrowly ovoid, acuminate; sepals

at length separate nearly to the base, reflexed, 4 mm. long; petals purple, about 1 cm. long; stigmas ovate, purple, as long as the style, both together 2 mm. long; stamens unequal, the shorter 2 mm., the longer 4 mm. long; ovary densely strigulose, 8-ribbed; capsules sessile, somewhat 4-sided, abruptly short-beaked, 10-14 mm. long.

Olympic Mountains, Clallam County, Washington, A. D. E. Elmer No. 2567, June, 1900. All of Elmer's plants were thus labelled as to locality, but the one here discussed was probably collected either at Port Angeles or at the mouth of the Elwha River, as it clearly is not an alpine plant.

It is the only species with very short style and stigmas excepting *G. romanzovii* (Ledeb.) Spach for which it was mistaken in "The Flora of the Northwest Coast." *G. romanzovii* as represented by a garden specimen in the Gray Herbarium has lanceolate petiolate nearly glabrous leaves, sepals 7 mm. long, petals 1.5 cm. long, stamens 10 mm. long, the filaments equaling the anther, and the style and stigma relatively shorter than in our plant.

Lappula venusta, n. sp.

Perennial from a loosely branched crown, the branches of which are covered by the old leaf bases; stems erect, simple to the inflorescence, terete, sparsely hirsute with somewhat reflexed pustulate-based hairs; leaves numerous, the basal ones spatulate-oblancoate, obtusish, 6-12 cm. long, the petioles margined; median leaves sessile, linear-oblong to oblanceolate, 4-6 cm. long; upper leaves sessile, broadest at base, the uppermost partly clasping; all green and hispid on both faces; inflorescence loosely cymose in age, the bracteate branches raceme-like 10-15 cm. long; bracts lanceolate to linear gradually reduced upwards; rachis slender, strigillose; pedicels recurved, 15-20 mm. long in fruit, strigillose; calyx-lobes linear, acute, strigillose, 4 mm. long; corolla white, 2 cm. broad, the lobes orbicular-obovate; appendages yellow, oblong, broadest above, emarginate, minutely and evenly roughened; anthers oblong, yellow, not reaching the appendages; nutlets trigonous, 6 mm. long, nearly as broad; marginal bristles united for about half their length, all glochidiate; dorsal surface convex, sparsely muriculate and with about 10 short glochidiate bristles; ventral surface smooth; the lanceolate scar central.

Between Tumwater and Drury, Chelan County, Washington, May 18 and June 9, 1920, I. C. Otis, No. 895.

A very handsome species probably nearest to *L. cinerea* Piper.

Allocarya corallicarpa, n. sp.

Annual, slender, much branched from near the base, the branches erect or ascending, 10-50 cm. high; stems strigillose; leaves linear, obtuse or acutish, 2-5 cm. long, sparsely strigillose above, densely so beneath, the hairs mostly pustulate; racemes bractless, 5-10 cm. long, rather loosely flowered, the lower internodes 3 to 5 times as long as the fruiting calyces; pedicels shorter than the calyces; calyx not accrescent, the lanceolate acute somewhat spreading lobes densely hispid with pale hairs, 3 mm. long in fruit; corolla rotate, 5 mm. broad; nutlets ovoid, plump, obtuse, dull, pale

or at length reddish-brown, 1.5 mm. long, the dorsum convex, keeled for two-thirds its length, evenly covered with an intricate convolute anastomosing network of pale rather prominent ridges, the relatively small interspaces granulate; venter keeled from the scar to apex, the surface sculptured as on the dorsal surface; scar ovate, almost basal, rather small, surrounded by a conspicuous ridge; epidermal cells conical, unicellular.

In moist open spaces, Grant's Pass, Oregon, *C. V. Piper*, June 2, 1921 (type); same place in depauperate specimens, *M. E. Peck* 2956, June 24, 1909; Medford, Oregon, *C. V. Piper*, June 1, 1921.

Nearest *A. scouleri* (Hook. & Arn.) Greene but stems more slender, racemes looser, flowers smaller, and nutlets more coarsely sculptured with uninterrupted ridges.

Allocarya aculeolata, n. sp.

Annual, not succulent, much branched from the base, the slender branches decumbent to ascending, 10 to 30 cm. long, the whole herbage strigillose; leaves linear, 1 to 3 cm. long, strigillose on both surfaces, pustulate beneath; racemes many-flowered, 5-15 cm. long, with few leafy bracts, the internodes mostly 2 to 3 times as long as the fruiting calyces; pedicels much shorter than the calyces; calyx lobes not accrescent, lanceolate, setulose, erect or somewhat spreading, 2 to 2.5 mm. long; corolla minute; nutlets narrowly ovoid, brownish, acutish, 1.5 mm. long, the dorsum convex, keeled above the middle, marked above the base with four nearly continuous transverse ridges, granulate basally and between the ridges, covered with simple hyaline bristles each with short barbs at the tip; venter keeled from scar to apex, obliquely rugulose and minutely bristly; scar ovate, small, nearly basal.

In dried mud holes on a ridge ten miles east of Chico, Calif., May 27, 1921, *C. V. Piper* No. 5020. Near *A. penicillata* Greene but nutlets smaller and narrower and the scar nearly basal.

Allocarya lamprocarpa, n. sp.

Annual, simple or few-branched from the base, the slender branches erect or ascending, 10 to 20 cm. high, sparsely strigillose; leaves linear, 1 to 2 cm. long, obtusish, glabrous or nearly so above, pustulate-strigulose beneath; racemes leafy-bracteate near the base, 5-15 cm. long, the internodes 2 to 4 times as long as the fruiting calyces; calyx not accrescent, setulose, the lanceolate nearly erect lobes 2 mm. long; corolla minute; nutlets broadly ovoid, abruptly narrowed toward the apex, dark grayish, shiny, 1.5 mm. long, 1 mm. wide, the dorsum keeled its whole length but rather faintly basally, coarsely and rather evenly tuberculate or obscurely rugulose with short or roundish low elevations, these less conspicuous basally, not at all granulate; venter obliquely and coarsely rugulose with short ridges, not granulate, the fully exposed keel lying in a narrow groove which is deepest basally; scar broadly ovate, flange margined, lying in a broad shallow depression.

In moist places in an old road, Grant's Pass, Oregon, June 2, 1921, *C. V.*

Piper No. 5023. This species is very unlike in its nutlets from any other of the *sulcata* group.

***Cryptantha scabrella*, n. sp.**

Annual, erect, loosely branched, 20–50 cm. high; stems slender, terete, puberulent with hairs of two kinds, long spreading and short appressed; branches erect or ascending; leaves linear, acute or acutish, pustulate-hirsutulous on both sides, 1–3 cm. long; inflorescence once-forked with a solitary flower in the fork, the branches spicate, loose in fruit, the internodes $2\frac{1}{8}$ times as long as the calyx; calyx-lobes lanceolate, setose with somewhat spreading bristles, 3–5 mm. long; corolla rotate, white, 6 mm. broad; mature nutlets 2–4, rarely 1, dark brown, dull, ovoid, constricted above and acutish, 2.5 mm. long, the margins rounded, the back convex, flattened and without median ridge, the ventral groove forked at base but closed, the whole surface densely and evenly scabrous with sharp points.

In dry open woods on hills, Grant's Pass, Oregon, June 2, 1921, C. V. *Piper* No. 5043.

***Valeriana seminuda*, n. sp.**

Stems rather stout, erect, terete, somewhat sulcate toward the base, glabrous or near the nodes sparsely puberulent, 70–90 cm. high, 4-jointed below the inflorescence; leaves rather thin, glabrous except the ciliate margins; basal leaves simple or with one or two lateral segments, spatulate, obtuse or acutish, entire or nearly so, the blade about 3 cm. long, exceeding the margined petiole; lower cauline leaves 6–10 cm. long, each with 5–7 divisions, the terminal one lance-oblong, acute at each end, entire or obscurely dentate, 4–5 cm. long, the lateral ones oblong, obtuse to acute, mostly 2 cm. long; middle cauline leaves sessile, 6 cm. long, with 5 segments, the terminal one lanceolate, sinuately dentate, acute at each end, the lateral ones narrowly lanceolate; bracts linear acute, the lowermost 2 cm. long; inflorescence of 5 cymose clusters, the terminal largest, 3 cm. broad, the lateral ones 1.5 cm. broad, the lower pair on slender naked peduncles 12 cm. long; bractlets subulate, acute, thin; flowers perfect; corolla nearly white, funnelform, gibbous at base, 3 mm. long; stamens much extruded; fruit ovoid, compressed, finely white-pubescent; pappus plumose, inrolled.

About half way between Mineral King and Farewell Gap, Sierra Nevada Mts., Tulare Co., California, August 5, 1891, *Coville & Funston* No. 1486. Type in the U. S. National Herbarium.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

NEW OR NOTEWORTHY FERNS FROM THE
DOMINICAN REPUBLIC.¹

BY WILLIAM R. MAXON.

In an earlier paper² the writer dealt briefly with an interesting collection of ferns obtained by Dr. W. L. Abbott in the north-eastern part of the Dominican Republic from November, 1920, to May, 1921, describing a new species of *Anemia* and listing a number of additional species that were either little known or new to the Dominican Republic. The present notes relate chiefly to the ferns of two more recent collections, made respectively in 1922 and the early part of 1923.

The 1922 collection, covering the period from January 3 to May 30, comprises 900 numbers, about half of which are ferns and lower cryptogams. On this trip Doctor Abbott revisited the region about Samaná Bay, and explored the entire southern portion of the province of Barahona, as well as the cordillera north of San Francisco de Macoris. In the province of Barahona he visited Paradis, Trujin, Enriquillo, Los Patos, Polo, Maniel Viejo, and Cabral, the first four being small villages on or near the seacoast south of Barahona City. Polo is a small settlement west of Barahona City, situated at the edge of a long flat valley about one mile wide. Immediately east of Polo the Loma de Cielo rises to a height of 1,260 meters, its flanks covered with wet forests; four miles to the northeast the Loma la Haut rises to 1,350 meters, its forest cover somewhat depleted by recent forest fires. Particular interest attaches to the material collected in the vicinity of Lo Bracito, a small village on the southern slopes of Quita Espuela, near San Fran-

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²Proc. Biol. Soc. Washington 35: 47-52. 1922.

cisco de Macoris. The mountains here are covered with humid thickets and forests and have the reputation of being one of the wettest parts of the Republic. This region would well repay further exploration.

Doctor Abbott's field work in the early part of 1923 (February 1 to March 13) was restricted to the region south of Samaná Bay, principally in the vicinity of Jovero, Liali, and Las Cañitas. Jovero is a small town 21 miles southeast of Samaná, near the river Lajiaguá and on the road running south of Seybo. Liali is a clearing with three or four houses, six miles south of Jovero. From this point Doctor Abbott was able to reach the summit of the Cordillera Central at an altitude of only 490 meters; the slopes are steep and for the most part still covered with virgin forest. Las Cañitas is a small settlement farther west on the south shore of Samaná Bay, near the mouth of the Catalina River and about 12 miles distant from Samaná.

Taken as a whole the collections are of great interest, indicating a rich fern flora when the Cordillera Central shall have been more completely explored. Of the species listed herewith as new to Hispaniola or the Dominican Republic solely on the basis of material collected by Doctor Abbott, some, no doubt, are represented also in the Türkheim and Fuertes collections, of which only incomplete sets have been received.

MARATTIACEAE.

Marattia alata Swartz.

Polo, altitude 900 meters or above, in a wet ravine, *Abbott* 1830.

Collected in the same province also by Fuertes (no. 1432) in 1911. The species is known otherwise from the Blue Mountains of Jamaica and from a few specimens collected in the Sierra Maestra of eastern Cuba.

SCHIZAEACEAE.

Anemia underwoodiana Maxon.

Quita Espuela, San Francisco de Macoris, at about 450 meters altitude, *Abbott* 2102.

This species, common in Jamaica and Cuba, has been known from Haiti previously but not from the Dominican Republic. The specimens are larger than is usual.

CYATHEACEAE.

Cyathea abbotti Maxon, sp. nov.

Trunk erect, apparently a meter high or more, about 4 cm. thick, rough above with appressed bases of old stipes, naked below, the scars suborbicular, about 12 mm. broad, obliquely depressed, distant, quincuncially

arranged in about 10 ranks. Fronds several, erect-spreading, exstipitate, oblanceolate-oblong, 90 to 110 cm. long, 28 to 32 cm. broad near the middle, abruptly short-acuminate at apex, acuminate in the basal third, subbipinnate; rachis dull brown, 5 or 6 mm. thick at the obtusely angulate base, unarmed, densely brownish-furfuraceous beneath, crispate-strigose above, deciduously paleaceous, the scales dark brown, subulate, 2 to 3 mm. long, or those along the ventral groove persistent, narrowly linear, subflexuous, 4 to 6 mm. long; pinnae about 60 pairs, sessile, mostly spreading, contiguous, the basal ones slightly deflexed, gradually reduced, the 2 or 3 lowermost pairs minute and vestigial, 4 to 8 mm. long; characteristic middle pinnae ligulate, with long-acuminate tips, 12 to 16 cm. long, 2 to 2.5 cm. broad, pinnatisect at base (the proximal basal segment sometimes free), deeply pinnatifid throughout (to about 0.5 mm. from the costa), the costa densely brown-strigose above, beneath deciduously paleaceous (the scales brown, thick, lustrous, 1.5 to 2 mm. long, narrowly linear from a thinner, slightly broader base, arcuate or subflexuous) and at first slightly puberulent; segments 28 to 34 pairs, close, slightly oblique, narrowly oblong, or sometimes narrowed and concave at base (thus subspatulate), subfalcate, acutish, coarsely crenate-serrate toward the tip, 10 to 15 mm. long, 3 to 4 mm. broad, the costule glabrous above, glabrous and persistently paleaceous beneath, the scales minute, pale brown, very strongly bullate, orbicular or ovate in outline; veins 9 to 11 pairs, mostly once-forked, strongly elevated above, glabrous on both surfaces, devoid of scales; sori 2 to 4 pairs, basal on the segments, borne near but usually not against the costule; indusia dark brown, firm, glabrous, deeply cyathiform, the capitate receptacle wholly included. Leaf tissue thick-herbaceous, dull dark green above, dull and much paler beneath, glabrous; margins faintly hyaline-cartilaginous, very narrowly revolute.

Type in the U. S. National Herbarium, nos. 1,145,242-3, representing a complete frond, and no. 1,145,846, representing the upper caudex in sections, collected on Quita Espuela, vicinity of San Francisco de Macoris, Provincia Pacificador, Dominican Republic, altitude about 900 meters, April 6, 1922, by W. L. Abbott (no. 2051). Dr. Abbott's no. 2145, collected at about 1,000 meters elevation in the same locality, is identical.

The nearest relative of *Cyathea abbotti* is *C. minor* D. C. Eaton, of eastern Cuba and the Dominican Republic, which differs notably in its much larger, strongly oblanceolate, basally attenuate, fully bipinnate blades, its more distant, fewer pinnae (30 to 45 pairs), its dense covering of long yellowish hairs and pale scales upon the under side of the costae and costules, its obtuse segments (these mostly constricted at base), its villous-hirsute veins, and its strictly basal sori, the indusia persistently villous-hirsute.

Cyathea minor D. C. Eaton.

"In sylvis Par Mingo," province of Barahona, altitude 1,400 meters, April, 1912, *Fuertes* 1547 (distributed as *C. pubescens* Mett.).

Known hitherto only from the mountains of eastern Cuba, the type being *Wright* 949. It is at once distinguished from *C. pubescens*, among numerous characters, by its villous-hirsute indusia.

Cyathea brooksii Maxon.

Quita Espuela, near San Francisco de Macoris, altitude 900 to 1,000 meters, *Abbott* 2052, 2054, 2148.

A species known previously only from the original collection in eastern Cuba (*Maxon* 4474) and well marked by its short, horizontal, mostly subterranean rhizome, its very long stipes, its slightly narrowed but not basally long-attenuate blades, its fully bipinnate condition throughout (the secondary pinnae hastulate, sessile or short-stalked), and the numerous minute, dark brown, spinescent-stellate scales of the costae and costules beneath, in all of which particulars it differs from *C. minor* D. C. Eaton, its nearest relative. The present material is larger and more completely fertile than the Cuban specimen and the pinnules (secondary pinnae) are more strongly crenate-serrate. The indusia bear a few hairs, a point overlooked in the original description.

Cyathea hieronymi Brause.

Near Paradis, altitude about 600 meters, *Abbott* 1666. Lo Bracito, San Francisco de Macoris, altitude 400 meters, *Abbott* 2031.

This is the Hispaniola analogue of *C. tussacii* Mett., of Jamaica. Other specimens are: Dominican Republic, *Türkheim* 2992 (type), *Eggers* 1854; Haiti, *Nash & Taylor* 1743, *Buch* 1135, 1551.

Cyathea crassa Maxon, *Contr. U. S. Nat. Herb.* **13: 40.** 1909.

Cyathea domingensis Brause in *Urban, Symb. Antill.* **7: 153.** 1912.

Liali, altitude about 300 meters, *Abbott* 2662.

Known only from the Dominican Republic. Other specimens are: *Eggers* 2735c (type), 2735; *Fuertes* 741 (distributed as *C. elegans* Hew., a Jamaican species); *Türkheim* 2716 (distributed as *C. serra* Willd.); *Türkheim* 2715 (type collection of *C. domingensis*).

Cyathea tenera (J. Sm.) Griseb.

Near Paradis, altitude about 600 meters, *Abbott* 1664.

This species, common in the Lesser Antilles and Trinidad, is new to Hispaniola.

Hemitelia wilsoni Hook.

Near Liali, altitude 300 meters, *Abbott* 2660.

A remarkable species known hitherto only from Porto Rico and from Jamaica, the type locality.¹

Alsophila microdonta Desv.

Las Cañitas, at sea level, February, 1923, *Abbott* 2683.

A noteworthy extension of range for this species, which was known from the West Indies previously only upon two collections from Cuba (*Ekman* 14679; *Britton, Wilson & Selby* 14329). It is common in the lowlands of continental tropical America, extending from Veracruz to Brazil and eastern Peru.

¹*Contr. U. S. Nat. Herb.* **17: 416.** *pl. 18.* 1914.

POLYPODIACEAE.

Elaphoglossum herminieri (Bory & Fée) Urban.

Near San Francisco de Macoris, at 300 to 450 meters elevation, *Abbott* 2021, 2099.

A widely distributed West Indian species previously reported from the Dominican Republic upon a single specimen (*Abbott* 434).

Elaphoglossum muscosum (Swartz) Moore.

Steep rocky slopes of Loma de Cielo, above Polo, at 1,000 to 1,250 meters elevation, *Abbott* 1820, 1846.

Described originally from Jamaica and since erroneously reported from a wide area in tropical America. Aside from a single Haitian collection (*Leonard* 3913) and the specimens above cited it is known to the writer only from the Blue Mountains of Jamaica.

Elaphoglossum siliquoides (Jenman) C. Chr.

Quita Espuela, San Francisco de Macoris, at about 900 meters elevation, *Abbott* 2056.

Described originally from Jamaica and heretofore known only from that island, Cuba (*Shafer* 4459), and Alta Verapaz (*Pittier* 172; *Maxon & Hay* 3109). The specimen is thoroughly characteristic.

Vittaria remota Fée.

Quita Espuela, near San Francisco de Macoris, at 900 to 1,000 meters elevation, *Abbott* 2081, 2128.

Hitherto known definitely in the West Indies from Jamaica and Porto Rico, but reported also from Dominica and St. Vincent. On the continent it ranges from Costa Rica to Venezuela.

Eschatogramme furcata (L.) Trev.

Near Paradis, at 450 meters elevation, *Abbott* 1631. Near Polo, at 600 to 900 meters elevation, *Abbott* 1841, 1884.

Widespread in continental America but very rare in the West Indies. Besides those above listed, specimens are at hand from eastern Cuba (*Maxon* 4444) and from Haiti (Marmelade, altitude 680 meters, *Nash & Taylor* 1356).

Adiantum wilsoni Hook.

Las Cañitas, near sea level, in damp ravines and on moist slopes of heavy forest, *Abbott* 2698, 2699, 2708, 2715.

Described from Jamaica and known in the West Indies also from Porto Rico (*Hioram* 199). New to Hispaniola. On the continent it extends from Guatemala to Panama.

Polypodium cultratum Willd.

Quita Espuela, vicinity of San Francisco de Macoris, at about 600 meters elevation, *Abbott* 2095.

Not previously recorded from Hispaniola, so far as noted.

Polypodium suspensum L.

Quita Espuela, vicinity of San Francisco de Macoris, altitude about 900 meters, *Abbott* 2074.

Long ago ascribed to Hispaniola by Fée. The specimens are smaller than is usual.

Polypodium taenifolium Jenman.

Quita Espuela, vicinity of San Francisco de Macoris, altitude about 1,000 meters, *Abbott* 2114b, 2146.

New to Hispaniola. A rare species, widely distributed in the West Indies; formerly known as *P. sintenisii* Hieron.¹

Polypodium trifurcatum L.

Quita Espuela, near San Francisco de Macoris, at 600 to 1,050 meters elevation, *Abbott* 2038, 2045, 2071, 2082.

A rather uncommon species, widely distributed through the West Indies but apparently not heretofore recorded from Hispaniola. The type is from Martinique.

Polypodium leucosticton Kunze.

Loma de Cielo, Polo, at 1,000 to 1,200 meters elevation, *Abbott* 1797, 1807, 1811.

This species, which has recently been collected also in Haiti (*Leonard* 4789), is known otherwise from Guatemala, Costa Rica, and northern South America.

Polypodium astrolepis Liebm.

Vicinity of Paradis, at about 450 meters elevation, *Abbott* 1647.

A common Middle American plant, apparently not previously listed from Hispaniola. It has usually been known as *Polypodium elongatum* (Swartz) Mett., an invalid name. The species of this difficult group have recently been treated by Weatherby.²

Polypodium decumanum Willd.

Dense forest on bank of Río Lajiaguá, Liali, at about 100 meters elevation, *Abbott* 2582.

This species, described originally from Brazil, extends thence northward to Mexico. It is common in Trinidad, but apparently has not heretofore been known from the West Indies proper. Collected also in the vicinity of Santo Domingo City by Rose, Fitch and Russell (no. 4114) in 1913.

Polypodium latum (Moore) Sod.

Paradis, at about 450 meters altitude, *Abbott* 1620.

There is apparently no published record of the occurrence of this species in Hispaniola. It is widely spread in tropical and subtropical America, and occurs in Florida.

¹*Contr. U. S. Nat. Herb.* 17: 555. *pl.* 38. 1916.

²*Contr. Gray Herb.* n. s. 65: 1-14. 1922.

Polypodium vexatum D. C. Eaton.

Loma de Cielo, Polo, altitude about 1,200 meters, *Abbott* 1959.

Though common in Haiti (*Leonard* 3736, 3762, 3950, 4031, 4459, 4554, 4616) this species seems never to have been listed from either that country or the Dominican Republic. It is abundant in eastern Cuba and is listed by Urban from Porto Rico (*Sintenis* 6743).

Asplenium laetum Swartz.

Polo, at 600 meters elevation, *Abbott* 1777. Liali, at about 400 meters elevation, *Abbott* 2627.

Widely distributed in the West Indies, but apparently not before definitely known from Hispaniola.

Asplenium monteverdense Hook.

Loma de Cielo, near Polo, at 750 to 1,200 meters altitude, *Abbott* 1880, 1954. Quita Espuela, near San Francisco de Macoris, altitude 450 meters, *Abbott* 2110.

Apparently not hitherto reported from Hispaniola. There are at hand, however, many specimens collected in Haiti by E. C. Leonard in 1920.

Asplenium pseudoerectum Hieron.

Loma de Cielo and elsewhere, vicinity of Polo, at 900 to 1,200 meters elevation, *Abbott* 1828, 1963a, 1966.

A critical species, widely distributed in the West Indies, but not previously reported from Hispaniola. Several specimens are at hand also from Haiti (*Leonard* 4020, 4526, 4706, 4720, 4727).

Asplenium sintenisii Hieron.

Loma la Haut, Polo, at about 1,050 meters elevation, *Abbott* 1866.

Described from Porto Rico and Haiti, an additional Haitian specimen being *Leonard* 3872, from Mission. It occurs also in Jamaica (*Hart* 250, 489; *Maxon & Killip* 798), and may be expected in Cuba.

Blechnum blechnoides (Lag.) C. Chr.

Liali, altitude 100 to 500 meters, *Abbott* 2636.

Although previously ascribed to Hispaniola, no other specimens from this island have been seen by the writer.

Hemidictyum marginatum (L.) Presl.

Vicinity of Las Cañitas, near sea level, *Abbott* 2695, 2696.

A very common tropical American species, apparently not previously reported from Hispaniola.

Dryopteris angustifolia (Willd.) Urban.

Dense woods along the Río Lajiaguá, near Liali, altitude about 100 meters, *Abbott* 2579.

So far as noted, this common species of tropical America has not hitherto been reported from Hispaniola.

Dryopteris pyramidata (Fée) Maxon.

Vicinity of Samaná, along a stream, near sea level, *Abbott* 1504. Lo Bracito, near San Francisco de Macoris, at about 300 meters elevation, *Abbott* 2022.

A not uncommon species from the Guianas northward through the Lesser Antilles. There is a single other record from the Dominican Republic (*Wright, Parry & Brummel* 12).

Fadyenia hookeri (Sweet) Maxon.

Quita Espuela, near San Francisco de Macoris, at about 300 meters altitude, *Abbott* 2089.

Well known from Cuba, Jamaica, and Porto Rico, but apparently new to Hispaniola.

Polystichum polystichiforme (Fée) Maxon.

Loma de Cielo, near Polo, at about 1,200 meters altitude, *Abbott* 1967, 1968, 1977.

Known from the mountains of Jamaica, Cuba, and Porto Rico, and upon two recent collections in Haiti (*Leonard* 4443, 4718).

LYCOPODIACEAE.

Lycopodium brauseanum Herter.

Quita Espuela, near San Francisco de Macoris, altitude 1,000 meters or above, *Abbott* 2123.

This species was described originally from Margarita Island, Venezuela, on material collected by J. R. Johnston (no. 156, in part). The present specimen has precisely the aspect of the Margarita plant, but is larger and has most of the leaves acutish. It may represent a distinct new species, but is more likely an ordinarily luxuriant state of *L. brauseanum*. The original specimen appears depauperate.

HYMENOPHYLLACEAE.

Hymenophyllum delicatissimum Fée.

Quita Espuela, near San Francisco de Macoris, at 900 to 1,000 meters elevation, *Abbott* 2057, 2120, 2177.

This species, which has been most injudiciously reduced to *H. lineare* Swartz, was founded on Brazilian material collected by Glaziou (no. 3591), a portion of which is at hand. From that species it is at once distinguished by its twice-stellate hairs, as also by its simpler blades. Additional specimens examined are: British Guiana, *in Thurn* 200; Trinidad, *Britton, Hazen & Mendelson* 1374; Grenada, *Sherring*; Guadeloupe, *Duss* 4268.

Hymenophyllum lanatum Fée.

Quita Espuela, near San Francisco de Macoris, at about 900 meters elevation, *Abbott* 2076.

Originally described from Guadeloupe. Known otherwise heretofore only from the Sierra Maestra of eastern Cuba and the Blue Mountain region of Jamaica, where it is abundant.

PROCEEDINGS
OF THE
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DESCRIPTIONS OF THREE NEW BIRDS FROM
GONAVE ISLAND, HAITI.

BY CHAS. W. RICHMOND AND BRADSHAW H. SWALES.

From July, 1916, to the winter of 1923, Dr. W. L. Abbott has made annual, and in some years semiannual, visits to Santo Domingo and Haiti, collecting miscellaneous natural history material for the United States National Museum. Among the specimens sent in were nearly 1400 bird skins, in addition to alcoholics and skeletons, including nearly 200 skins from Gonave Island. Gonave (or Gonaive) Island is hardly more than 15 miles off the east coast of Haiti, in the Gulf of Gonave or Leogane. It is the largest of the islets on the coast of the larger island, and is about 35 miles long by not over 10 miles wide, but apparently far enough from the mainland to have given rise to a few well-marked subspecies which we have recognized as follows:

Saurothera longirostris petersi, new subspecies.

Type, No. 251,486, U. S. National Museum, adult male, Gonave Island, Haiti, Feb. 20, 1918; Dr. W. L. Abbott.

Characters.—Differs from *S. l. longirostris*¹ in lacking a buffy brown throat patch, and in the paler color of the abdomen, under tail-coverts, under wing-coverts, etc., and in slightly larger dimensions, except wing.

Description of type.—Upper parts (including scapulars, secondaries, wing-coverts and upper tail-coverts) clear gray (nearly smoke gray), darker and with a brownish wash on the pileum; secondaries with a greenish wash in some lights; ear-coverts, malar region, sides of neck, throat, chest and breast, pale smoke gray, paler on throat, where there is a faint trace of light buff in some specimens (absent in the type); abdomen, sides, flanks, thighs, under tail-coverts, axillars, and under wing-coverts near ochraceous-

¹*Cuculus longirostris* Hermann (Tabula Affinitatum Animalium, 1783, 186, note) has many years priority over *Saurothera dominicensis* Lafresnaye, 1847, as shown by Stresemann (Novitates Zoologicae, XXVII, 1920, 330).

buff or warm buff, lighter than the corresponding areas of *S. l. longirostris*; primaries hazel, the tips of the feathers and terminal portions of outer webs (becoming more extensive on the outer primaries) grayish brown; middle rectrices (including narrow margin at tip) colored like the secondaries, with a broad subterminal bluish black band; text pair of feathers similar, but bluish black area larger, the tip of the feather with narrow white end; remaining rectrices mostly bluish black, with successively broader white tips and narrower gray bases.

Measurements.—Length, in the flesh, 435, wing, 136; tail, 224; tarsus, 37; bill, from anterior end of nostril, 38 mm.

Average measurements of 17 skins of *S. l. longirostris*: wing, 136.4; tail, 214.5; tarsus, 36.5; bill, from anterior end of nostril, 35 mm. Nine skins of *S. l. petersi* measure: wing, 134.2; tail, 215.7; tarsus, 37.2; bill, from anterior end of nostril, 40 mm.

Remarks.—One female of the mainland form, from Jarabacoa, Santo Domingo, has comparatively little buffy brown on the throat, though this is darker than in the darkest one of *petersi*, a male, collected Feb. 21, 1918. Other Gonave birds (6 skins) show still less buffy brown, and others (3 skins) have no trace of it whatever.

Named for Mr. James Lee Peters, who did some ornithological work on the north side of the island, and who has since made extensive collections in Argentina.

***Calyptophilus frugivorus abbotti*, new subspecies.**

Type, No. 251,669, U. S. National Museum, adult male, Gonave Island, Haiti, Feb. 18, 1918; Dr. W. L. Abbott.

Characters.—Differs from *Calyptophilus f. frugivorus* in being slightly smaller and noticeably paler in color, with the head not darker than the remainder of the upper parts; under wing-coverts and axillars not so strongly yellow; sides and flanks and under tail-coverts paler.

Description of type.—Pileum, hindneck and sides of neck deep grayish olive, the feathers of crown and forehead with darker centers; back, rump, and upper tail-coverts deep olive, without sharp demarkation between the color of the hindneck and back, and becoming browner on the upper tail-coverts; wings and tail deep olive, like the back; lesser wing-coverts olive, washed with warbler green; primary coverts buffy brown or olive brown; ear-coverts deep grayish olive, with indistinct lighter shaft streaks; supra-loral region, extending to upper eyelid, yellow, some of the feathers with dusky tips; lores white, the feathers tipped with dusky; malar region, throat, breast and abdomen white, becoming pale smoke gray on sides of chest; sides and flanks gray brown (between drab and light grayish brown); thighs drab; edge of inner webs of primaries and secondaries deep olive buff; edge of wing strontian yellow, the axillars similar, but the inner feathers much paler; under wing-coverts buffy olive, the feathers edged with whitish; under tail-coverts buffy whitish, the feathers with darker centers.

Measurements.—Length (in flesh), male, 204; wing, 80.5; tail, 80.5; tarsus, 28; bill, from anterior end of nostril, 14 mm. Female, length (in

flesh), 185; wing, 77.5; tail, 78; tarsus, 24.5; bill, from anterior end of nostril, 14 mm.

Remarks.—One pair only. The color of the iris in the female is stated to be "brown." Named for Dr. William L. Abbott, who has made some remarkable discoveries in Haiti and Santo Domingo in recent years.

Phaenicophilus poliocephalus coryi, new subspecies.

Type, No. 251,609, U. S. National Museum, adult male, Gonave Island, Haiti, Feb. 19, 1918; Dr. W. L. Abbott.

Characters.—Differs from *Phaenicophilus p. poliocephalus* in larger size, and in having the center of the abdomen and middle of the breast white; lighter under tail-coverts (as a rule, though not always); and (particularly in males) a tendency toward the formation of a small white spot on the median line of the crown, immediately posterior to the black of the forehead. Traces of white are shown also in a few males of *P. p. poliocephalus*, but the traces are very slight.

Measurements.—Average of 9 Haitian males of *P. p. poliocephalus*: wing, 84.7; tail, 69 (one tail defective and omitted); tarsus, 22.8; bill, from anterior end of nostril, 13.9 mm.

Average of 6 females from Haiti: wing, 83.3; tail, 68.1; tarsus, 22.5; bill, from anterior end of nostril, 14.1 mm.

Average of 8 males of *P. p. coryi*: wing, 90.2; tail, 69.5; tarsus, 24.6; bill, from anterior end of nostril, 15.3 (one bill defective and omitted) mm.

One female of *P. p. coryi* measures: wing, 90; tail, 69; tarsus, 25; bill, from anterior end of nostril, 15 mm.

Remarks.—Named for the late Charles Barney Cory, who published a work on "The Birds of Haiti and San Domingo," in 1885, and whose name is indelibly stamped on the birds of this region.

From Oliver P. Hay
Washington, D.C. U.S.A.

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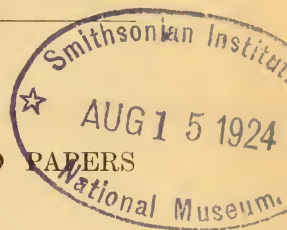
PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

ON THE STATUS OF PRIVATELY ISSUED PAPERS
ON SYSTEMATIC ZOOLOGY.

BY OLIVER P. HAY.

In the Proceedings of the Biological Society of Washington, volume XXXVI, 1923, on pages 1 to 6, Prof. H. F. Osborn published an article entitled Publication Standards in Vertebrate Palaeontology. This paper contained many excellent suggestions on the subject; also the opinions of a number of systematists whom all naturalists hold in high honor. Nevertheless, regarding the proposition which constitutes the core of the communication, namely that "privately published" descriptions of species and genera are not valid, there are so many statements only partially true and so many conclusions inadequately supported that the article is extremely misleading.

It has been the fortune of the writer to be long associated with many systematic writers on biological subjects, and his experience leads him to wonder how Professor Osborn happened to secure only the opinions of men who favor his own view. Of all systematic writers in Washington, for example, the writer knows of only one who adheres to Professor Osborn's view of the validity of privately issued papers. To get at the root of the matter, it may be said that for nearly 200 years naturalists, striving to reach unanimity of procedure in nomenclature and publication, have adopted several codes of rules; and to these codes authors have conformed more or less closely, some not without reluctance. Now, in not one of these codes has it been prescribed exactly how one must bring his discoveries to the notice of his colleagues; not one that he shall, instead of being his own publisher, his own donor or vendor, put a price on his product and employ a broker to distribute it.



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The solicited opinions published by Professor Osborn are the personal views of good men. They doubtless have their influence on the methods of publication, but probably not much on the recognition of papers after they are issued; and when anybody states that it is essential that a certain number of hundreds of copies of a paper shall be distributed, he speaks for himself alone.

It is stated by Professor Osborn that privately issued brochures and books are without precedent. Quite the contrary. Without going outside of our own country or outside of palaeozoology, one finds, for example, a paper of four pages on fossil crustaceans by A. W. Vogdes; another of 18 pages on fossil crinoids by James Hall; one of 36 pages on geology and fossil corals by Yandell and Shumard. Professor Osborn has told us how many papers on *Proboscidea* he has consulted, all of which conform to his ideas of propriety; but *Proboscidea* are not the only organisms that have been described. Were there only a motive and not so many more important things to do, the writer would undertake to collect, in the various branches of zoology and botany, a hundred papers which would fall under Professor Osborn's ban.

Professor Osborn refers to the despair caused to editors, proof readers, and succeeding generations of systematists by Cope in publishing on two occasions specific names in the explanation of plates. These, we are told, seem to be glaring exceptions to an otherwise regular practice. This statement appears to put the stamp of approval on what are known as Cope's Palaeontological Bulletins. These, as found collected in book-form in some libraries, are what a systematist might call a heterogeneous assemblage. Some are simple reprints issued in advance of appearance in a scientific journal; others are papers which were later reprinted in some journal; still others are productions or copies of them that never appeared in any scientific periodical. Thirty of these bulletins are before me. Apparently not one of the first seventeen announces either a publisher or the place of publication; only one indicates an address at which a purchaser may apply to the author; none has any price put on it. The first thirteen and some of the others had no common title, the name "Palaeontological Bulletin" being first applied to No. 14. Some of them are without date of issue. The writer

has found copies of the earlier bulletins which did not have the serial numbers printed on them. It is possible therefore that the original bulletins did not have these numbers. Although the first nine bulletins were some months afterward reprinted in the Proceedings of the American Philosophical Society, Cope expressly denied that the originals had been read before that society. These statements apply likewise to Bulletin No. 12, in which appeared descriptions and names of various new species.

The first edition of each of the first nine bulletins did not exceed 100 copies; in some cases not 50 copies (Pal. Bull. No. 13, p. 5). It is possible that copies of the first edition of these are in existence; but the writer has not been able to find any in the libraries at Washington. These early productions were as purely privately issued papers as can be imagined, hastily prepared, and intended to serve as caveats. If not "privately published" papers, a new definition of this expression is needed. If the bulletins as a whole are regarded as a serial of "a high and uniform standard," this characterization requires further exegesis.

Privately printed and issued papers are recognized as valid by nearly all systematic workers in America and probably also abroad, even though these papers do not conform to Professor Osborn's standards. Naturally we may suppose that Professor Cope endorsed their validity; likewise Professor Marsh. Between Cope and Marsh there was a contention regarding the correctness of the dates of Cope's early bulletins. How inconsiderate it was for Professor Marsh to dispute with his rival about these dates when he might have returned the leaflets to Cope with the declaration that the crude productions had no scientific standing anyhow.

How American naturalists have regarded such independent publications may be learned from Dr. Wm. H. Dall's report (Proc. Amer. Assoc. Adv. Sci., vol. XXVI, 1877, p. 19). On a vote to exclude these papers from recognition the count stood: "No, 21; desirable, but impracticable, 10; yes, 14."

For more than 25 years it has been the practice of zoologists and palaeontologists of the American Museum of Natural History to recognize the validity of privately issued systematic papers. Dr. J. A. Allen was one of the great authorities of the

world on matters of zoological nomenclature and publications. He showed his evaluation of privately printed and distributed publications when, by a two-page leaflet, without name of publisher and without price, he was anticipated in naming a new species of reindeer; and he accepted his disappointment in the spirit of a good loser. In the department of vertebrate palaeontology it has been the usage for more than 30 years, to accept as authoritative papers thus published. As early as 1891 (*Proc. Phila. Acad. Nat. Sci.*, 1891, p. 111) Charles Earle quoted Cope's bulletins Nos. 7 and 11. In 1908 (*Bull. Amer. Mus. Nat. Hist.*, vol. XXIV, pp. 221-264) Walter Granger cited Cope's bulletins Nos. 2, 3, 12, and 17 as accepted media for publication of new names. Dr. W. D. Matthew has so often and so consistently recognized Cope's bulletins as valid papers that only two citations will be made. One of these belongs to the year 1901 (*Bull. Amer. Mus. Nat. Hist.*, vol. XIV, p. 24); the other to 1909 (*Mem. Amer. Mus. Nat. Hist.*, vol. I, pp. 299, 300, 552).

In 1892 (*Bull. Amer. Mus. Nat. Hist.*, vol. XVI, pp. 172-175) Professor Osborn quoted as original references for new species Cope's bulletins Nos. 1, 3, 8. In July, 1919 (*Proc. Amer. Philos. Soc.* vol. LVIII, pp. 386-396) Osborn and Mook published a paper on *Camarasaurus*, in which, on their page 387, they say that Cope published the original description of this reptile August 23, 1877. This description constituted pages 5 to 10 of Cope's *Palaeontological Bulletin* No. 25. This part of that bulletin was never reprinted, although portions of it were incorporated into other papers. As in other cases, this bulletin announces no printer, no publisher, no place of publication, no address of author, no price. The writer has no intention to censure the authors here mentioned for their recognition of Cope's bulletins. Their action was natural and proper. It appears, however, that the opinion now supported by Professor Osborn presents a marked contrast with his 30 years of practice.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

REMARKS ON THE GENUS *AMBLYCERCUS* AND
ITS ALLIES.

BY W. E. CLYDE TODD.

Although the Icteridæ or Troupials, comprising as they do so many of the larger and more conspicuous of the Passerine birds, have naturally received a great deal of attention from ornithologists, and are in general better understood than perhaps any other one family of the Neotropical Region, there still remains much to learn concerning them, even from a systematic standpoint. In the course of a critical study of the group as represented in the collection of the Carnegie Museum, completed not long since, it was brought to light not only that some supposedly well-known species were involved in much confusion, but also that certain genera were badly in need of readjustment. The present paper deals with the genus *Amblycercus*, and is offered as an attempt to define the status and relationships of the several forms of this generic group, and to determine its position with reference to allied genera. In addition to the specimens in the Carnegie Museum I have had the privilege of studying certain pertinent material in the collection of the American Museum of Natural History, for which courtesy I am indebted to Dr. Frank M. Chapman. As in previous papers by the writer, all measurements are in millimeters, and the length of the bill is that of the exposed culmen.

As accepted by Sclater (Catalogue Birds British Museum, XI, 1886, 326), the genus consists of two species, *A. solitarius* and "a smaller northern representative," *A. holosericeus*. Mr. Ridgway (Bulletin U. S. National Museum, II, 1902, 192-3) recognizes the same two species, pointing out that they "are really very distinct in certain structural details and may not

be truly congeneric." He gives the type of *Amblycercus* Cabanis (Museum Heineanum, I, 1851, 190) as *Cassicus nigerrimus* Spix = *C. solitarius* Vieillot. This is clearly a mistake, since Cabanis explicitly states "Amblyrhamphus Prevosti Less. * * * bildet daher den Typus einer eignen Gruppe: Gen. **Amblycercus n. gen.**" This becomes very important in view of the fact that *Amblyrhamphus prevosti* (originally written *Amblyramphus prevosti*), which is a synonym of *Sturnus holosericeus* Lichtenstein, is *not* congeneric with *Cassicus solitarius* Vieillot. As above noted, Mr. Ridgway pointed out the differences between the two forms, but failed to separate them formally. In *holosericeus* the culmen is flattened with parallel sides; the nostrils are rounded and exposed; the pileum is plain, and the tail is very strongly rounded, almost graduated. In *solitarius* the culmen is rounded and somewhat expanded towards the base; the nostrils are linear and overhung by a membrane; the pileum is crested, and the tail is less strongly rounded. In all these respects *solitarius* agrees with *Archiplanus* Cabanis (type, *Cassicus albirostris* Vieillot = *Xanthornus chrysopterus* Vigors),¹ and in my opinion should be referred thereto, although it differs from the type species in larger size, and in having no yellow in the plumage.

Archiplanus would thus seem to be a perfectly good genus, distinguished from *Cacicus* by its straighter and flatter culmen, more rounded nostrils, shorter wing-tip, and better developed crest. The several species of *Cacicus* vary considerably among themselves in all these characters, but taken as a group are sufficiently distinct. The *Agelæus sclateri* of Dubois (Bulletin Musée Royal d'Histoire Naturelle de Belgique, V, 1887, I, pl. 1), which species I have lately been permitted to examine through the courtesy of the authorities of the American Museum of Natural History, is certainly not a member of that genus, but should probably be referred to *Archiplanus*, although tending towards *Cacicus* in some respects. Possibly some other species not seen by me may belong here also. *Amblycercus* as thus restricted is very sharply defined by its entire lack of a crest, much rounded wing with very short tip, strongly rounded tail, and conspicuously flattened mesorhinium. In a linear

¹The removal of this species into another genus will permit the revival of its earliest name, *albirostris* of Vieillot, which otherwise would be debarred by *Tanagra albirostris* Linnæus, 1764, which is a synonym of *Cacicus cela* (Linnæus) 1758.

sequence it should probably stand with relation to allied genera as follows: *Ostinops*, *Cassiculus*, *Archiplanus*, *Cacicus*, *Amblycerus*.

In a group in which the coloration is plain black variation, if present, can only express itself in other ways, namely, in size, relative proportions, and color of the soft parts. Up to about nine years ago it was supposed that *Amblycerus holosericeus* was a single individual species, ranging from southern Mexico to western Ecuador and Peru. Mr. Ridgway, it is true, had called attention to the remarkable range of variation in size shown by the series examined by him, but it remained for Dr. Chapman to separate the form from western Colombia and Ecuador under the name *flavirostris*. This left the way open for the writer to describe the Central American race in 1916, which was accordingly given the name *centralis*. More recently Dr. Chapman has applied the name *australis* to a bird from the highlands of Bolivia and Peru. There are thus four forms to be considered in the present review of the group.

***Amblycerus holosericeus holosericeus* (Lichtenstein).**

Sturnus holosericeus LICHTENSTEIN, Preis.-Verz. Mex. Vögel, 1830, 1 (Mexico).
Amblyramphus prevostii LESSON, Cent. Zool., 1830, 159. pl. 54 (Mexico).

In this, the typical race, the wing is a little shorter than the tail, as shown by measurements of a small series of specimens from the States of Tamaulipas and Vera Cruz, eastern Mexico. Mr. Ridgway's measurements for birds from the same general region agree with the above in respect to the relative proportions of the wings and tail. Care must be used, however, to select for measurement only specimens in comparatively unworn plumage, as otherwise the results may be misleading. The exact range of the present race remains to be determined, no specimens from south of British Honduras having been examined in this connection. There is a possibility, too, that birds from the more elevated interior parts of Mexico and Guatemala may not be the same as those from the coast district, and that they may, indeed, belong to the form next to be considered.

***Amblycerus holosericeus centralis* Todd.**

Amblycerus holosericeus centralis TODD, Proc. Biol. Soc. Washington, XXIX, 1916, 95 (Rio Sicsola, Costa Rica).

In the present race the relative proportions of the wings and tail are the reverse of those in typical *holosericeus*, the former being longer than the latter. This is well shown by the series of Costa Rican specimens in the collection of the Carnegie Museum. Panama specimens in the Biological Survey collection and American Museum of Natural History are perfectly typical of this form also. According to Mr. Ridgway birds from Nicaragua

agree with those from Costa Rica. In three examples from northern Colombia (Turbaco, Cartagena, and Punto Zapote) in the Carnegie Museum the bill is given as "pale pea green" or "yellowish pea green"—precisely as in the majority of Costa Rican skins. The measurements, too, agree with those of females of *centralis* from that country. These records extend the range of *centralis* along the Caribbean coast of Colombia as far as the delta of the Magdalena River. According to Mr. Carriker (Annals Carnegie Museum, VI, 1910, 833) it ranges from sea-level in Costa Rica up to 8000 feet on the slopes of the Volcano Irazú, specimens from these respective extremes being precisely the same.

Amblycercus flavirostris Chapman.

Amblycercus holosericeus flavirostris CHAPMAN, Bull. Am. Mus. Nat. Hist. XXXIV, 1915, 659 (Barbacoas, Colombia).

In the relative proportions of the wings and tail this form resembles *centralis*, to which it is nearest geographically, rather than *holosericeus*. It differs from *centralis*, however, in the decidedly yellow color of the bill, as said by Dr. Chapman, and as is obvious even in the dry skins, so that this author has done quite right in describing it under the name *flavirostris*. He seems to have erred, however, in referring all his Colombian specimens to this form, as shown by his tables of measurements and an inspection of the specimens themselves. After examining the type series in connection with our own I am convinced that this form should stand as a distinct species. Its characters are constant even where it approaches the range of *centralis*. It is a Tropical Zone form, strictly confined to the Colombian Pacific Fauna in Colombia and Ecuador, since records cited by Dr. Chapman from the interior at higher altitudes all prove to belong to the long-tailed Subtropical Zone form *australis*, as will be shown beyond.

Amblycercus australis Chapman.

Amblycercus holosericeus australis CHAPMAN, Bull. Am. Mus. Nat. Hist., XLI, 1919, 333 (Incachaca, Bolivia).

Amblycercus holosericeus subsp. TODD and CARRIKER, Ann. Carnegie Mus., XIV, 1922, 478 (Heights of Chirua, Colombia).

When I wrote my notes on *Amblycercus* for the paper above cited I was unable to place the series at hand from the Santa Marta region with any degree of certainty. A male from the Temperate Zone of the Eastern Andes of Colombia (Ramirez) and a female from the Subtropical Zone of the Western Andes (Sancudo) agree with the Santa Marta series, which, it will be noted, come from the Subtropical Zone also. Not only are they alike in having the tail longer than the wing, but also in the color of the bill, in life (as noted on the labels) as well as in the dried state. Dr. Chapman's measurements for his birds from the higher elevations in Colombia (*i. e.*, Rio Toché and El Piñon) agree with those of the above specimens, instead of *flavirostris*, his birds from the interior having been wrongly referred to the latter, as shown by actual examination of the specimens involved. On the other hand, they agree well (except for slightly smaller size) with the bird from Bolivia which Dr. Chapman has called *australis*, the characters

ascribed to which are confirmed by a topotype in the collection of the Carnegie Museum. Three specimens from the Andes of Merida (Le Cuchilla) are also referable to the same form. *Amblycercus australis* is thus shown to range from the highlands of Bolivia and Peru northward into the Andes of Colombia (all three ranges), the Andes of Venezuela, and the Sierra Nevada de Santa Marta. Oddly enough, in the relative proportions of the wings and tail it is like typical *holosericeus* of Mexico, but may be told from that form by its brighter, more yellowish bill, as shown in the dried skin, and which is probably well marked in life. The bill averages a little smaller and slenderer, too. Although the differences are thus so slight, I believe that they are of specific value, the more so in view of the fact that *australis* is not known except from the Subtropical and Temperate Zones in South America, while *holosericeus* is primarily a form of the Tropical Zone, and is moreover separated from *australis* by the intervention of *centralis* and *flavirostris*, both short-tailed forms.

The distribution of the several forms of *Amblycercus* raises some interesting questions as to their origin and dispersal, which I hope to discuss at some future time.

PROCEEDINGS
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A NEW CUCKOO-SHRIKE FROM AUSTRALIA.

BY W. E. CLYDE TODD.

There is in the Carnegie Museum a small but interesting collection of birds from Australia and New Guinea, made by Messrs. Shelley W. and Sherman F. Denton in 1881-83. In working over the Campophagidæ belonging to this collection an apparently new race of *Lalage leucomela* has been discovered, which I propose to call:

Lalage leucomela insulicola, subsp. nov.

Similar to *Lalage leucomela leucomela* (Vigors and Horsfield) from Queensland, but male almost pure white below, with no trace of grayish shading, and the buffy cinnamon area paler and more restricted, confined to the crissum and under tail-coverts; the white on the tail more restricted. Female also much whiter below than the same sex of *leucomela*, with the buffy cinnamon color paler and virtually confined to the posterior under parts, almost as in the male; the white on the tail less in extent. The size is about the same as in typical *leucomela*.

All in all the pair of birds on which the above name is based seem to represent a strongly marked subspecies, or perhaps species. Mr. Mathews (*Novitates Zoologicæ*, XVIII, 1912, 329) has described a race from Cape York under the name *yorki*, the only character being the smaller size. In his *Birds of Australia*, IX, iv, 1921, 156, he refers to Campbell's note on the peculiarities of birds from the islands in Torres Straits, which confirms those I have already indicated, but apparently without attaching any especial significance to the circumstance.

I am indebted to Dr. Charles W. Richmond and Mr. Joseph H. Riley for comparing the two birds in question with additional material of *leucomela* in the collection of the U. S. National Museum.

Type, No. 35,774, Collection Carnegie Museum, adult male; Friday Island, Torres Straits, Queensland, June 15, 1883; Shelley W. Denton.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

DESCRIPTIONS OF EIGHT NEW NEOTROPICAL
BIRDS.

BY W. E. CLYDE TODD.

Systematic study of the bird collection of the Carnegie Museum, which has been enriched in the past few years by notable accessions from Venezuela, Bolivia, and the lower Amazon, continues to reveal the existence of more apparently unnamed forms. In the present paper, which is the tenth of the series to appear in these Proceedings, eight new subspecies of Passerine birds are characterized, belonging to the families Tanagridæ, Icteridæ, Cerebidæ, Mniotiltidæ, and Vireonidæ. The same rules as to measurements, names of colors, etc., have been followed as in previous papers of the series. The author wishes to tender acknowledgments to the authorities of the American Museum of Natural History for the loan of specimens used in this connection.

Tangara chrysotis cochabambæ, subsp. nov.

Similar to *Tangara chrysotis chrysotis* (DuBus) of Peru and Ecuador, but with the green of the upper and under parts purer, with less golden sheen by reflected light (the eye between the bird and the light), and much more bluish with the bird between the eye and the light, while the rufous of the under parts is obviously paler.

The type-locality of *Calliste chrysotis* DuBus is "Perou"—probably eastern Peru, and two specimens from eastern Ecuador in the collection of the American Museum of Natural History, with which comparison has been made, are doubtless typical. Although old skins, they are very richly colored as compared with our two Bolivian birds, the green with a golden sheen by reflected light, the rufous of the lower parts rich and deep. All in all the Bolivian birds seem to constitute an excellent subspecies.

Type, No. 85,519, Collection Carnegie Museum, adult male; Yungas de Cochabamba, Bolivia, July 10, 1921; José Steinbach.

***Icterus croconotus strictifrons*, subsp. nov.**

Similar to *Icterus croconotus croconotus* (Wagler) of Guiana and the lower Amazon Valley, but white area on the secondaries larger, and black frontlet narrower.

A series from eastern Bolivia differ from another from the lower Amazon (Santarem and Obidos), which are assumed to be typical *croconotus* (described from Guiana), in the size of the white spot on the wing, this area being more extensive in the Bolivian birds, nearly or quite reaching the shafts of the secondaries, while in the Amazon birds it seldom reaches more than halfway to the shafts. The black on the forehead averages narrower, too, and the indications are that the black of the breast is more restricted, but as the skins from the two regions are of different "makes" one can not be sure. The differences here pointed out are in my judgment of racial value.

Type, No. 80,132, Collection Carnegie Museum, adult male; Palmarito, Bolivia, May 22, 1918; José Steinbach.

***Chlorophanes spiza subtropicalis*, subsp. nov.**

Adult male very similar to that of *Chlorophanes spiza cærulescens* Cassin, but adult female differing in being strongly flammulated with yellow below.

Of this race no less than nineteen specimens have been examined in this connection, three in the collection of the Carnegie Museum and sixteen in that of the American Museum of Natural History. These examples are all from the Subtropical Zone of the Colombian Andes. The males are practically indistinguishable from those of *cærulescens*, but the females are conspicuously flammulated with yellow below, which is decidedly not true of any other known race of this species. Dr. Chapman (Bulletin American Museum of Natural History, XXXVI, 1917, 586-7) noted the difference between his specimen from Cocal and those from Las Lomitas and San Antonio, but one and two thousand feet higher in the same range, but referred the latter to *cærulescens*, which on geographical grounds alone scarcely seems possible. The new form appears to be confined to the Subtropical Zone, and as its characters are most obvious in the female I select a bird of that sex as the type.

Type, No. 67,618, Collection Carnegie Museum, adult female; La Cumbre (Western Andes), Colombia, July 11, 1918; M. A. Carriker, Jr.

***Ateleodacnis leucogenys cyanochrous*, subsp. nov.**

Similar to *Ateleodacnis leucogenys leucogenys* (Lafresnaye), as represented by a series from Colombia and the Sierra de Carabobo of Venezuela, but male with under parts darker and more uniform grayish blue, and white of auricular region more restricted.

Although I was at some pains to point out the comparative uniformity of the series of this species handled by me not long since (cf. Annals Carnegie Museum, XIV, 1922, 455), the receipt of additional material obliges me to describe the present new race from the Humid Tropical Zone of Venezuela—a region where numerous other species of birds tend to assume dark color-

tion. The new form is markedly darker grayish blue below (slate gray, instead of deep gull gray), with the flanks but little paler, giving a more uniform effect. In typical *leucogenys* the auriculars are all white, while in the new form only the upper half of this area is white. In one example the back is black, concolor with the pileum, but in the specimen selected as type the back is no darker than in many specimens of *leucogenys*. An immature bird is not so dark colored below. The difference in depth of coloration between this race and typical *leucogenys* is almost as well marked as between *A. speciosa* and *A. amazonum*, and is certainly not due to season. There is no especial difference in size, however.

Type, No. 90,502, Collection Carnegie Museum, adult male; Santa Elena, Merida, Venezuela, August 11, 1922; M. A. Carriker, Jr.

***Compsothlypis pitiaiyumi melanogenys*, subsp. nov.**

Similar to *Compsothlypis pitiaiyumi elegans* Todd of Venezuela and Colombia, but general coloration much deeper, and with more white on the tail.

This form resembles *elegans* in the brighter coloration of the lower parts as compared with *pitiaiyumi*, but the upper parts are much darker, this condition applying not only to the blue parts (which are of an indigo blue shade), but also to the green spot on the back (similarly olive green), and to the sides of the head, which are more uniformly and more extensively black. There is more white on the tail, also. In *elegans* the white area is not only more restricted, but also confined as a rule to the two outer pairs of rectrices, while in the new form this area is larger, occupying more of the feathers, and there is always a good-sized spot on the third pair of feathers.

The occurrence of a form such as this, which in its characters is so far removed from true *pitiaiyumi*, in a region so close to that occupied by the typical race, is most interesting. As it comes from an elevation of 1500 meters, it is probably a Subtropical Zone form. According to Dr. Hellmayr (*Novitates Zoologicae*, XXVIII, 1921, 243), two Bolivian specimens collected by D'Orbigny, from Yungas and Chiquitos respectively, are referable to true *pitiaiyumi*, but in any case the name *venustula* (a *lapsus* for *venusta* Temminck), under which they were recorded, would scarcely be applicable.

Type, No. 85,511, Collection Carnegie Museum, adult male; Yungas de Cochabamba, Bolivia, July 4, 1921; José Steinbach.

***Dendroica bryanti xanthotera*, subsp. nov.**

Similar to *Dendroica bryanti castaneiceps* Ridgway of Lower California, but differs in being deeper yellow below, with the rufous chestnut streaks more prominent, and in particular by having the tail more sharply bicolor, and with more yellow, this color occupying all of the inner webs (except the terminal portion) of the five outer pairs of rectrices. In *castaneiceps* a considerable part of the inner web next the shaft of these rectrices is of the same dusky green color as the outer webs.

These characters, which were first remarked upon examination of the few specimens in the collection in the Carnegie Museum, have recently been

confirmed by a study of a larger series in other collections, so that sub-specific separation seems to be justified. I am not yet convinced, however, of the desirability of calling *castaneiceps* a race of *erithachorides*, as proposed by Dr. Oberholser (Auk, XXXVI, 1919, 85).

Type, No. 28,301, Collection Carnegie Museum, adult male; Puntarenas, Costa Rica, June 1, 1907; M. A. Carriker, Jr.

***Vireosylva chivi griseola*, subsp. nov.**

Similar to *Vireosylva chivi vividior* Hellmayr, but darker green above, and with the under parts washed with grayish.

This proposed race is based on a series of thirty specimens, all from French Guiana and northern Brazil. In the darker color of the upper parts it approaches true *chivi*, but differs from that form in having the entire under surface, but particularly the flanks, washed with grayish. This gray wash is sometimes evident in *vividior*, but is very characteristic of the present race. The crissum averages slightly paler than in *vividior*, too. While individual specimens might sometimes be hard to place considered alone, the differences between the two series stand out sufficiently well to justify their formal separation. The size is about the same.

Type, No. 68,070, Collection Carnegie Museum, adult male; Pied Saut, French Guiana, March 11, 1918; Samuel M. Klages.

***Vireosylva leucophrys lætissima*, subsp. nov.**

Similar to *Vireosylva leucophrys leucophrys* (Lafresnaye) of the Colombian Andes, but general coloration much paler.

So far as I am aware this species, which until lately has passed under the name *josepha*, has not hitherto been recorded from Bolivia, and it is not surprising to find that the series from that country represent an undescribed race. It is a surprise, however, to find that in its characters the new race resembles *mirandæ* of the coast range of Venezuela and the Sierra Nevada de Santa Marta, from which it is separated by the interposition of typical *leucophrys*. It is still paler than *mirandæ*, the pileum in particular being duller, so that there is less contrast between the pileum and the back. With a series of ten specimens available the difference stands out sufficiently well to justify formal recognition. It is in fact the most strongly marked of all the races of this species, certain of which could be suppressed without doing much violence to the facts.

Type, No. 85,982, Collection Carnegie Museum, adult male; Incachaca, Bolivia, November 2, 1921; José Steinbach.

PROCEEDINGS
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A NEW GYMNOPHIS FROM COLOMBIA.

BY THOMAS BARBOUR.



Among several collections received from my valued correspondent Hermano Nicéforo Maria of the Institute de la Salle in Bogotá was one which contained this new coecilian. Hermano Nicéforo is to be congratulated upon his success in securing rare apodal amphibians, since last year he collected the extremely unusual *Typhlonectes natans* Fischer at Honda whence also comes this distinct new form, to be called

Gymnophis nicefori, sp. nov.

Type, Museum of Comparative Zoology No. 9609 from Honda, Colombia. Collected March, 1924, by Hermano Nicéforo Maria of Bogotá.

Description.—Diameter of head, 3.6 mm.; diameter of neck, 3.6 mm.; angle of mouth to tip of snout, 4.1 mm.; diameter of body, 5 mm. Forty-nine primary rings on body complete and without sign of secondary folds. Then secondary folds appear, first as short lateral plications, which increase in length until at the ninety-third ring they become complete and as distinct as the primary folds. Of these two sorts there are now one hundred and twenty rings—sixty representing primary and sixty representing complete secondary rings. There are thus one hundred and fifty-three (153) complete primary folds and sixty (60) complete secondary folds or two hundred and thirteen (213) complete rings in all, while more or less incomplete rings may be seen upon forty-four (44) segments anterior to the ninety-third. Maxillary teeth many, apparently about thirty; mandibular probably about equal in number, in two rows. The jaw is broken and no careful count is possible. Eye entirely invisible; tentacle midway between angle of mouth and nostril, very near to the labial margin. Body dark slate colour, head a little lighter. Length, 193 mm.; diameter contained in total length 38.6 times.

Remarks.—This specimen is beyond doubt immature, and the dermal scales, often indistinct in this genus, are very hard indeed to see. Nieden (Das Tierreich, No. 37, Berlin, 1913), cites four Central American species of *Gymnophis*, no one of which seems very near to *nicefori*. The genus is apparently unknown to the mainland of South America.

PROCEEDINGS
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NEW SPECIES OF CRABS FROM SAMOA.

BY MARY J. RATHBUN.

The species here described were found in a collection of crabs made in Samoa in 1902, by a party from the United States Fish Commission.

Libystes villosus, sp. nov.

Holotype.—Female, adult, Cat. No. 46378, United States National Museum. Apia, Samoa, at mouth of river; June.

Measurements.—Female holotype, length of carapace, 6.8 mm., width, 11.3 mm., distance across front and orbits, 6 mm.

Description.—Anterior and antero-lateral borders of carapace almost concealed by shaggy hair; also surface of chelipeds and above all the margins of the four pairs of legs. Carapace oblong-oval, postero-lateral borders moderately convergent backward; branchial regions higher than middle part of carapace. The fine granulation of the under part of the carapace is continued upon the antero-lateral part of the dorsum; marginal lines of granules incomplete. A ridge of fine granules leads forward from postero-lateral angles. Upper margin of orbit slants distinctly forward and outward, and in front view downward; outer end of orbit and of eye, and also the cornea, smaller than in *L. nitidus*.¹ Edge of front in dorsal and front views transverse, with a slight median emargination.

Larger cheliped (smaller one missing) very strong; fingers shorter than palm, crossing far from tips, leaving a triangular gape at base; largest tooth of immovable finger near its middle, of dactylus near its origin, but this basal tooth very little larger than the others.

Legs less slender than in *L. nitidus*; second leg twice as long as carapace; carpus and propodus of last leg widened, dactylus falcate.

All abdominal segments distinctly separate, lateral margins of third to sixth segments inclusive, taken together, slightly convex.

Sesarma (Parasesarma) obliquifrons, sp. nov.

Holotype.—Male, Cat. No. 45913, United States National Museum. Pago Pago, Samoa, fresh water; July 28.

Measurements.—Male holotype, length of carapace, 11.3 mm., width of

¹A. Milne Edwards, Ann. Soc. Entom. France, ser. 4, vol. 7, 1867, p. 285; Nouv. Arch. Mus. Hist. Nat. Paris, vol. 4, 1868, p. 83, pl. 20, figs. 5-7.

carapace at antero-lateral angles, 12.8 mm., at postero-lateral angles, 13.2 mm., width of front, 7 mm., length of propodus of cheliped below, 9 mm., length of same above, 4.4 mm., height of same 5.5 mm., length of merus of third leg, 9.5 mm., width of same, 3.7 mm.

Description.—Sides of carapace subparallel; regions deeply separated; meso-gastric region subdivided into three parts by transverse furrows; surface punctate, very rugose above postfrontal lobes; these are separated by deep V-shaped notches, median larger than lateral; lobes of middle pair slightly wider than those of outer pair; edges of all oblique, outer lobe forming a shallow V with inner one. The concave surface of the front, the sides of which diverge from above downward, has two transverse tuberculous ridges above and parallel to the lower margin, one on each side; also a tubercle below outer angle of inner lobe; lower edge convex in front view, sinuous in dorsal view.

Upper margin of arm without subdistal spine; inner margin with a triangular expansion which is denticulate on distal margin. Wrist without inner spine. Hands high; greater part of outer surface of palm nearly smooth, granules on upper and proximal half, a few granulated lines near articulation with wrist; lower margin denticulate as far as middle of finger; on upper surface two oblique pectinated ridges and one granulated ridge subparallel to posterior margin, all prolonged in convergent granulated lines toward wrist; inner surface rough with distant granules. Fingers stout, gaping at base, prehensile teeth irregular; immovable finger with lower margin partly concave, basal portion of finger swollen; basal half of dactylus swollen, upper margin ornamented with 6 or 7 oblique scaliform prominences, the anterior or distal slope of which is long and the posterior short.

Legs slender; meropodites narrowing toward either end and armed above with an acute tooth or spine; propodites longer than dactylopodites in second and third pairs, a little shorter in first and fourth pairs.

Abdomen narrow; posterior width of sixth segment less than twice as great as length.

Nearest to *S. moluccense* de Man² but differs in its squarer carapace, oblique postfrontal lobes, swollen immovable finger with concave lower margin, and different ornamentation of movable finger.

²*Sesarma melissa* var. *moluccensis* de Man, in Max Weber, *Zool. Ergebnisse einer Reise nach Niederländisch Ostindien*, vol. 2, 1892, p. 328. *Sesarma* (*Parasesarma*) *moluccensis* de Man, *Zool. Jahrb., Syst.*, vol. 9, 1895, p. 202; vol. 10, 1898, pl. 31, fig. 36.

PROCEEDINGS
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A NEW SPOTTED BABBLER FROM SIAM.

BY J. H. RILEY.¹

When Dr. Hugh M. Smith returned to the United States, on a vacation from Siam, early in the past summer, he presented the U. S. National Museum with a small lot of birds, mostly collected on Koh Chang, a rather large island off the south-east coast of Siam. Dr. Smith informs me that the island is quite hilly and different in character from the opposite mainland, distant twelve or more miles, with deep water between. One of the birds is a babbler of the genus *Pellorneum*, related to *ruficeps* but quite distinct. I take pleasure in naming it after its discoverer:

***Pellorneum smithi*, sp. nov.**

Type.—Adult female, U. S. National Museum, No. 277,379, Koh Chang Island, south-east Siam, April 4, 1924. Collected by Dr. Hugh M. Smith.

Similar to *Pellorneum ruficeps subochraceum*, but the upper-parts, flanks, and streaks on the chest much darker.

Description.—Pileum auburn; back, wings, and tail cinnamon brown; the outside primaries fuscous, edged with ochraceous-tawny; a cinnamon-buff superciliary streak, extending from the bill to the nape; ear-coverts tawny, bordered below and posteriorly by a dusky line; chin, throat, and malar region white; a band across the chest cinnamon-buff, heavily streaked with blackish; flanks buckthorn brown with obscure dusky streaks; under tail-coverts dresden brown edged narrowly with cinnamon-buff; remaining under-parts buffy-white; thighs tawny; under wing-coverts cinnamon-buff with some dusky markings. Wing, 65; tail, 58; culmen, 17; tarsus, 25; middle-toe, 16.5 mm.

Remarks.—Count Gyldenstolpe² records only two races of *Pellorneum* for Siam: *Pellorneum ruficeps subochraceum* Swinhoe and *Pellorneum ruficeps minus* Hume. Of the former the U. S. National Museum possesses

¹Published with the permission of the Secretary of the Smithsonian Institution.

²Ibis, 1920, 481.

a good series, but the latter is not represented. Various descriptions of Hume's form which have been consulted do not agree with *Pellorneum smithi*, nor does the plate (Cat. Birds Br. Museum, 7, 1883, pl. 13, fig. 1) of *Pellorneum intermedium* Sharpe, which Oates¹ puts in the synonymy of *Pellorneum minus*. If the plate and descriptions are anywhere near correct, *Pellorneum smithi* is a much darker bird and lacks the streaks on the hind-neck.

¹Fauna Br. India, Birds, 1, 1889, 141.

PROCEEDINGS
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RECORDS OF SPECIES OF THE GENUS *ERYTHRONEURA* (HOMOPTERA; EUPTERYGIDAE) WITH DESCRIPTIONS OF NEW FORMS.

BY W. L. McATEE.

The material upon which the following records are based is in collections of Dr. E. D. Ball, and of the State College of Iowa, the latter received through the kindness of Dr. Carl J. Drake. The types of the new forms described with the exception of *E. pyra* which is in the collection of the State College, are in the private collection of Dr. Ball. This paper is by no means a catalog of the two collections involved, as only records are cited that add to knowledge of distribution of the species.

Recently there has been unusual activity in publishing upon the genus *Erythroneura*, hence for convenience a bibliography is appended of papers appearing since the writer's "Key" in 1920 (Trans. Am. Ent. Soc. 46, pp. 267-321, Pl. 12).

Genus *Erythroneura* Fitch.

E. vulnerata var. *vulnerata* Fitch, fulvous form.—Ames, Iowa, July 1, 1895; Phoenix, Ariz., May, 1897.

E. vulnerata var. *niger* Gillette.—Onaga, Kans., April 4, 1898; Galena, Kans., Columbus, Ohio.

E. vulnerata var. *nigerrima* McAtee.—N. Colo., March 4, 1898; Holly, Colo., Sept. 8, 1898.

E. obliqua var. *obliqua* Say, red form.—Sullivan, Wis., Sept. 22, 1917; Portage, N. Y., May 30, 1888, E. P. Van Duzee.

E. obliqua var. *obliqua* Say, yellow form.—Ames, Iowa, June, August, Sept.; Lancaster, N. Y., June 4, 1889, E. P. Van Duzee.

E. obliqua var. *dorsalis* Gillette, red form.—Ames, Iowa, Aug., Sept.; Kansas City, Mo., Dec. 30, 1901; Sullivan, Wis., Sept. 22, 1917.

E. obliqua var. *dorsalis* Gillette, dark form.—Ames, Iowa, April; Buffalo, N. Y., May 11, 1888; Ridgeway, Ont., May 21, 1886, E. P. Van Duzee.

E. obliqua var. *stolata* McAtee.—Ames, Iowa.

E. obliqua var. *noevus* Gillette, red and yellow forms.—Ames, Iowa.

E. obliqua var. *fumida* Gillette, red form.—Ames, Iowa, April 24; Boston, Mass., Aug. 31, 1919.

E. obliqua var. *electa* McAtee.—Ames, Iowa, Aug. 13, 1895; Sullivan, Wis., Sept. 12, 1917.

E. obliqua var. *parma* McAtee.—Ames, Iowa, Sept. 14, 1895, C. W. M.

***Erythroneura obliqua* var. *amabilis*, new variety.**

Head and thorax pale yellow, with the usual two nearly percurrent vittae a deeper, more golden yellow; tegmina carmine from base to near crossveins, nearly hyaline posteriorly, except for the crossveins, longitudinal veins near them, and a little of the adjacent membrane which are golden yellow; underparts yellow, abdomen except genitalia dark. Length, 2.75 mm.

Holotype, ♀, Md. (near Washington, D. C.), June 1, 1924, E. D. Ball.

E. rubroscuta Gillette.—Berwick, Iowa, Sept. 28, 1895, C. W. M.

E. bipunctata Gillette, red form.—Ft. Yuma, Ariz., July 20, H. G. Hubbard.

***Erythroneura bipunctata* var. *abluta*, new variety.**

Differs from *E. bipunctata* var. *bipunctata*, yellow form, principally in lacking black spots in basal angles of scutellum. General color pale greenish, the vertex more yellowish, the apical cells more hyaline. The two round black spots on vertex are distinct. Length 2.5 mm.

Holotype ♀ and allotype, and one other specimen not entirely typical, Indio, Calif., June 19, 1909, E. D. Ball.

E. dentata Gillette, red form.—Salinas, Calif., June 25, 1908; Stanford University, June 21, 1908.

E. dentata Gillette, yellow form.—Same data as for the red form, and in addition, Visalia, Calif., June 11, 1909; Watsonville, Calif., Aug. 9, 1912; Pasadena, Calif., June 17, 1908; Stockton, Calif., June 10, 1909; and Salt Lake, Utah, June 4, 1910.

E. abolla var. *abolla* McAtee, red form.—Ames, Iowa, July 21, 1919.

***Erythroneura inornata*, new species.**

Runs to group 3 in my 1920 paper, and in that group to *abolla*, from which it differs in male genitalia. The outer clasper as seen from side is abruptly narrowed near base and of about the same width thereafter to apex, while in *abolla* the base is narrowed gradually not reducing to the width of apical part until about the middle. Ground color of head and thorax pale yellow, two brownish dots on disc of vertex, median line of vertex posteriorly and eyes dark; disk of pronotum and tegmina pale greenish; face and legs yellow; abdomen except edgings and outer claspers of genitalia, black. Length, 3.25 mm.

Holotype male, Ward, Colorado, August, 1899, E. D. Ball.

***Erythroneura aprica*, new species.**

Belongs to Group 3. Ground color of head and thorax whitish, a round

dot on tip of vertex, and extreme apex of scutellum black; two trapezoidal marks on vertex, two larger ones very similar in shape on pronotum, and most of scutellum golden yellow; basal two-thirds of clavus except inner angle, spot near apex of clavus, vitta on corium bordering middle part of clavus, and spot on costa anterior to that of the same color; large blotch between third sector and claval suture anterior to crossveins, and a few smaller irregular blotches anterior and exterior to it, carmine; apex of tegmen from region of crossveins fumose. Lower parts pale yellow, beak a little reddish, black tipped, abdomen somewhat darkened above; ovipositor black-tipped. Length, 2.5 mm.

Holotype ♀, Santa Rita Mts., Ariz., July, F. H. Snow.

E. tecta var. *tecta* McAtee.—Osceola, Wis., Sept. 15, 1917.

E. tecta var. *carbonata* McAtee.—Husted, N. J., July 23, E. L. Dickerson.

E. aclys McAtee.—Onaga, Kans., April 4, 1898.

E. illinoensis var. *illinoensis* Gillette, red form.—Kansas City, Mo., May 1, Dec. 1, 30, 1901.

E. hartii Gillette.—Ohio, October.

E. scutelleris Gillette, red form.—Onaga, Kans., April 4, 1898; Ohio, October.

***Erythroneura pyra*, new species.**

Vertex, pronotum, and scutellum ivory colored without definite markings; tegmina milky white with the following scarlet markings: nearly all of basal third of clavus, a band near apex of clavus, and a broad vitta between claval suture and costal plaque. The common pattern of the disk of tegmina is a truncate triangular figure, almost straight across distal end (the base), and jagged on the sides, in scarlet, enclosing a somewhat pear-shaped area of the ground color on middle of the clavi. In the type the vittae are orange in bases of clavi, but this may be due to fading. The costal plaque is chalky with a dark spot at posterior end, there is a dash of red on outer crossvein at costa, and a dusky spot in base of fourth apical cell. Underparts pale yellowish.

Holotype ♂, Berwick, Iowa, Sept. 28, 1895, C. W. M.

This species belongs in Group 4 and suggests *E. harti* in appearance; the pale saddle spot is quite different, however, both in shape and position.

E. maculata var. *maculata* Gillette, red form.—Riverton, N. J., Aug. 11, E. L. Dickerson; Boston, Mass., Aug. 31, 1919; Fort Collins, Colo., May 11, 1899; Osceola, Wis., July 20, 1917.

E. maculata var. *maculata* Gillette, yellow form.—Ames, Iowa, Aug. 10, 1897, May 11, 1898; Riverton, N. J., Aug. 11, E. R. Dickerson; Cranberry Lake, N. Y., Aug. 5, 1920, H. Osborn; Stanford University, Calif., June 21, 1908.

E. maculata var. *begemina* McAtee.—Ames, Iowa, Aug. 16, 1895; Spring Green, Wis., Aug. 1, 1917.

E. maculata var. *gemina* McAtee.—Ames, Iowa, Aug. 7, 1895.

***Erythroneura ligata* var. *caetra*, new variety.**

The basal triangles and two discal spots of scutellum are black; the sides of pronotum blackish anteriorly and exteriorly, reddish posteriorly; apex

of scutellum reddish; tegminal vittae sanguineous, a little more diffuse than usual in the species; apical cells with an oblique dusky band from base of fourth to apex of second cells. Length, 3 mm.

Holotype ♀, Salinas, Calif., April 26, 1908, E. D. Ball.

E. vitis var. *vitis* Harris, red and yellow forms.—Ames, Iowa.

E. tricincta var. *integra* McAtee.—Kansas City, Mo., Dec. 30, 1901.

E. comes var. *vitifex* Fitch, red form.—Fort Collins, Colo., Sept. 8, 1898, May 12, 1899; Saanich Dist., B. C., May 3, 1918, W. Downes.

E. comes var. *vitifex* Fitch, yellow form.—Ames, Iowa, July 1, 1895.

E. comes var. *elegans* McAtee.—Kansas City, Mo., May 3, 1901; Pikes Peak, Colo., T. D. A. Cockerell.

E. comes var. *rubra* Gillette.—Sullivan, Wis., Sept. 22, 1917.

E. comes var. *reflecta* McAtee.—Ames, Iowa, July 26, Aug. 7, 1895; Onaga, Kans., April 4, 1898.

E. comes var. *accepta* McAtee, yellow form.—Ames, Iowa, July 3, 1895.

E. comes var. *ziczac* Walsh, red form.—Ames, Iowa, Sept. 25, 1889, April 29, July 15, 1896.

E. comes var. *ziczac* Walsh, yellow form.—Hill City, Kansas.

E. comes var. *comes* Say, red form.—Ames, Iowa, July 1, 1895.

E. comes var. *comes* Say, yellow form.—Lancaster, N. Y., June 4, 1889, E. P. Van Duzee.

E. lunata McAtee.—Onaga, Kans. Has very little red markings, but agrees otherwise with the original description.

E. comes var. *coloradoensis* Gillette.—Has a yellow marked form, as exemplified by a specimen labelled Colo., No. 2733; and a form without color markings, but the black spots as usual, Colo., No. 2890.

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Notes on a collection of Erythroneura and Hymetta (Eupterygidae), chiefly from Illinois, with Descriptions of new forms.

Bul. Ill. Nat. Hist. Surv., 15, Art II, April, 1924, pp. 39-44.

Three new species, 4 new varieties of Erythroneura.

Notes on Eupterygid leaf-hoppers with description of a few forms (Homoptera).

Florida Ent. In press.

One new species, 5 new varieties of Erythroneura.

ROBINSON, W.

Some new species of Erythroneura (Homoptera, Cicadellidae).

Can. Ent. 56, No. 3, March, 1924, pp. 58-62.

Fourteen new species; 1 new variety.

Additional new species of Erythroneura (Homoptera, Cicadellidae).

Can. Ent. 56, No. 7, July, 1924, pp. 154-157.

Ten new species; 1 new variety.

VAN DUZEE, E. P.

The genus Erythroneura in California (Homoptera).

Proc. Calif. Ac. Sci., Fourth Series, 13, No. 13, pp. 231-236, March 18, 1924.

Four new species; 1 new subspecies.

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NOTES ON THE RACES OF *RAMPHALCYON CAPENSIS*.

BY HARRY C. OBERHOLSER.

Since the publication of the writer's revision of the genus *Ramphalcyon*,¹ various data concerning the subspecies of *Ramphalcyon capensis* have accumulated. These have been gathered chiefly from the examination of additional material, and seem worthy of placing on permanent record.

Dr. E. D. Van Oort has recently² transferred the name *Ramphalcyon capensis javana* (Boddaert) to the Philippine bird commonly known as *Ramphalcyon capensis gigantea* (Walden); and the bird from Borneo, to which Dr. Sharpe, Dr. Hartert, and the writer have restricted the name *Ramphalcyon capensis javana*, he has named *Ramphalcyon capensis innominata*.³ This, as we have in detail elsewhere shown⁴ is certainly not the best disposition of the case. The chief basis⁵ of Boddaert's name might be either the pale form from the Philippine Islands or the bird from Borneo; and, in view of this situation, it is undoubtedly preferable to follow the selection of the first revisor, in which case the pale Philippine race will continue to be called *Ramphalcyon capensis gigantea* (Walden), and the Borneo subspecies, *Ramphalcyon capensis javana*, which disposition would make *Ramphalcyon capensis innominata* a synonym of *Ramphalcyon capensis gigantea*.

The form of this species inhabiting the Rhio Archipelago and the Island of Singapore, *Ramphalcyon capensis hydrophila*,⁶ has recently⁷ been synonymized with *Ramphalcyon capensis malaccensis*, but it is clearly a recognizable race. It differs from *Ramphalcyon capensis malaccensis* in its larger bill, lighter, and (when in fresh plumage) more extensively ochraceous pileum, and usually paler lower parts.

Dr. Edgar A. Mearns described the form of *Ramphalcyon capensis* occurring in the central part of the Philippine Islands as *Ramphalcyon*

¹Proc. U. S. Nat. Mus., XXXV, February 9, 1909, pp. 657-680.

²Notes Leyden Mus., XXXII, Nos. 2 and 3, April 30, 1910, pp. 125-126.

³Loc. cit., p. 126.

⁴Proc. U. S. Nat. Mus., LV, June 5, 1919, pp. 485-486.

⁵d'Aubenton, Planches Enluminées, pl. 757.

⁶Oberholser, Proc. U. S. Nat. Mus., XXXV, February 9, 1909, p. 677.

⁷Journ. Fed. Malay States Mus., VII, Part 2, December, 1916, p. 71.

capensis smithi,¹ and while this is, of course, intermediate between *Ramphalcyon capensis capensis gouldi* and *Ramphalcyon capensis gigantea*, it seems to have characters and a geographic range sufficiently distinct to entitle it to recognition by name.

For lack of sufficient comparable material, the writer formerly considered birds from southeastern Sumatra and Billiton Island² as belonging to the typical race from Java. Additional specimens, particularly from the last mentioned island, show clearly that birds from southeastern Sumatra are readily separable from *Ramphalcyon capensis capensis* of Java, and, furthermore, are not identical with any of the other races. This form apparently has no name, and we therefore propose to call it

***Ramphalcyon capensis arignota*, subsp. nov.**

Chars. subsp.—Similar to *Ramphalcyon capensis capensis*, but bill shorter; pileum darker, and, in worn plumage, with less ochraceous; cervix darker; back and wings somewhat more deeply colored and slightly more bluish; lower parts decidedly darker, more uniform; and throat less whitish.

Description.—Type, adult male, No. 178994, U. S. National Museum; Indrigiri River, southeastern Sumatra, September 23, 1901; Dr. W. L. Abbott. Pileum, sides of head and of neck, light clay color, the feathers of the pileum centrally dark hair brown; cervix ochraceous; upper back and scapulars between prussian green and dark cinnabar green; lower back pale Nile blue; rump Nile blue; middle upper tail-coverts beryl green; remaining upper tail-coverts prussian green; tail fuscous, but middle pair of feathers and broad edgings on the remainder, juvenile blue, with, in places, indigo blue reflections; wings chaetura black, but paling to chaetura drab on their inner webs, the inner margins of the latter chamois verging toward cinnamon buff; lesser wing-coverts like the back; remaining superior wing-coverts juvenile blue, with, in places, indigo blue reflections; chin and throat between warm buff and light ochraceous buff; rest of the lower parts, including the lining of the wing and the malar region, ochraceous, somewhat darker posteriorly.

Measurements.—Male:³ wing, 137.5–141 (average, 139) mm.; tail, 86.5–92 (88.9); exposed culmen, 70.5–76.5 (73.5); tarsus, 16–17 (16.6).

Female:⁴ wing, 147.5–150.5 (average, 148.7) mm.; tail, 92–98.5 (94.2); exposed culmen, 70–75.5 (73); tarsus, 17.5–18.5 (17.8).

Geographic distribution.—Southeastern Sumatra and Billiton Island.

This new subspecies differs from *Ramphalcyon capensis hydrophila* of the Rhio Archipelago and Singapore in its decidedly smaller size, particularly of the bill; lighter, more ochraceous, and less distinctly capped pileum; and darker lower surface.

The following detailed measurements show the difference between *Ramphalcyon capensis arignota* and *Ramphalcyon capensis capensis* from Java.

¹Proc. U. S. Nat. Mus., XXXVI, May 27, 1909, p. 466 (Dumurug Point, Masbate Island Philippine Islands).

²Proc. U. S. Nat. Mus., XXXV, Feb. 9, 1909, pp. 664 and 665.

³Four specimens, from Sumatra.

⁴Three specimens, from Sumatra and the Island of Billiton.

Measurements of *Ramphalcyon capensis arignota*.

Museum and Number.	Sex.	Locality.	Date.	Wing.	Tail.	Exposed culmen.	Tarsus.
U.S.N.M. 178995	♂	Indrigriri River, Sumatra.	Sept. 19, 1901.	137.5	89	76.5	16.5
178994	♂	Indrigriri River, Sumatra. ¹	Sept. 23, 1901.	138.5	86.5	70.5	16
Acad. Nat. Sci. Phila. 39093	[♂]	Goenong Soegi, Lampong, Sumatra.	Oct.-Nov., 1901.	141	88	71.5	17
39096	[♂]	Goenong Soegi, Lampong, Sumatra.	Oct.-Nov., 1901.	139	92	75.5	17
U.S.N.M. 180516	♀	Tangong Poctak, Billiton I.	Aug. 13, 1904.	148	92	70	18.5
Acad. Nat. Sci. Phila. 39094	[♀]	Goenong Soegi, Lampong, Sumatra.	Oct.-Nov., 1901.	150.5	98.5	75.5	17.5
39095	[♀]	Goenong Soegi, Lampong, Sumatra.	Oct.-Nov., 1901.	147.5	92	73.5	17.5
Measurements of <i>Ramphalcyon capensis capensis</i> .							
U.S.N.M. 218408	♂	Batavia, Java.	Apr. 9, 1909.	135	90	74.5	18.3
219826	♂	Samarna, Wynkoop's Bay, Bantam, Java.	Nov. 4, 1909.	139	97	69.8	17.5
U.S.N.M. 219376	♀	Batavia, Java.	July 8, 1909.	149.5	102	79	18

¹Type.

With the above addition the recognized subspecies of *Ramphalcyon capensis* now number 17. A list of these, rearranged in accordance with what now seems to be their most natural order, is as follows:

- Ramphalcyon capensis capensis* (Linnaeus)
- Ramphalcyon capensis floresiana* (Sharpe)
- Ramphalcyon capensis javana* (Boddaert)
- Ramphalcyon capensis gouldi* (Sharpe)
- Ramphalcyon capensis smithi* Mearns
- Ramphalcyon capensis gigantea* (Walden)
- Ramphalcyon capensis simalurensis* (Richmond)
- Ramphalcyon capensis nesoecca* Oberholser
- Ramphalcyon capensis sodalis* (Richmond)
- Ramphalcyon capensis isoptera* Oberholser
- Ramphalcyon capensis cyanopteryx* Oberholser
- Ramphalcyon capensis arignota* Oberholser
- Ramphalcyon capensis hydrophila* Oberholser
- Ramphalcyon capensis malaccensis* (Sharpe)
- Ramphalcyon capensis intermedia* (Hume)
- Ramphalcyon capensis burmanica* (Sharpe)
- Ramphalcyon capensis gurial* (Pearson)

The genus *Ramphalcyon*, as already so well shown by Mr. W. DeW. Miller,¹ is quite out of place in any of the currently recognized subfamilies of ALCEDINIDAE, so it should really be separated as a monotypic subfamily, **Ramphalcyoninae**, and placed between the *Daceloninae* and the *Alcedininae*.

¹Bull. Amer. Mus. Nat. Hist., XXXI, September 12, 1912, pp. 259-261.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

A NEW ANTARCTIC FORM OF *LARUS DOMINICANUS*
LICHTENSTEIN.

BY J. H. FLEMING.

The Southern Black-backed, or Dominican Gull, from the South Shetland Islands appears to differ subspecifically from the typical form of South America and may be known as:

Larus dominicanus austrinus, subsp. nov.

Like *Larus dominicanus dominicanus*, but mantle lighter and grayer, light mouse gray¹ not deep mouse gray as in the typical form. Type no. 28492, coll. J. H. F.; ♂ ad., Deception Island, South Shetland Islands; collected March 13, 1922, by A. G. Bennett, original number 755.

A careful review of the geographical forms of *Larus dominicanus* is needed; Lichtenstein (Verz. Doubl., p. 82, 1823) gives "coast of Brazil" as the type locality for *Larus dominicanus*, but the birds from both coasts of South America should be compared, since, though probably the same, the Falkland Island bird is nearer *austrinus*. In South African seas a form with very dark mantle occurs and is probably separable as *littoreus* of Forster (Descr. Anim. p. 46, 1844); while the New Zealand form has been generally recognized as *antipodus* of Gray (List Birds Brit. Mus., Anseres, p. 169, 1844).

¹Ridgway, Color Standards, 1912.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

A NEW BULLFROG (*RANA HECKSCHERI*) FROM
GEORGIA AND FLORIDA.¹

BY A. H. WRIGHT.

In 1902 Dr. Leonhard Stejneger described *Rana grylio*, "A New Species of Bullfrog from Florida and the Gulf Coast" (U. S. Nat. Mus. Vol. XXIV, No. 1252, pp. 211-215). These southern bullfrogs, or "Joe Browns" are very distinct in adult, tadpole and egg characters from the bullfrog, *Rana catesbeiana*. In the last ten years, evidence in the Okefinokee swamp region has presented enough material to warrant our description of a third bullfrog, *Rana heckscheri* from Georgia and Florida. It is as distinct if not more so than *Rana grylio*. In tadpoles, voice and adult characters it is clearly a new species. We have not the egg characters.

Narrative:—

On June 16, 1912, at the Fargo (Ga.) heronry amongst a swampy tangle of buttonbush (*Cephalanthus occidentalis*), "hurrah bushes" (*Leucothoe racemosa*) and "lather leaf" (*Clethra alnifolia*) the author found some black tadpoles with yellowish white crossbands and surmised that they were the tadpoles of *R. grylio*. That was a mistake. On the western edge of swamp on the day of our first entrance in 1912 we secured an adult frog which puzzled us. We saw it only for a few moments. We soon lost it in the rigors of the trip. It was a fine male of *R. heckscheri*.

In 1921 when I returned from the swamp three tadpoles were

¹The investigation upon which this article is based was supported by a grant from the Heckscher Foundation for the Advancement of Research, established at Cornell University by August Heckscher. The expense of its publication was borne in part by a second grant from the same Foundation.

In the summer of 1921 Mr. Francis Harper assisted in the field work of this study and in the summer of 1922, Mrs. A. H. (Anna Allen) Wright, Mr. Francis Harper and Mr. Miles D. Pirnie gave valuable assistance to the author in this same series of studies.

referred to me from the U. S. Bureau of Fisheries. They were unlike anything we had seen before. Our reply was solely as to the identity of the material. The correspondent, a doctor from Savannah, Georgia, was concerned to know if albinism was common in tadpoles. Some of them were albinos and some normal. A week or so later, Aug. 7, 1921, Mr. Francis Harper and Marion Lee found a small tadpole in the St. Mary's river, Baker county, Florida, about 10 miles south of Moniac, Georgia. On Aug. 16, 1921, at Camp Pinckney (3 mi. E SE of Folkston, Ga.) St. Mary's River, they secured three more larger tadpoles. These and the Savannah tadpoles were at hand when we surmised they might be gopher frog (*R. aesopus*) or sphagnum frog (*R. virgatipes*) tadpoles. They are of neither species.

In 1922 on July 17 at Thompson landing (south of Folkston) St. Mary's River in a cut-off overflow pool we found the water almost a pure culture of a small black tadpole with a gold and white transverse band like those of June 16, 1912. My journal reads thus:

"In one cut off pool in a water course (which now is a succession of separated pools) we hauled the seine. It was covered with a wriggly mass which at first looked like water beetles to Miles (Mr. M. D. Pirnie). I must confess I would have seen them the same way if I had seen them before. The tails are transparent and were hardly in evidence. They have a band across the back. In another cut-off from the river proper (St. Mary's River) in shallow water they were in immense numbers and presented a very beautiful sight in sunlit situations with their dark bodies and transverse bands. Were it not for the transverse bands, they would look like toad tadpoles. Then I provisionally placed them with the green tree-frog, *Hyla cinerea*, which sometimes has somewhat of the same appearance."

Three days later, July 20, we started for Jacksonville, Florida.

"At Callahan, Florida, (just north) near a large concrete bridge for the Dixie highway, a car was stuck on the smaller bridge to the west in the detour and we had to wait. In the areas beside the new Dixie highway were shallow ponds or overflow areas. These were tributary to Alligator Swamp which in turn is a part of Mills Swamp (U. S. Geol. Survey Sheet, Hilliard). At first I saw a few cross-banded forms of the Thompson's landing sort which I took to be *Hyla cinerea*. Now I

suspect they are probably *R. aesopus* or *R. virgatipes*, probably the former. We collected a few and went on. They are very conspicuous with black-rimmed crests and black bands on upper half of tail musculature and a light color on lower musculature. In one-third grown ones the cross bands show through faintly. When half grown it disappears."

On July 21, on our return from Jacksonville "we stopped at Callahan (Alligator Swamp). The tadpoles of July 20 were abundant. They travel in big schools as no other big tadpoles do. They remind me of a school of mature *Bufo* tadpoles. Once in a while amongst the fair-sized ones were monsters almost as big as a bullfrog tadpole. And these monsters have no suggestion of hind-leg buds. Does this species winter over one or two years as a tadpole."

We checked up our Thompson Landing (Ga.) and Alligator Swamp (Fla.) material and found them all of the same species. We later found they could not be tadpoles of *Rana aesopus* or *Rana virgatipes*.

A month later, Aug. 18, 1922, we visited this place at night. Mrs. Wright discovered a queer looking green frog as she supposed and as she was calling to us we were startled by a call unlike any other *Rana* we ever had heard. To one it was a snore, to another a snort, and to others neither. The queer green frog and the author of the call proved of the same species and not green frogs of which we captured some for comparison. "With a light we captured eight or ten frogs of various sizes from probable one-year frogs to full-sized adults. We found them in shrubbery and on the banks about the bases of trees. More were captured than lost. They were rather awkward in their escape and would tumble off from their perches. Later in the evening we lost all but three of our captures."

Mr. Francis Harper while traveling down the St. Mary's river in August, 1921 "heard a number of times, in addition to the regular snoring call, a peculiar explosive snarling grunt." Then he associated it with *Rana aesopus* but now he believes it this species.

***Rana heckscheri*, new species.**

Diagnosis.—Like *Rana grylio* and *Rana catesbeiana*, it has no dorso-lateral fold and no phalanx of the fourth toe is totally free of web; third toe in 56 mm. specimens 1 to 3 mm. shorter in *Rana heckscheri* than in the

other two species of bullfrog or 3 to 6 mm. shorter in 82 mm. specimens or 6 to 9 mm. shorter in 95 mm. specimens; third toe 3.8 (95 mm.)–3.56 (82 mm.)–3.3 (56 mm.) in length (snout to vent) in *R. heckscheri* while 2.7 to 3.1 (95–56 mm.) in *R. grylio* and *R. catesbeiana*; third toe 1.6–1.7 in fourth toe in *R. heckscheri* while 1.2–1.5 in fourth toe in the other two species; first finger decidedly longer than second, while in the other two species it is usually shorter or sometimes equal; first, second, third and fifth toes shorter than corresponding toes of *R. grylio* and *R. catesbeiana*; fourth finger 8.6 (95 mm.)–8.2 (82 mm.)–8.0 (56 mm.) in length (snout to vent) while 6.0 to 6.3 (95 mm.)–6.8 to 7.4 (82 mm.)–5.6 to 7.1 (56 mm.) in the other two species; internasal space less than upper eyelid width, 1.07–1.43 in it while .85–1.0 in *R. grylio* and *R. catesbeiana*; tympanum in males is proportionally greatest in *R. grylio*, somewhat smaller in *R. catesbeiana* and *R. clamitans* and smallest in *R. heckscheri*; intertympanic width of 95 mm. males in length (snout to vent) 4.52 in *R. heckscheri*, 5.43 in *R. clamitans* and 6.3 in *R. grylio* (*R. catesbeiana* males of 95 mm. have tympanum poorly developed, but a 136 mm. male has it 4.85); in general, intertympanic width broadest in *R. heckscheri* and *R. catesbeiana* and narrowest in *R. grylio*; distance from the rear corner of the eye to the same corner of the other eye much greater than the intertympanic width in *R. grylio*, somewhat greater in *R. clamitans*, about equal in *R. catesbeiana* and equal in *R. heckscheri*, i. e., in the males.

In spirits, four 95 mm. males of four species are as follows: bister or mummy brown on dorsum of *R. catesbeiana*, brownish olive in *R. grylio*, deep grayish olive in *R. clamitans*, and deep mouse gray in *R. heckscheri*; upper parts without very distinct dark spots in *R. clamitans* and *R. catesbeiana*, with prominent large black spots in *R. grylio*, and with many small dark spots in *R. heckscheri*; venter of *R. clamitans* clear white except for the yellow throat, venter of *R. catesbeiana* heavily blotched with black, so also in *R. grylio*—all three, however, with a white background color but in *R. heckscheri* the deep mouse gray or dark color so prominent it becomes the background color and the white, scattering spots; light spots on upper and lower jaws more prominent than in *R. clamitans*.

Coloration in life.—Adult male (95 mm.) (Aug. 18, 1922). General dorsal color citrine drab to grayish olive becoming on top and sides of head and center of tympanum dark olive buff, isabella color or cinnamon brown. Ear drum except middle mummy brown. On back of body and on head and on some of the sides is some serpentine green. Under parts spotted white and glaucous gray or light payne's gray or pale drab gray on throat and breast. Throat with a little citron green or deep chrysolite green. Spots on lower jaw rim four or five, seafoam yellow to deep colonial buff in the spot just back of the angle of the mouth. This spot except above surrounded by black.

Black spot just below angle of mouth to and across the insertion of the brachium. Three black spots on the front edge of the antebrachium. Rear of fore legs black to tips of fingers and webs. Tops of the fingers with seafoam yellow or deep colonial buff spots.

Narrow black bars across the dorsum of the femur, tibia and hind foot.

Rear of femur with white unconnected spots on a bone brown ground color. Rear edge of hind foot to tip of fourth and fifth toes black.

Iris: outside rim bright green-yellow; inner rim capucine orange; and interval black with orange rufous spots.

A younger specimen 65 mm. long is dark olive or deep olive on entire upper parts and very warty. Throat is deep grayish olive.

Two greenfrogs from the same place were: one, a female, dark olive buff uniform; and a smaller one wood brown to avellaneous uniform; back of eye and side of head and over angle of mouth apple green. Bars on hind legs absent in female, scanty in smaller specimens. Both with costal folds.

Type.—A male, 95 mm. long (C. U. No. 1025) taken August 18, 1922.

Type locality.—Alligator Swamp, Callahan, Florida.

Known range.—Coastal Georgia and Florida. From Savannah, Georgia, to Fargo (on Suwannee river) and Folkston (near St. Mary's river) in Georgia, all along the St. Mary's river on both Georgia and Florida sides and in Florida to Callahan.

Habitat.—It seems a frog of the swampy edges of rivers and streams,—a truly fluviatile species.

Mature tadpole.—Coloration in life. (July 21, 1922.) Body dark greenish olive or olive, finely covered with pale green-yellow or pale greenish-yellow flecks or spots on the dorsum. On venter they are vinaceous fawn, vinaceous cinnamon or orange vinaceous. Just back of angle of mouth in a mature tadpole and on the venter is a clump of 4 to 6 much larger spots. Lower belly pale forget-me-not blue to upper belly and breast jay-blue, Chapman's blue or grayish violaceous blue. Spots of back become thicker on lower belly and at times almost touch or make patches of color. Lateral line pores very prominent on the head and body.

Ventral half of muscular part of the tail light salmon orange or apricot buff or vinaceous cinnamon or ochraceous salmon. Upper half of the muscular part with a black band on caudal two-thirds and more or less merged into body color at its basal third. The black bandlike effect is produced by oblique bars of black where the myocommas are. These overshadow the intervening body color. Whole rim of tail or edge of crests black, least just in front of the vent.

Iris rim above and below orange cinnamon, tawny vinaceous, tawny or orange rufous or better vinaceous rufous. Iris rim in front and behind pupil black.

Mature tadpole.—General description. Tadpole quite large (95 mm.), usually black of body, and the most striking of all our (U. S.) *Rana* tadpoles. Belly pigmented so intestine does not show through in preserved specimens. Tail elongate, top acuminate; dorsal crest not as wide as musculature width; not much different from lower crest and not extending on body beyond the vertical through the buds of the hind limbs. Spiracle sinistral, just visible from dorsal aspect, divided backward and somewhat obliquely upwards. Spiracle usually with a distinct semicircular impression on body and opening. Opening, leaving exposed an elliptical or hemispherical patch on body. Spiracle clearly below lateral axis (mus-

culature axis). Eye on or just above lateral axis but in dorsal aspect nearer lateral outline than mid-dorsal axis. Anus dextral opening at edge of ventral crest.

Muciferous crypts distinct, white: a short dorsal row of a few pores on either side of middle line of the back from the dorsal crest forward; from above the middle line of insertion of tail musculature on body to a short distance behind eye a prominent dorsolateral row; apparently resumed behind eye after an interval, and continued as supraorbital and infraorbital lines to above and below the nostril; another lateral row from above insertion of hind legs to gill region where a ventral commissure goes across to the row of the other side. A third of the distance across the ventral branchial region a branch from the commissure goes outwards and forwards along the jaw region almost to the mouth.

Mature tadpole.—Mouth parts: Teeth $\frac{2}{3}$ or $\frac{3}{3}$. Edge of upper labium greater than length of upper horny beak and fringed by a continuous row of teeth. Sometimes this fringe is broken up as in figure. In either corner, beneath this fringe is a short row of teeth about one-fourth to one-third of the length of the upper fringe. The outer end of this second row never reaches outward beyond the first fringe. Median space between these second row teeth, one to one and one-half times the length of either lateral series of the second row. In some median-sized tadpoles the space may be greater and the second row much shorter or rarely absent. The third upper row very short, frequently absent in young and medium-aged tadpoles. From above the end of the first upper labial row of teeth to beneath the end of the third lower labial row are two or three irregular rows of papillae which are continued across lower labium's edge as one serrate row. The third labial row longer than this single row of papillae equal to length of horny beak but $\frac{1}{4}$ – $\frac{1}{5}$ shorter than first and second rows which extend beyond the ends of the horny beaks. The first row is continuous or broken in the middle.

Mature tadpole.—Measurements. Length of body (32.0–41.5 mm.) in tail (50–57.5 mm.) 1.4–1.85, average 1.625. Width of body (15.0–22.5 mm. in its own length 1.4–2.4 average 1.8. Depth (13–20 mm.) of body .9–1.6 in its own width, average 1.14, rarely greater than body. Depth of body 1.8–2.46 in body width, average 2.08. Depth of tail (14–18 mm.) of tail in length of tail 2.6–4.6, average 3.2. Depth of tail .8–1.3 in body depth, average 1.02. Muscular part (9–11 mm.) of tail in its own tail depth 1.45–2.0, average 1.72. Spiracle .86–1.2 nearer vent than snout, average 1.0 i. e. about equidistant in general; spiracle to snout (17–22 mm.) and spiracle to vent or base of hind legs (17–23 mm.). Spiracle to eye (8–12 mm.) in eye to snout (8–11 mm.) .85–1.2 average .99, i. e. eye to snout and spiracle to eye usually equidistant. Nostril to eye (4.0–6.0 mm.) equals the distance from nostril to snout (3.5–6.0 mm.). Mouth (3.0–7.0 mm.) usually 1.0–1.5 greater than the internasal space (3.0–6.5 mm.), average 1.2. Mouth contained 1.1–2.0 (average 1.46) in interorbital distance (5.0–10 mm.). Internasal space contained in interorbital space 1.4–2.0 average 1.75.

The dimensions of the largest tadpole are:

	mm.		mm.
Total length	95.0	Spiracle to vent	23.0
Body length	41.5	Spiracle to eye	11.5
Body depth	17.0	Eye to snout	10.0
Body width	17.0	Eye to nostril	6.0
Tail length	53.5	Nostril to snout	6.0
Tail depth	16.0	Mouth	6.5
Musculature of tail	11.0	Interorbital distance	10.0
Spiracle to snout	21.0	Internasal distance	5.0

Measurements of adult frogs.—We captured eight or ten specimens of this species but lost all but three male specimens of three different sizes, namely 56, 82 and 95 mm. respectively, from snout to vent.

In order to make the actual as well as derived relative measurements instantly show differences we compared 56 mm. male specimens of *R. virgatipes*, *R. septentrionalis*, *R. clamitans*, *R. grylio* (50, 51 mm.) *R. catesbeiana* (transforming and transformed). They were each the same size as our 56 mm. specimen of *R. heckscheri*. Likewise, with the 82 mm. specimen we compared males (82 mm.) of *R. clamitans*, *R. grylio* and *R. catesbeiana*. With the 95 mm. specimen, we compared similar-sized males of *R. clamitans*, *R. grylio* and *R. catesbeiana*. Finally, in the table are placed the measurements of a 136 mm. male of *R. catesbeiana*.

<i>Number</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Sex</i>	<i>virg.</i> ♂	<i>sept.</i> ♂	<i>clam.</i> ♂	<i>heck.</i>	<i>gryl.</i>	<i>gryl.</i>	<i>cates.</i> <i>transfg.</i>	<i>cates.</i> <i>transfg.</i>	<i>clam.</i> ♂	<i>heck.</i> ♂	<i>gryl.</i> ♂	<i>cates.</i> ♂	<i>clam.</i> ♂	<i>heck.</i> ♂	<i>gryl.</i> ♂	<i>cates.</i> ♂	<i>cates.</i> ♂
<i>Rana</i>																	
Length (sn.-vent).....	56	56	56	56	50	51	56	56	82	82	82	82	95	95	95	95	136
Head (tympanum).....	21	24	26	23	20	20	18	22	31	34	35	29	37.5	38	40	37	51
Head (angle mouth).....	15	19	19.5	20	18.5	19	16	20	25	29	29	27	31.5	35	35	34	49
Width of head.....	18	23	24	24	19	19.5	19	23	30	38	33	31	38	41	38	41	56
Snout.....	8	9	10	10	8	8	9	9	12	14	13	12	15	16	16	15	21
Eye.....	6.5	7	8	7	7	7	6	7	8	9	9	9	11	10	10	10	13
Interorbital space.....	2	3	3.5	3	3	3	5	4	5	7	5	6	5	9	7	6	6
Upper eyelid width.....	4.5	6	5.5	6	4	3.5	4.5	4.5	7	8	6	5	8	7.5	6	7	11
Tympanum.....	7	10	9	5	5	6	4	5	13	12	13	7	14	13	16	11	18
Intertympanic width.....	12.5	11	12	15.5	12	10	15	15	17	18	15.5	19	17.5	21	15	21	28
Internasal space.....	4.5	4	6	5.5	4.5	4	6	6	7	7	7	7	7	7	7	7	10
Forelimb.....	23	30	31	29	29	30	33	31	41	35	50	38	54	47	51	50	66
1st finger.....	7	7	9	9	8	9	10	10	12	12	14	13	15	13	15	17	20
2d finger.....	7	9	8	7.5	9	10	10	10	11	11	16	13	14	12	16	16	19
3d finger.....	9	10.5	12	10	11.5	12	12	12	16	13	18	18	19	16	20	20	26
4th finger.....	6	9	7	7	7	9	10	10	11	10	12	12	15	11	16	15	20
Hind limb.....	75	88	86	84	75	77	75	82	111	119	128	107	146	133	144	130	190
Tibia.....	23	29	31	29	25	25	24	28	41	41	42	37	50	45	46	45	66
Foot.....	25	32	33	30	26	27	27	28	37	43	48	40	48	48	49	50	96
1st toe.....	7	7	8	8	8.5	9	8	9	10	11	15	12	11	13	17	15	15
2d toe.....	13	13	12	12	14	13	13	13	18	18	24	18	19	21	25	23	28
3d toe.....	18	20	18	17	18	19	18	18	22	23	29	26	27	25	34	31	41
4th toe.....	24	28	30	27	25	23	25	27	35	38	44	36	43	42	45	46	60
5th toe.....	16	19	20.5	18	19	19	20	20	27	28	35	30	29	30	37	35	42

Rana heckscheri.—Head to angle of mouth 1.2 (56 mm.)–1.31(82 mm.)–1.17(95 mm.) in width of head; head to rear of tympanum 1.04–1.11–1.08 in width of head; head to angle of mouth 2.8–2.82–2.71 in length of body; head to rear of tympanum 2.43–2.41–2.5 in length of body; snout .9–.71–.69 in fourth finger; snout .8–.78–.81 in first toe; eye 1.43–1.55–1.6 in snout; eye .70–1.3–1.3 in tympanum; eye 1.3–1.33–1.3 in first finger; tympanum 3.1–1.5–1.61 in intertympanic width; tympanum 2.0–1.16–1.23 in snout; internasal width 1.08–1.43–1.07 in upper eyelid width; interorbital width 2.0–1.14–.83 in upper eyelid width; interorbital width 1.83–1.0–.77 in internasal width; interorbital width 5.16–2.57–2.33 in intertympanic width.

Forelimb: 1.93–2.34–2.0 in length (snout to vent); forelimb 2.9–3.4–2.83 in hind limb; first finger 1.11–1.08–1.23 in third finger; second finger 1.375–1.18–1.09–1.08 in first finger; third finger 1.2–1.36–1.3 in second toe; fourth finger 1.14–1.1–1.18 in first toe; fourth finger 1.42–1.1–1.45 in third finger; internasal width 1.63–1.71–1.85 in first finger; 1.36–1.57–1.71 in second finger; 1.8–1.85–2.3 in third finger; 1.27–1.43–1.57 in fourth finger.

Hindlimb: length 1.5–1.45–1.4 in hind limb; tibia 1.93–2.0–2.11 in length; tibia 2.89–2.9–2.95 in hind limb; tibia 1.0–.853–1.04 in forelimb; tibia 1.03–1.04–1.06 in hind foot; first toe 1.5–1.63–1.61 in second toe; 1.87–2.72–1.84 in third toe; 3.37–3.45–3.23 in fourth toe; 2.25–2.63–2.3 in fifth toe; second toe 1.41–1.61–1.14 in third toe; 2.25–2.11–2.0 in fourth toe; 1.5–1.55–1.42 in fifth toe; third toe 1.59–1.31–1.75 in fourth toe; 1.06–.96–1.25 in fifth toe; fourth toe 1.11–1.13–1.14 in hind foot; 1.07–1.07–1.07 in tibia; 1.07–.92–1.12 in forelimb; fifth toe 1.5–1.35–1.4 in fourth toe; internasal width 1.45–1.57–1.85 in first toe; 2.18–2.57–3.0 in second toe; 3.08–4.14–3.43 in third toe; 4.9–5.43–6.0 in fourth toe; 3.2–4.0–4.3 in fifth toe.

Rana catesbeiana.—Head to angle of mouth, 1.18 (56 mm. transforming)–1.15 (56 mm. transformed)–1.14 (82 mm.)–1.2 (95 mm.)–1.14 (136 mm.) in width of head; head to rear of tympanum 1.05–1.04–1.06–1.10–1.1 in width of head; head to angle of mouth 3.5–2.8–3.03–2.82–2.77 in length (snout to vent); head to rear of tympanum 3.1–2.54–2.82–2.57–2.66 in length; snout 1.11–1.11–1.0–1.0–1.0 in fourth finger; snout .88–1.0–1.0–1.0–.71 in first toe; snout 1.11–1.11–1.08–1.13–1.1 in first finger; eye 1.5–1.3–1.33–1.5–1.72 in snout; .66–.70–.77–1.1–1.38 in tympanum; tympanum 3.75–3.0–2.71–1.9–1.55 in intertympanic width; 2.25–1.8–1.71–1.36–1.16 in snout; internasal width .75–.75–.71–1.0–1.1 in upper eyelid width; interorbital width .9–1.11–.83–1.16–1.8 in upper eyelid width; 1.2–1.5–1.16–1.16–1.66 in internasal width; 3.0–3.75–3.16–3.5–4.66 in intertympanic width.

Forelimb: 1.7–1.8–2.15–1.9–2.06 in length; 2.2–2.6–2.81–2.6–2.88 in hind limb; first finger 1.2–1.2–1.36–1.17–1.3 in third finger; second finger 1.2–1.2–1.36–1.25–1.36 in third finger; .80–.90–1.0–1.06–1.05 in first finger; third finger 1.08–1.08–1.0–1.15–1.76 in second toe; fourth finger .8–.9–1.0–1.13–.75 in first toe; 1.2–1.2–1.08–1.33–1.3 in third finger; internasal width 1.66–1.66–1.85–2.43–2.6 in first finger; 1.66–1.66–1.85–2.3–1.9 in second finger; 2.0–2.0–2.57–2.85–2.6 in third finger; 1.66–1.66–1.71–2.14–2.0 in fourth finger.

Hindlimb: length 1.34–1.46–1.30–1.36–1.4 in hind limb; tibia 2.33–2.0–

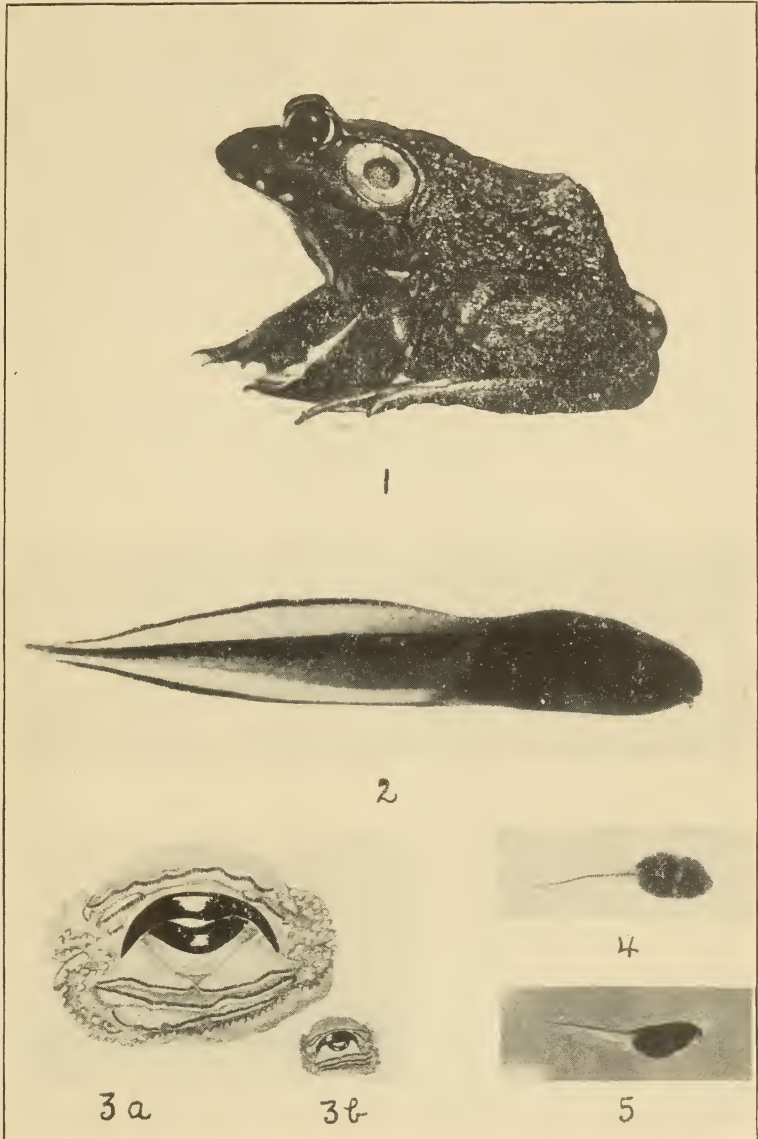
2.21-2.11-2.06 in length; 3.12-2.92-3.04-2.88-2.87 in hind limb; 1.37-1.10-1.03-1.11-1.0 in forelimb; 1.12-1.0-1.08-1.11-1.45 in hind foot; first toe 1.62-1.44-1.5-1.53-1.86 in second toe; 2.25-2.0-2.16-2.06-2.7 in third toe; 3.12-3.0-3.0-3.06-4.0 in fourth toe; 2.5-2.22-2.5-2.33-2.8 in fifth toe; second toe 1.38-1.38-1.44-1.35-1.47 in third toe; 1.88-2.7-2.0-2.0-2.14 in fourth toe; 1.53-1.53-1.66-1.56-1.5 in fifth toe; third toe 1.39-1.5-1.38-1.48-1.46 in fourth toe; 1.11-1.11-1.15-1.12-1.02 in fifth toe; fourth toe 1.08-1.03-1.11-1.09-1.06 in hind foot; .96-1.03-1.02-.98-1.1 in tibia; 1.32-1.14-1.05-1.08-1.1 in forelimb; fifth toe 1.25-1.35-1.2-1.31-1.42 in fourth toe; internasal width 1.33-1.5-1.71-2.14-1.5 in first toe; 2.16-2.16-2.57-3.3-2.8 in second toe; 3.0-3.0-3.71-4.43-4.1 in third toe; 4.16-4.5-5.14-6.57-6.0 in fourth toe; 3.33-3.33-4.3-5.0-4.2 in fifth toe.

Rana clamitans.—Head to angle of mouth 1.24-1.2-1.2 in width of head; head to rear of tympanum .92-.967-1.01 in width of head; head to angle of mouth 2.82-3.28-3.05 in length (snout to vent); head to rear of tympanum 2.15-2.64-2.53 in length; snout .9-.916-1.0 in fourth finger; snout .8-.83-.73 in first toe; eye 1.25-1.5-1.36 in snout; eye 1.12-1.62-1.27 in tympanum; eye 1.12-1.5-1.36 in first finger; tympanum 1.33-1.3-1.25 in intertympanic width; tympanum 1.11-.92-1.07 in snout; internasal width .91-1.0-1.14 in upper eyelid width; interorbital width 1.67-1.40-1.6 in upper eyelid width; 1.71-1.4-1.4 in internasal width; 3.4-3.4-3.5 in intertympanic width.

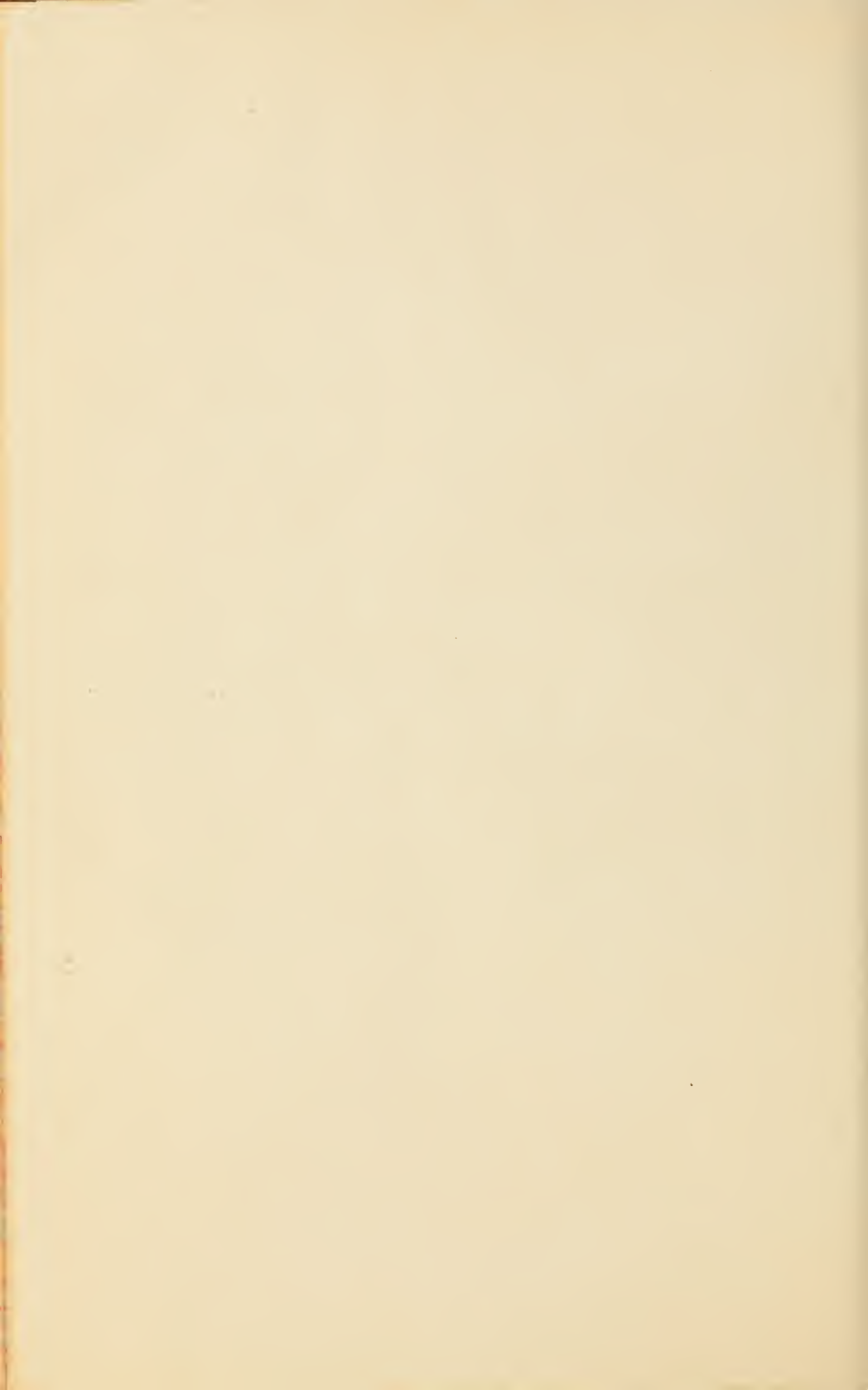
Forelimb 1.8-2.0-1.75 in length; 2.77-2.7-2.71 in hind limb; first finger 1.33-1.33-1.26 in third finger; second finger 1.5-1.45-1.35 in third finger; 1.0-1.09-1.07 in first finger; third finger 1.0-1.12-1.0 in second toe; fourth finger 1.14-.91-1.0 in first toe; 1.7-1.45-1.26 in third finger; internasal width 1.5-1.71-2.14 in first finger; 1.25-1.57-2.0 in second finger; 2.0-2.3-2.7 in third finger; 1.16-1.57-2.14 in fourth finger.

Hind limb: length 1.53-1.33-1.53 in hind limb; tibia 1.86-2.0-1.9 in length; 2.77-2.7-2.92 in hind limb; 1.0-1.0-1.08 in forelimb; 1.64-.902-.96 in hind foot; first toe 1.5-1.8-1.72 in second toe; 2.25-2.2-2.54 in third toe; 3.75-3.5-3.91 in fourth toe; 2.56-2.7-2.72 in fifth toe; second toe 1.5-1.22-1.42 in third toe; 2.5-1.94-2.26 in fourth toe; 1.70-1.22-1.52 in fifth toe; third toe 1.66-1.59-1.59 in fourth toe; 1.14-1.22-1.07 in fifth toe; fourth toe 1.1-1.05-1.11 in hind foot; 1.03-1.17-1.16 in tibia; 1.03-1.17-1.25 in forelimb; fifth toe 1.46-1.3-1.48 in fourth toe; internasal width 1.33-1.42-1.57 in first toe; 2.0-2.57-2.7 in second toe; 3.0-3.14-3.85 in third toe; 5.0-5.0-6.14 in fourth toe; 3.4-3.85-4.14 in fifth toe.

Rana grylio.—Head to angle of mouth 1.02(50 mm.)-1.02(51 mm.)-1.13(82 mm.)-1.08(95 mm.) in width of head; head to rear of tympanum .95-.975-.94-.95 in width of head; head to angle of mouth 3.37-2.68-2.82-2.71 in length; head to rear of tympanum 2.8-2.55-2.34-2.375 in length; snout 1.0-1.12-.92-1.0 in fourth finger; 1.06-1.12-1.15-1.06 in first toe; eye 1.14-1.14-1.44-1.6 in snout; eye .70-.85-1.44-1.6 in tympanum; eye 1.14-1.29-1.55-1.5 in first finger; tympanum 2.4-1.66-1.2-.93 in intertympanic width; 1.6-1.33-1.0-1.0 in snout; internasal width .88-.875-.857-.85 in upper eyelid width; interorbital width 1.33-1.16-1.2-.86 in upper eyelid width; 1.5-1.33-1.4-1.0 in internasal width; 4.0-3.33-3.1-2.14 in intertympanic width.



Rana heckscheri.





Venters of Adult Males of Uncommon Ranas of E. U. S.



Forelimb 1.68-1.7-1.64-1.86 in length; 2.6-2.56-2.56-2.8 in hind limb; first finger 1.44-1.33-1.28-1.33 in third finger; second finger 1.27-1.2-1.12-1.25 in third finger; .94-.9-.87-.93 in first finger; third finger 1.21-1.08-1.33-1.25 in second toe; fourth finger 1.21-1.0-1.25-.937 in first toe; 1.64-1.33-1.33-1.25; internasal width 1.77-2.25-2.0-2.14 in first finger; 2.0-2.5-2.3-2.3 in second finger; 2.55-3.0-2.57-2.85 in third finger; 1.55-2.25-1.71-2.3 in fourth finger.

Hind limb: length 1.5-1.51-1.56-1.51 in hind limb; tibia 2.0-2.0-1.95-2.04 in length (snout to vent); 3.0-3.08-3.04-3.13 in hind limb; 1.15-1.2-1.19-1.18 in forelimb; 1.04-1.08-1.14-1.06 in hind foot; first toe 1.64-1.44-1.6-1.49 in second toe; 2.10-2.11-1.93-2.0 in third toe; 2.09-2.55-2.93-2.64 in fourth toe; 2.23-2.11-2.33-2.17 in fifth toe; second toe 1.64-1.46-1.2-1.36 in third toe; 1.8-1.76-1.83-1.8 in fourth toe; 1.35-1.46-1.45-1.48 in fifth toe; third toe 1.39-1.2-1.5-1.32 in fourth toe; 1.05-1.0-1.2-1.08 in fifth toe; fourth toe 1.04-1.17-1.09-1.09 in hind foot; 1.0-1.08-.95-1.02 in tibia; 1.16-1.3-1.13-1.13 in forelimb; fifth toe 1.31-1.2-1.25-1.21 in fourth toe; internasal width 1.88-2.25-2.14-2.43 in first toe; 3.1-3.25-3.43-3.57 in second toe; 4.0-4.75-4.14-4.85 in third toe; 5.55-5.75-6.3-6.43 in fourth toe; 4.02-4.75-5.0-5.3 in fifth toe.

Rana virgatipes.—Head to angle of mouth 1.0 (28 mm. near transformation)-1.16 (38 mm.)-1.2 (56 mm.) in width of head; head to rear of tympanum .87-.93-.857 in width of head; head to angle of mouth 2.8-3.04-3.75 in length of body; head to rear of tympanum 2.43-2.45-2.66 in length of body; snout .95-.84-.875 in fourth finger; .76-.84-.875 in first toe; eye 1.3-1.3-1.23 in snout; .61-.9-1.07 in tympanum; 1.12-1.2-1.07 in first finger; tympanum 3.2-2.33-1.8 in intertympanic width; 2.1-1.44-1.14 in snout; internasal width .66-1.0-1.0 in upper eyelid width; interorbital width 1.0-1.5-2.25 in upper eyelid width; 1.5-1.5-2.25 in internasal space; 4.0-5.25-6.25 in intertympanic width.

Forelimb 1.75-1.81-2.43 in length of body; 2.75-2.62-3.2 in hind limb; first finger 1.33-1.16-1.3 in third finger; second finger 1.5-1.27-1.3 in third finger; 1.12-1.0-1.0 in first finger; third finger 1.08-1.35-1.44 in second toe; fourth finger .80-1.0-1.16 in first toe; 1.2-1.27-1.5 in third finger; internasal space 1.5-2.0-1.55 in first finger; 1.33-1.83-1.55 in second finger; 2.0-2.33-2.0 in third finger; 1.66-1.83-1.33 in fourth finger.

Hindlimb: length 1.57-1.44-1.34 in hind limb; tibia 2.07-2.11-2.43 in length of body; 3.25-3.05-3.26 in hind limb; 1.18-1.05-1.0 in forelimb; 1.11-1.16-1.08 in hind foot; first toe 1.61-1.74-1.85 in second toe; 2.25-2.45-2.55 in third toe; 3.0-3.45-3.43 in fourth toe; 2.0-2.36-2.28 in fifth toe; second toe 1.38-1.42-1.38 in third toe; 1.84-2.0-1.83 in fourth toe; 1.23-1.36-1.23 in fifth toe; third toe 1.33-1.4-1.33 in fourth toe; .88-.963-.88 in fifth toe; fourth toe 1.08-1.05-1.04 in hind foot; 1.12-.94-.95 in tibia; 1.25-1.1-.95 in forelimb; fifth toe 1.5-1.46-1.5 in fourth toe; internasal space 1.33-1.83-1.55 in first toe; 2.18-3.16-2.88 in second toe; 3.0-3.5-4.0 in third toe; 4.0-6.33-5.33 in fourth toe; 2.66-4.33-3.55 in fifth toe.

Rana septentrionalis.—Head to angle of mouth 1.41 (38 mm. transforming)-1.22(56 mm. ♂) in width of head; head to rear of tympanum .92-.95 in width of head; head to angle of mouth 4.4-2.95 in length of body; head

to rear of tympanum 2.92-2.33 in length; snout 1.09-.77 in fourth finger; 1.0 or 1.09-.77 in first toe; eye 1.1-1.3 in snout; .5-1.43 in tympanum; 1.0-1.0 in first finger; tympanum 4.02-1.1 in intertympanic width; 2.2-.9 in snout; internasal width 1.0-1.5 in upper eyelid width; interorbital width 1.0-2.0 in upper eyelid width; 1.0-1.33 in internasal width; 3.5-3.66 in intertympanic width.

Forelimb 2.45-1.86 in length; 3.09-2.93 in hind limb; first finger 1.6-1.5 in third finger; second finger 1.33-1.16 in third finger; .83-.77 in first finger; third finger 1.18-1.23 in second toe; fourth finger 1.0 or .9-.77 in first toe; 1.33-1.16 in third finger; internasal space 1.66-1.75 in first finger; 2.0-2.25 in second finger; 2.66-2.62 in third finger; 2.0-2.25 in fourth finger.

Hindlimb: length 1.26-1.57 in hind limb; tibia 2.11-1.93 in length; 2.66-3.0 in hind limb; .86-1.03 in forelimb; 1.11-1.1 in hind foot; first toe 1.58 or 1.7-1.85 in second toe; 2.3 or 2.5-2.85 in third toe; 3.08 or 3.3-4.0 in fourth toe; 2.08 to 2.27-2.70 in fifth toe; second toe 1.47-1.53 in third toe; 1.95-2.15 in fourth toe; 1.31-1.46 in fifth toe; third toe 1.32-1.4 in fourth toe; .90-.95 in fifth toe; fourth toe 1.08-1.14 in hind foot; .97-1.03 in tibia; .84-1.07 in forelimb; fifth toe 1.48-1.47 in fourth toe; internasal width 2.0 or 1.8-1.75 in first toe; 3.16-3.25 in second toe; 4.66-5.0 in third toe; 6.16-7.0 in fourth toe; 4.16-4.75 in fifth toe.

DESCRIPTION OF PLATES.

Plate XI. Rana heckscheri.

Fig. 1. Adult male, Callahan, Fla., Aug. 18, 1922. Lateral aspect. x 0.6

Fig. 2. Mature tadpole, Callahan, Fla., July 20, 1922. Lateral aspect. x 1.0

Fig. 3. a. Mouth-parts of a mature tadpole. x 4.5

b. Mouth-parts of a small black tadpole. x 4.5

Fig. 4. Small black tadpole, Thompson's Landing, St. Mary's River, Ga., July 17, 1922. Dorsal aspect. x 1.0

Fig. 5. Small black tadpole, Thompson's Landing, St. Mary's River, Ga., July 17, 1922. Lateral aspect. x 1.0

Photos by F. Harper and A. A. Wright; Fig. 3 by A. A. Wright.

Plate XII. Venters of Adult Males of Uncommon Ranas of E. U. S.

Fig. 1. *Rana septentrionalis*, Onekio, N. Y., June 21, 1923. x 0.7

Fig. 2. *Rana heckscheri*, Callahan, Fla., Aug. 17, 1922. x 0.5

Fig. 3. *Rana grylio*, Okefinokee Swamp, Ga., April 29, 1921. x 0.3

Fig. 4. *Rana virgatipes*, Okefinokee Swamp, Ga., July 22, 1922. x 1.0

Photos: Fig. 1 by A. A. Wright; Figs. 2 and 4 by F. Harper and A. A. Wright; Fig. 3 by F. Harper and A. H. Wright.

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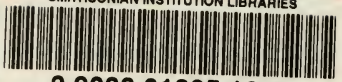
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