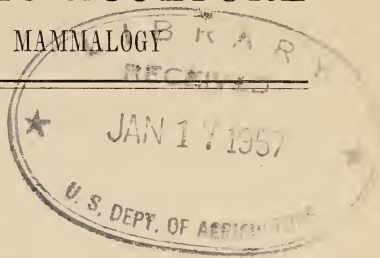


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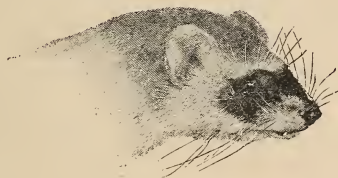
U. S. DEPARTMENT OF AGRICULTURE
DIVISION OF ORNITHOLOGY AND MAMMALOLOGY



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Revision of the North American Pocket Mice

BY DR. C. HART MERRIAM

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U. S. DEPARTMENT OF AGRICULTURE,

July 3, 1889.

SIR: I have the honor to transmit herewith the first of a series of faunal papers to be published, under your direction, in the form of a serial entitled NORTH AMERICAN FAUNA. The present communication consists of a revision of the North American Pocket Mice (including descriptions of twelve new species and three new subspecies), and is based largely upon material collected in Dakota, Nebraska, Utah, and Arizona by Mr. Vernon Bailey, an energetic and enthusiastic naturalist now employed as a field agent of the Division.

Respectfully,

C. HART MERRIAM,

*Chief of Division of
Ornithology and Mammalogy.*

Hon. J. M. RUSK,

Secretary of Agriculture.

ANNOUNCEMENT.

The Division of Ornithology and Mammalogy is engaged in mapping the geographical distribution of birds and mammals, in addition to the study of their economic relations. The purpose of this work is to ascertain the boundaries of the natural faunal areas of North America. The original information on which the maps are based is collected mainly by special field agents employed by the Division; a smaller portion is contributed by voluntary observers. In the progress of the work many new facts are obtained which ought to be put on record for the benefit of other workers in this department of science. It is not unusual to find new species in the collections made by the field agents of the Division, and such species must be named and assigned their proper systematic position before they can be discussed intelligently.

It is evident that the results of the investigations of the Division are of importance to two distinct classes of readers—farmers and naturalists. It is deemed desirable, therefore, to publish such of the results as are of use mainly to those engaged in scientific research separately from those of a more purely economic character. The publication of the economic material being already provided for (and appearing as bulletins and reports), it has been decided to publish a series of faunal papers, under the title *NORTH AMERICAN FAUNA*. This publication will contain, in addition to the faunal papers proper, such technical matter as results from the study of the material collected or as may be necessary to an intelligent understanding of the reports which follow.

No attempt will be made to issue the separate numbers at regular intervals, but each number will bear date of actual publication. The present is the first of the series.



PRELIMINARY REVISION OF THE NORTH AMERICAN POCKET MICE

(Genera *PEROGNATHUS* ET *CRICETODIPUS* auct.)

WITH DESCRIPTIONS OF NEW SPECIES AND SUBSPECIES AND A KEY TO THE KNOWN FORMS.

By Dr. C. HART MERRIAM.

INTRODUCTORY REMARKS.

The present contribution toward a revision of the North American Pocket Mice is the outgrowth of a recent attempt to identify a large number of specimens for the purpose of mapping their geographical distribution. The results were wholly unexpected. Only six species were previously recognized. This number is here increased to eighteen; three subspecies also are described, and several well known names are shifted to forms other than those to which they have been heretofore commonly applied. The material at hand is far more extensive* and of better quality than that accessible to any previous writer; at the same time many large areas in the West still remain unrepresented in collections.

The present revision of the group is by no means exhaustive—it is intended merely as a foundation for future study. Several problems in synonymy remain to be worked out in the light of material yet to be collected, and additional species remain to be discovered. The region between the Rocky Mountains and the Pacific coast has not been so thoroughly explored as to be barren of new forms; and Mexico, if I may be allowed the prediction, will furnish a number of species now unknown, some of which will shed much light on the affinities of the group and the interrelations of its principal subdivisions.

* The present study is based on about 170 specimens, of which 120 are in my own collection and about 50 in the U. S. National Museum.

HISTORY AND NOMENCLATURE.

Maximilian, Prince of Wied, was first to discover and describe a pocket mouse from North America. In 1839 he published an excellent description of a species collected by himself on the Upper Missouri River, near the mouth of the Yellowstone. He named it *Perognathus fasciatus*—both genus and species being new.*

In 1848 Peale described a second genus and species, from Oregon, under the name *Cricetodipus parvus*.†

In 1852 Woodhouse described a pocket mouse from San Francisco Mountain, Arizona, naming it *Perognathus penicillatus*.‡

In 1855 Baird added another species, *Perognathus flavus*, basing his description on a specimen from El Paso,§ Texas (but afterwards confusing with it specimens from widely remote localities).

In 1857 Baird described two more species, *P. hispidus*, from northern Mexico, and *P. monticola*, from western Montana.||

In 1868 Gray attempted, though with ill success, to describe two additional species, which he named *Abromys lordi* (gen. et sp. nov.), from British Columbia; and *Perognathus bicolor*, from Honduras.¶ The former has not been since collected; the latter, as shown by Alston, "is neither a *Perognathus* nor a native of the subregion" (Central America), but is a *Heteromys*, and came from Venezuela. (Ann. and Mag. Nat. Hist., 5th series, VI, 1880, 118, 119.)

Excluding "*P. bicolor*," then, as not belonging to the group at all, the seven species already mentioned are all that have been formally described.

In 1875 Coues provisionally proposed two additional names (*mollipilosus* and *longimembris*),** suggesting their adoption in case the animals to which they were applied should prove different from the species under whose names they were placed (*P. monticola* and *parvus*, respectively); thus making a total of nine specific names proposed up to the present time.

In 1857 Baird separated the pocket mice into two sections or subgenera, *Perognathus* and *Cricetodipus*. He characterized *Perognathus* as the larger of the two, with larger ears and a distinct lobe to the antitragus, and with the soles entirely naked; *Cricetodipus* as smaller, with smaller ears, without any lobe to the antitragus, and with the posterior portion of the sole hairy.†† He assigned no cranial characters to either of these subgenera.

* Nova Acta Acad. Caes. Leop. Carol., Nat. Cur., XIX, 1839, 368-374, pl. xxxiv.

† Rept. Mam. and Ornith., U. S. Expl. Expd., Wilkes, VIII, 1848, 52-54.

‡ Proc. Acad. Nat. Sci. Phila., 1852, 200.

§ Proc. Acad. Nat. Sci. Phila., 1855, 332.

|| Mammals N. Am., 1857, 421-423.

¶ Proc. Zool. Soc. Lond., 1868, 202.

** Proc. Acad. Nat. Sci. Phila., 1875, 296, 305.

†† This was done on the assumption that Peale's *Cricetodipus parvus* was the same as the small animal from southern California, here called *P. longimembris*, which see,

In 1868 J. E. Gray named a genus *Abromys*, from an animal collected in British Columbia by Lord. The only character mentioned by Gray as distinguishing his genus *Abromys* from the genus *Perognathus* is the character of the fur, which he stated to be *soft* in *Abromys* and *harsh* or *hispid* in *Perognathus*.

In 1875 Coues raised *Cricetodipus* to full generic rank and pointed out differential cranial characters by which it might be readily separated from *Perognathus*, to which latter genus he referred *Abromys* as a synonym. With characteristic sagacity he suspected that the small species without lobed antitragus might not belong to Peale's genus *Cricetodipus* at all, and therefore provisionally suggested the generic and specific name *Otognosis longimembris* for the Fort Tejon animal, which he described under the head of *Cricetodipus parvus*. This was done on the supposition that the generic name *Perognathus* Max. Wied belonged to the largest species, with lobed antitragus, while in reality the contrary is true, as will be shown directly. *Otognosis* Coues, therefore, becomes a synonym, pure and simple, of *Perognathus*.

Having received a number of specimens of so-called *Cricetodipus flavus* from the region of the Upper Missouri, near the mouth of the Yellowstone, some of them taken within a few miles of the very spot where Maximilian procured his type of *Perognathus fasciatus*, and being unable to secure any reliable record of the occurrence of *Perognathus fasciatus* of Baird and subsequent authors further north than Nebraska, I turned to Maximilian's original description, which is very full and exact, and is accompanied by a colored plate of the animal, natural size, and by figures of the skull and teeth and tables of measurements. It allows no room whatever for difference of opinion as to what his animal really is—it is the *Cricetodipus flavus* (in part) of recent authors, my own specimens from the Upper Missouri region agreeing in the minutest detail with his careful description. This discovery unfortunately renders necessary a total change in the nomenclature of the group. *Cricetodipus* of Baird and Coues becomes a synonym, pure and

But in reality *C. parvus* of Peale was a very different animal. His description was based on a single specimen, which must have been very young, as may be seen from the following: (1) Both the Latin diagnosis of the genus and the English description which follows begin with the statement that the head and body were "nearly equal in size," and further on he speaks of "its singularly large head, which equals its body in bulk." (2) The molars are said to have "six rounded tubercles on each." (3) The dental formula is given as follows: "Incisors, $\frac{2}{2}$; canine, $\frac{0}{0}$; molars, $\frac{3}{3}$ = 16" (and later on in the same description he states that he found "rudiments of a fourth molar tooth in each side of the lower jaw, which would eventually have replaced the front ones, already much worn"). (4) "Lips large, tumid;" which would indicate a sucking young; and (5) the relative proportions of head, body, and feet. The most important measurements, reduced to millimeters, are: Head and body, 48; head from nose to occiput, 23; tail, 58; hind foot, 20.5; metatarsus, 13.

It is perfectly evident from the above that Peale's *Cricetodipus parvus* could not have been one of the smaller species at all, but must have been a very young individual of one of the larger species, possibly the *Perognathus mollipilosus* of Coues.

simple, of *Perognathus*, and the large animal from the plains, called by these authors *Perognathus fasciatus*, is left without a name. I have named it, therefore, *Perognathus paradoxus*.*

During the half century since the publication of Maximilian's description of *Perognathus fasciatus* the species has never been known by its right name. Baird, in 1857, placed it in his subgenus *Cricetodipus* (under the specific name *flavus*). Twenty years later (in 1877) he was followed by Coues, who raised *Cricetodipus* to full generic rank. It is rare, indeed, that a species is thus separated further and further from itself, until it comes to be placed in another genus from that originally framed for its reception.

The aim of the present paper is to establish certain types, and to correct certain errors of nomenclature and synonymy. Hence the descriptions have been based principally on type specimens;† and no attempt has been made to determine the limits of sexual and individual variation, or to discuss other interesting questions which will be treated fully in a subsequent communication.

CLASSIFICATION AND KEY TO SPECIES.

The twenty-one species and subspecies of *Perognathus* here described may be arranged in two principal divisions or subgenera according to their natural affinities. Unfortunately, no dependence can be placed upon external characters, such as size, the presence or absence of a lobed antitragus, the hairiness of the sole, or the possession of a crested penicillate tail, none of these peculiarities being exclusively associated with the members of either subgenus, although heretofore they have been credited with even generic significance. The classification here proposed is based solely on cranial characters. The teeth furnish excellent specific characters, but none of subgeneric value.

SUBGENERA.

Perognathus (proper).

Mastoids largely developed, projecting behind plane of occiput; interparietal, shield-shaped or pentagonal; mastoid side of parietal longest; audital bullæ meeting or nearly meeting anteriorly below basisphenoid.

* Professor Baird had but few specimens before him when he wrote his great work on the Mammals of North America, in 1857. It is not strange, therefore, that he fell into one or two errors of identification, particularly in view of the enforced haste in which his manuscript was prepared. His most serious error, and one in which he has been blindly followed by subsequent writers, lay in referring the largest species of the group (*P. paradoxus* of the present paper) to Maximilian's *Perognathus fasciatus*. He noticed the great discrepancy in size, but thought it due to age.

†Of the twenty-one species and subspecies herein formally defined, no less than nineteen have been described from the actual types, twelve of which are in my own collection and seven in the United States National Museum. Of the remaining two, one (*P. fasciatus*), has been described from a duplicate type (*i. e.*, a specimen from the original type locality); the other (*P. flavus*) from a specimen taken about 400 miles from the type locality, Baird's type having been lost. This is the only one concerning which there remains any doubt.

Chatodipus.*

Mastoids moderately developed, not projecting behind plane of occiput; interparietal broadly pentagonal, or strap-shaped; mastoid side of parietal not longest; audital bullæ separated anteriorly by full width or nearly full width of basisphenoid.

The species comprising the subgenus *Perognathus*, excepting *P. formosus* alone, constitute a very natural and compact group. *P. formosus* agrees with the others in cranial characters, but differs from them widely in external peculiarities.

The subgenus may be conveniently divided into two minor groups or sections as follows:

1. Tail vertebræ $\frac{1}{4}$ longer than head and body; tail heavily crested; ears very long; soles completely naked; pelage coarse..... *Formosus* group.
2. Tail at most only slightly longer than head and body; never crested; ears short or moderate; soles more or less hairy; pelage fine..... *Fasciatus* group.

The species comprising the subgenus *Chatodipus* naturally fall into four minor groups or sections, which may be characterized as follows:

A. OCCIPUT TRUNCATED POSTERIORLY.

(a) *Hind foot long and narrow*:

1. Tail always crested-penicillate; interparietal more than twice as broad as long; no supra-orbital bead *Penicillatus* group.
2. Tail never crested-penicillate; interparietal less than twice as broad as long; a distinct supra-orbital bead (largest forms known).
Paradoxus group.

(b) *Hind foot short and broad*:

3. Tail not crested-penicillate..... *Hispidus* group.

B. OCCIPUT BULGING POSTERIORLY:

4. Tail crested-penicillate; ears very long..... *Californicus* group.

LIST OF SPECIES AND SUBSPECIES HEREIN DESCRIBED.

- | | | | | | | | | | | | |
|--|--|---|---------------------------------------|---|----------------------------|---|------------------------------|---|--------------------------|---|----------------------------|
| <ol style="list-style-type: none"> 1. <i>Fasciatus</i> 1^a. <i>Fasciatus flavescens</i>... 2. <i>Flavus</i> 3. <i>Bimaculatus</i> 4. <i>Longimembris</i> 5. <i>Apache</i> 6. <i>Inornatus</i> 7. <i>Menticola</i> 8. <i>Olivaceus</i> 8^a. <i>Olivaceus amœnus</i> 9. <i>Formosus</i> 10. <i>Intermedius</i> 11. <i>Fallax</i> 12. <i>Obscurus</i> 13. <i>Spinatus</i> 14. <i>Penicillatus</i> 15. <i>Hispidus</i>, <i>Hispidus</i> group 16. <i>Paradoxus</i> 16^a. <i>Paradoxus spilotus</i> 17. <i>Californicus</i> 18. <i>Armatus</i> | <table style="border: none;"> <tr> <td style="font-size: 3em; vertical-align: middle;">}</td> <td style="vertical-align: middle;">Subgenus <i>Perognathus</i> (proper).</td> </tr> <tr> <td style="font-size: 3em; vertical-align: middle;">}</td> <td style="vertical-align: middle;"><i>Penicillatus</i> group.</td> </tr> <tr> <td style="font-size: 3em; vertical-align: middle;">}</td> <td style="vertical-align: middle;">Subgenus <i>Chatodipus</i>.</td> </tr> <tr> <td style="font-size: 3em; vertical-align: middle;">}</td> <td style="vertical-align: middle;"><i>Paradoxus</i> group..</td> </tr> <tr> <td style="font-size: 3em; vertical-align: middle;">}</td> <td style="vertical-align: middle;"><i>Californicus</i> group.</td> </tr> </table> | } | Subgenus <i>Perognathus</i> (proper). | } | <i>Penicillatus</i> group. | } | Subgenus <i>Chatodipus</i> . | } | <i>Paradoxus</i> group.. | } | <i>Californicus</i> group. |
| } | Subgenus <i>Perognathus</i> (proper). | | | | | | | | | | |
| } | <i>Penicillatus</i> group. | | | | | | | | | | |
| } | Subgenus <i>Chatodipus</i> . | | | | | | | | | | |
| } | <i>Paradoxus</i> group.. | | | | | | | | | | |
| } | <i>Californicus</i> group. | | | | | | | | | | |

KEY TO SPECIES AND SUBSPECIES OF PEROGNATHUS.

In the preparation of the following key the dichotomous system has been followed because of the manifest advantage it affords in presenting

* *Chatodipus*, in reference to the stiff hairs of these animals compared with the soft pelage of *Perognathus* proper. The type is *Chatodipus spinatus* sp. nov.

in alternative couplets the characters employed, and also because it permits the use of antithetical diagnoses throughout.

External characters have been selected whenever feasible, in order to increase the usefulness of the key.

For greater convenience, subspecies have been treated as species, both in the key and in the tables which follow :—

Mastoids projecting behind plane of occiput ; mastoid side of parietal longest
(subgenus *Perognathus*).

- a*¹ Tail crested-penicillate ; pelage coarse.
Antitragus lobed ; hind foot 26 ; tail vertebræ $\frac{1}{4}$ longer than head and body *formosus*.
- a*² Tail not crested-penicillate ; pelage fine or soft.
- b*¹ *Antitragus* LOBED ; size rather large (tail vertebræ longer than head and body).
- c*¹ Fur of belly plumbeous at base.
Hind foot about 24.5 *amœnus*.
Hind foot about 21 *monticola*.
- c*² Fur of belly white to roots of hair *olivaceus*.
- b*² *Antitragus* NOT lobed ; size medium or small.
- d*¹ Tail vertebræ longer than head and body.
Audital bullæ meeting in symphysis anteriorly *inornatus*.
Audital bullæ not meeting anteriorly *longimembris*.
- d*² Tail vertebræ not longer than head and body.
- e*¹ Tail vertebræ nearly as long as head and body.
Lower premolar about half as large as last lower molar *apache*.
- e*² Tail considerably shorter than head and body.
- f*¹ Tail vertebræ about 60.
Upper parts olive-green *fasciatus*.
Upper part yellowish-brown *flavescens*.
- f*² Tail vertebræ about 40.
Hind foot 15 ; lower premolar longer than broad *flavus*.
Hind foot 17 ; lower premolar broader than long *bimaculatus*.

Mastoids not projecting behind plane of occiput ; mastoid side of parietal not longest (subgenus *Chætodipus*).

OCCIPUT TRUNCATED POSTERIORLY.

- b*¹ Hind foot long and narrow.
- c*¹ Tail crested-penicillate ; no supra-orbital bead (*Penicillatus* group).
- d*¹ Spines or bristles on rump.
- e*¹ Interparietal strap-shaped ; rump spines small.
Tail very long (vertebræ 106) ; pelage coarse *intermedius*.
Tail shorter (vertebræ 92) ; pelage finer *obscurus*.
- e*² Interparietal broadly pentagonal ; rump spines large.
Hind foot 24 ; lower premolar larger than last molar *fallax*.
Hind foot 21 ; lower premolar smaller than last molar *spinatus*.
- d*² No spines or bristles on rump.
Hind foot about 25 *penicillatus*.
- c*² Tail not crested-penicillate ; a distinct supra-orbital bead (*Paradoxus* group).
Hind foot 26 ; ear without distinct spot *paradoxus*.
Hind foot 23 ; ear with distinct dark spot *spilotus*.
- b*² Hind foot short and broad.
Tail not crested-penicillate (*Hispidus* group).
Hind foot 21.5 ; lower premolar larger than last molar *hispidus*.
- a*³ OCCIPUT BULGING POSTERIORLY.
Tail crested-penicillate ; ears very long (*Californicus* group).
White spines confined to rump *californicus*.
White spines extending forward on flanks *armatus*.

ARRANGEMENT OF SPECIES AND SUBSPECIES BY HAIRINESS OF SOLES.

Sole of hind foot..	}	Entirely naked:.....	{ formosus. fallax. intermedius. obscurus. spinatus. penicillatus. californicus. armatus. paradoxus. spilatus. hispidus.
		Posterior $\frac{1}{2}$ hairy	{ fasciatus. flavescens. flavus. apache.
		Posterior $\frac{1}{3}$ hairy	{ inornatus. longimembris.
		Posterior $\frac{1}{4}$ hairy	{ olivaceus. amœnus.

ARRANGEMENT OF SPECIES AND SUBSPECIES BY RELATIVE SIZE AND SHAPE OF LOWER PREMOLAR.

1. SIZE OF LOWER PREMOLAR COMPARED WITH LAST MOLAR.

<i>Larger.</i>	<i>Smaller.</i>	<i>About equal.</i>
Californicus.	Apache.	Paradoxus.
Armatus.	Monticola.	Spilotus.
Hispidus.	Olivaceus.	Inornatus.
Intermedius.	Amœnus.	Fasciatus.
Fallax.	Bimaculatus.	
Obscurus.	Flavescens.	
Penicillatus.	Spinatus.	
Formosus.		
Flavus.		
Longimembris.		

2. RELATIVE PROPORTIONS OF CROWN OF LOWER PREMOLAR.

<i>(a.) Noticeably longer than broad.</i>	<i>(b.) About as broad as long.</i>	<i>(c.) Broader than long.</i>
Californicus.	Paradoxus.	Apache.
Armatus.	Spilotus.	Bimaculatus.
Flavus.	Hispidus.	Penicillatus.
Fallax.	Intermedius.	Fasciatus.
	Formosus.	Obscurus.
	Flavescens.	
	Longimembris.	
	Inornatus.	
	Olivaceus.	
	Amœnus.	
	Monticola.	

3. RELATIVE SHAPE OF CROWN OF LOWER PREMOLAR.

<i>(1.) Narrowest anteriorly.</i>	<i>(2.) Narrowest externally.</i>	<i>(3.) Sub-triangular.</i>
Paradoxus.	Apache.	Apache.
Spilotus.	Inornatus.	Fasciatus.
Californicus.	Olivaceus.	Spinatus.
Intermedius.	Amœnus.	
Obscurus.	Fasciatus.	
Fallax.	Formosus.	
Penicillatus.	Spinatus.	
Formosus.		
Monticola.		
Flavescens.		

ARRANGEMENT OF SPECIES AND SUBSPECIES BY SHAPE OF INTERPARIETAL.



Shield-shaped or squarish-pentagonal (ratio of length to breadth above 60).

Inornatus. Apache. Longimembris. Bimaculatus (?). Fasciatus.	Flavus (anterior angles rounded). Olivaceus. Amœnus. Monticola.	Formosus (posterior angles rounded). Flavescens.
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Broadly pentagonal (ratio of length to breadth below 60).

Penicillatus (posterior angles rounded). Fallax. Spinatus.	Paradoxus. Spilotus } posterior angles rounded; sides strongly divergent anteriorly. Hispidus } Californicus (convex posteriorly).
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Strap-shaped (ratio of length to breadth 38.2 to 46.6).

Obscurus.	Intermedius.
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Arrangement of species and subspecies by parietal proportions.

[By longest side.]

Mastoid side longest.	Median and frontal sub-equal.	Frontal and posterior subequal (median shorter).	Frontal, posterior, and median sub-equal.
Apache. Inornatus. Longimembris. Flavus. Bimaculatus. Fasciatus. Flavescens. Formosus. Olivaceus. Amœnus. Monticola.	Paradoxus. Spilotus. Hispidus. Fallax. Intermedius. Obscurus.	Californicus. Penicillatus.	Spinatus. Armatus.

Measurements and ratios of skulls of *Perognathus*.*

	Fasciatus 445 ♂	Flavescens 5027 ♂	Apache. 4984 ♂	Inornatus. 13394 ♂	Longimembri. 3572 ♂	Flavus. 5047 ♂	Olivaceus. 5623 ♂	Aeneus. 5795 ♂	Monticola. 1586 ♀	Formosus. 5908 ♂	Intermedius. 5309 ♂	Fallax. 2264 ♂	Obscurus. 2848 ♀	Spinatus. 6137 ♂	Penicillatus. 6206 ♂	Paradoxus. 1544 ♀	Spilotus. 23096 ♀	Californicus. 5827 ♀	Hispidus. 1696 ♀
Basilar length (occipital condyle to incisor).....	19	17.5	19.3	.....	16.7	15.8	20.6	21	.....	21.1	19	20.8	19.7	18.8	21.1	20.6	25.2	20.5	.....
Basilar length of Hensel (inferior lip of foramen magnum to incisor).....	18	15.4	17.5	.....	15	14	18.5	19	.....	19.2	16.6	18.7	17.4	16.5	19.1	23.7	23	18.1	.....
Occipito-nasal length (greatest length of skull).....	23.4	22.3	24.3	23.2	21.4	19.7	27	26.5	24.5	27.5	24.4	26.7	25.4	23.7	26.4	32	31	26.7	27.5
Greatest mastoid breadth.....	12.3	12	12.3	12.9	11.8	11	13.4	13.8	13	14.6	13.5	13.8	13	12.2	13.2	15.7	14.5	13.4	14.5
Inornastoid breadth (at narrowest point).....	4.1	3.3	3.8	3.4	3.6	3.2	4.4	5.7	2	6	8	8.4	8.7	8	8.6	9	8.6	8.7	8
Greatest length of interparietal.....	3	3.2	3	2.8	3.2	2.5	3.6	3.5	3.4	4	3	3.7	3.4	3.5	3.5	4.5	4.2	4.3	3.8
Greatest breadth of interparietal.....	4.5	5.2	3.8	3.3	3.7	3.2	5.1	5.3	5	5.8	7.8	8.1	7.3	7.3	7.5	8	7.3	8.5	7
Ratio of mastoid breadth to basilar length (condylar diameter).....	49	38.5	63.7	.....	70.6	69.6	65	65.7	.....	69.1	71	66.3	65.9	64.8	62.5	59	57.5	63.3	.....
Internastoid breadth to basilar length (condylar diameter).....	21.5	30.2	19.6	.....	21.5	20.2	26.2	27.1	.....	28.4	42.1	40.3	40.6	42.5	40.7	33.8	34.1	42.4	.....
Mastoid breadth to basilar length of Hensel.....	68.3	77.9	70.2	.....	78.6	78.5	72.4	72.6	.....	76	81.3	73.7	74.7	73.9	69.1	66.2	63	74	.....
Internastoid breadth to basilar length of Hensel.....	22.7	34.4	21.7	.....	24	22.8	29.1	30	.....	31.2	47.8	44.9	45.9	48.4	45	37.9	37.3	48	.....
Mastoid breadth to occipito-nasal length.....	52.5	53.8	50.6	55.6	55.1	55.8	49.6	52	53	53	55.3	51.6	51.1	51.4	50	49	46.7	50.1	152.7
Length to breadth of interparietal.....	66.6	61.5	78.9	84.8	86.4	78.1	70.5	66	68	69	38.2	45.6	46.6	47.9	46.6	56.3	57.5	50.5	54.2

* This table contains measurements and ratios of nineteen of the twenty-one species and subspecies described in this paper. The skulls of the two remaining species (*bimaculatus* and *armatus*) are too much broken to admit of measurement.
 † Approximate; skull broken.

PEROGNATHUS FASCIATUS Maximilian.

Perognathus fasciatus Max. Wied, Nova Acta Acad. Cæs. Leop. Carol., XIX, 1, 1839, 369-373, pl. XXXIV (col.). *Type* from the Upper Missouri near its junction with the Yellowstone.—Max. Wied, Reise in das innere Nord Amerika, I, 1839, 449-450.

Perognathus flavus Baird, Mammals of North America, 1857, 423-425 (in part only).

Duplicate type $\frac{3\frac{3}{4} \times 6\frac{5}{8}}{4\frac{1}{4} \times 5}$ ♂. From near junction of Yellowstone and Missouri Rivers, Montana, October 6, 1887. Vernon Bailey.

Measurements.—Total length, 135; tail vertebrae, 60 (taken in flesh by collector). Hind foot, 17.5; ear from crown, 4.5 (measured from dry skin).

General characters.—Size small (intermediate between *penicillatus* and *longimembris*); ears small, well haired on both sides, particularly on the inflexed upper portion and on the base below; no antitragal lobe; tail nearly as long as head and body, not crested or penicillate; posterior half of soles haired; pelage soft.

Color.—Above, between olive green and olive-gray, faintly suffused with pale fulvous, and finely lined with blackish; a light fulvous lateral stripe*; under parts, including fore legs and feet, white to roots of hairs. Tail not bicolor, but slightly paler below than above. Ears with a light yellowish patch on inflexed upper portion, another on lower margin; a larger patch of same color behind each ear.

Cranial and dental characters.—Skull rather small, moderately arched; mastoids largely developed and projecting slightly behind plane of occiput (ratio of mastoid breadth to basilar length of Hensel, 68.3; of intermastoid breadth, 22.7); audital bullæ separated by less than breadth of basisphenoid; interparietal pentagonal, considerably broader than long (ratio of length to breadth 66.6); nasals not extending quite so far posteriorly as nasal branch of premaxillaries; mastoid border of parietal longest; coronoid process of mandible rather long. Upper premolar hardly as broad as first molar; second and third molars successively narrower. Lower premolar about the size of last molar, its crown broader than long,† much narrower externally than internally, and anteriorly than posteriorly; first lower molar conspicuously the largest tooth; second and third successively smaller; deciduous lower premolar nearly twice as long as broad, as usual in the genus.

General remarks.—*Perognathus fasciatus* is remarkable among mammals for the olive-green color which pervades its upper parts. A trace

* Throughout this paper the term *lateral stripe* is applied to the tawny band which usually separates the color of the upper parts from the white of the under parts. It must not be supposed to imply the existence of a real stripe *within* the color of the upper parts, such as is present in many of the ground squirrels.

† In the genus *Perognathus* the deciduous lower premolar is a long time in falling out, and in the case of young skulls care must be taken not to mistake it for the permanent tooth. It is very much longer than broad, and has five well-developed cusps: an anterior, a middle pair, and a posterior pair (see plate IV, fig. 1).

of the same tint occurs in its congeners *P. olivaceus* and *P. olivaceus amoenus*, but it is only a trace. In size it ranks among the smaller members of the genus, being little larger than *longimembris*.

Just fifty years ago (in 1839) this beautiful species, the type of the genus *Perognathus*, was accurately described and figured by Prince Maximilian from specimens collected by himself near the junction of the Yellowstone with the Missouri. From that time till the present it has never been recognized by its right name, but has been confounded with *Perognathus flavus*, a very different animal. The origin of this confusion has been already explained in the introductory portion of the present paper.

PEROGNATHUS FASCIATUS FLAVESCENS subsp. nov.

Perognathus flavus Baird, Mamm. N. Am., 1857, 423-425 (in part only).

Type $\frac{4393}{3027}$ ♂ ad. From Kennedy, Nebraska, June 11, 1888. Vernon Bailey.

Measurements.—Total length, 136; tail vertebræ, 63 (taken in flesh by collector). Hind foot, 17; ear from crown, 4 (measured from dry skin).

General characters.—Size of *P. fasciatus*, with ears and tail as in that species; pelage coarser.

Color.—Above, pale yellowish-brown, lined with blackish, without trace of the olive-green of *fasciatus*; sides with a pale fulvous lateral stripe; under parts, including fore legs and feet, white to base of hairs; ear with a whitish spot on inflexed upper portion and another on inferior margin. The dark hairs of the back do not reach so far down on the face and sides as in *fasciatus*; on the head they are limited to the triangular space extending from the upper corners of the ears to the sides of the nose, leaving a broad zone of pale fulvous around each eye. The end of the nose is whitish all round. The absence of black hairs from the upper surface of the thighs leaves these parts pale fulvous like the sides.

Cranial and dental characters.—Skull a little smaller than that of *fasciatus*; vault of cranium more highly arched; mastoids not quite so large (ratio of mastoid breadth to basilar length of Hensel, 77.9; of intermastoid breadth, 34.4); interparietal broader (ratio of length to breadth, 61.5), sides much spreading, posterior edge notched; audital bullæ meeting anteriorly; mastoid border of parietal longest; coronoid process of mandible more slender and less spreading. Lower premolar slightly smaller than last molar, its crown squarish with rounded corners; not decidedly narrower externally than internally.

General remarks.—*P. fasciatus flavescens* is a well marked subspecies, easily distinguished from *fasciatus* by coloration, by its broad orbital ring, by the comparative harshness of its pelage, by the shape of the crown of its lower premolar, and by the fact that its audital bullæ meet anteriorly.

PEROGNATHUS FLAVUS Baird.

Perognathus flavus Baird, Proc. Acad. Nat. Sci. Phila., Apr., 1855. 332 (*type* from El Paso, Tex.).—Baird, Mamm. N. Am. 1857. 423-425 (in part only).

No. $\frac{4323}{5047}$ ♂ ad. From Mason, Texas, May 31, 1888. Ira B. Henry.

Measurements.—Total length 95^{mm} (taken in flesh by collector; other measurements from dry skin); tail vertebræ, 40 + (extreme tip gone); hind foot, 15; ear from crown, 4.

General characters.—Size, smallest of the known species; ear relatively large; no antitragal lobe; tail considerably less than head and body—perhaps about equaling body alone—not crested or penicillate; pelage soft; posterior half of sole sparsely haired.

Color.—Above, light fulvous, obscured by black-tipped hairs and clearest on the sides, but no distinct lateral stripe; under parts, including fore legs and feet, white to base of hairs; ears with a white spot on inferior margin; a large, light yellowish-buff patch behind each ear; a broad ring of dull, pale fulvous around each eye.

Cranial and dental characters.—Skull very small, with largely-developed mastoids, which encroach on interparietal and project behind occipital plane (ratio of mastoid breadth to basilar length of Hensel, 78.5; of intermastoid breadth, 22.8); interparietal very small, with anterior angles much rounded (ratio of length to breadth, 78.1); audital bullæ meeting in symphysis below basisphenoid; mastoid border of parietal longest. Lower premolar slightly larger than last molar, its crown longer than broad. First lower molar largest; second and third successively smaller.

General remarks.—Unfortunately, Baird's type can not be found. His original description, which is very brief, applies well to the above specimen from Mason, Texas, except that the tail was longer. Mason is a little more than 400 miles east of El Paso, and is in another faunal area; hence it would not be strange if future collections show the El Paso animal to be different from the one here described.*

PEROGNATHUS BIMACULATUS sp. nov.

Type no. $\frac{8455}{23729}$ ♂ ad. U. S. National Museum. From Fort Whipple, Arizona, May 21, 1865. Dr. Elliott Coues.

Measurements.—Total length, 117^{mm}; head and body, 71 (taken in flesh by collector). Tail vertebræ, 40 (bone left in tail); hind foot, 17; ear from crown, 4 (from dry skin).

* Following is Baird's original description in full:

"*Perognathus flavus* Baird.—Much smaller than the common house mouse (*Mus musculus*). Tail nearly equal to or less than the body, scarcely differing in color above and below. Hind feet short.

"*Color*.—Above yellowish buff, with dusky tips to some of the hairs; paler and clearer on the sides. Beneath snowy white to the roots of the hairs. Hairs on the back plumbeous only on their basal half. Head and body, 2 $\frac{1}{2}$ inches. Tail to end of vertebræ, 2 inches. Hind foot from heel, 7 $\frac{1}{2}$ inches [manifest error for *lines*].

"Collected at El Paso by J. H. Clark." (Proc. Acad. Nat. Sci. Phila., vol. VII, 1855, 332.)

General characters.—Size, small, about equal to *P. longimembris*; tail short, hardly equaling body without head; ear relatively large; no antitragal lobe; pelage soft; sole haired on posterior half.

Color.—Similar to that of *P. flavus* but darker, with top of nose much darker, and yellowish post-auricular spot much larger and more conspicuous.

Cranial and dental characters.—Nothing remains of the skull but a few fragments. The mastoids, audital bullæ, and interparietal are altogether wanting, so that it is impossible to ascertain a single cranial character. The lower jaw, however, is in fair condition, and the teeth remain in situ. The lower premolar is noticeably smaller than the last molar and its crown is broader than long.

General remarks.—*P. bimaculatus* may be distinguished from *P. flavus* by its larger size, longer hind foot (17 instead of 15), and the small size of the lower premolar.

PEROGNATHUS LONGIMEMBRIS (Coues).

? *Perognathus parrus* Baird [not Peale], Mammals N. Am., 1857, 425-426 (from Tulare County, Cal.).

Cricetodipus parvus Coues, Proc. Acad. Nat. Sci. Phila., 1875, 303-305.

Otognosis longimembris Coues [provisional name], Proc. Acad. Nat. Sci. Phila., 1875, 305.

Type no. 9856, ♀, U. S. National Museum. From Fort Tejon, Cal. J. Xantus.

Measurements.—Head and body, 51^{mm} (from Coues; other measurements made by myself from the alcoholic specimen); tail vertebræ, 58; pencil, 8; hind foot, 17.5; ear, 3.5.

General remarks.—Coues states: "As well as can be judged from the insufficient material before me, this species does not differ materially in color from *P. flavus*; and in fact the only diagnostic characters at present appreciable are the greater length of the hind feet and tail." (Proc. Acad. Nat. Sci. Phila., 1875, 304.)

Fortunately, I possess a fine series of specimens from San Bernardino, Cal., which place is only about 100 miles from Fort Tejon, the type locality of *O. longimembris*. I take pleasure in adding, therefore, the following description of an adult male:

No. 3892 ♂ ad. From San Bernardino, Cal., May 6, 1885. F. Stephens.

Measurements.—Head and body, 56; tail vertebræ, 63; hairs, 5.5; (taken in flesh by collector); hind foot, 17.5; ear from crown, 4.5 (measured from dry skin).

General characters.—Size, small; ears rather large, without antitragal lobe; tail vertebræ a little longer than head and body; scantily haired, and with a sparse terminal pencil, not crested; posterior third of soles haired; pelage soft.

Color.—Above, yellowish brown, everywhere finely lined with dusky; sides with a lateral line of the same color, but without the dark hairs; under parts, including fore legs and feet, white; tail concolor, yellow-

ish, becoming dusky toward the tip. There is a yellowish patch behind each ear, and a white spot at the inferior margin of the ear. [Some specimens have also a white spot on the infolded upper margin. Young grayish brown above, tail darker above than below.]

Cranial and dental characters.—Skull small, rather flat; mastoids very much swollen, projecting considerably behind plane of occiput (ratio of mastoid breadth to basilar length of Hensel, 78.6; of intermastoid, 24); interparietal pentagonal, nearly as long as broad (ratio of length to breadth, 86.4); audital bullæ separated by full breadth of basisphenoid; mastoid border of parietal longest. Coronoid process of mandible moderately developed. Lower premolar slightly larger than last molar, its crown squarish, slightly narrower anteriorly than posteriorly, and externally than internally; first molar larger than second; third a little more than half as large as second.

PEROGNATHUS APACHE sp. nov.

Type $\frac{4253}{1934}$ ♂ ad. Apache County, Arizona, May 22, 1888.

Measurements.—Total length (measured in the flesh), 140. Tail, 68; hind foot, 18.5; ear from crown, 4 (measured from dry skin).

General characters.—Size, medium; tail about as long as head and body, or a little shorter, not crested or penicillate; ears small; no antitragal lobe; soles haired to base of toes; whiskers rather short; pelage moderately soft.

Color.—Above, light tawny-ochraceous, finely and sparingly lined with black, which does not hide the ground color; under parts, including fore legs and feet, pure white to base of fur. Tail indistinctly bicolor, yellowish above and whitish beneath. Ears with an indistinct whitish spot on lower margin. On the back the plumbeous basal portion of the fur occupies less than half the length of the hairs.

Cranial and dental characters.—Skull a little larger than that of *P. fasciatus*, nearly flat; mastoids greatly swollen, reaching, perhaps, the maximum of development seen in the genus, and projecting backward behind the plane of the occiput (ratio of mastoid breadth to basilar length of Hensel 70.2; of intermastoid breadth 21.7); interparietal pentagonal, very small, sides scarcely divergent anteriorly (ratio of length to breadth 78.9); audital bullæ meeting in a symphysis below the basisphenoid; nasals ending posteriorly almost on a line with nasal branch of premaxillaries; mastoid border of parietal longest; coronoid process of mandible rather small. Crown of upper premolar narrower than first molar; lower premolar very small, scarcely half as large as last molar, its crown broader than long, subtriangular.

General remarks.—*P. apache* is the *yellowest* species thus far discovered. In size it is a little larger than *P. fasciatus*. In the great development of the mastoids and consequent smallness of the interparietal it closely approaches *P. inornatus*.

PEROGNATHUS INORNATUS sp. nov.

? *Perognathus parvus* Baird, Mamm. N. Am., 1857, 425-426.

Type No. $\frac{133794}{23794}$ ♂ yg. ad. Fresno, California.

Measurements.—(Taken from alcoholic specimen before skinning out skull.) Total length, 137; head and body, 65; tail vertebræ, 71; pencil, 4; hind foot, 18.5; ear from crown, 4.

General characters.—Size, medium, about equaling *P. apache*, which it greatly resembles; tail a little longer than head and body, not crested; ear rather small; no antitragal lobe; posterior third of soles haired; whiskers rather short; pelage rather soft.

Color.—Owing to long immersion in alcohol it is impossible to be sure of the original color. Apparently, however, it was a light yellowish-brown not unlike that of *P. apache*, but faintly lined with blackish.

Cranial and dental characters.—Skull similar to that of *P. apache* in size and shape, but even flatter, and narrower interorbitally; mastoids greatly swollen and projecting considerably behind plane of occiput (ratio of mastoid breadth to occipito-nasal length, 55.6); audital bullæ meeting anteriorly in symphysis; interparietal very small, squarish-pentagonal with sharp angles (ratio of length to breadth, 84.8); nasals falling considerably short of nasal branch of premaxillaries; mastoid border of parietal longest. Coronoid process of mandible rather large. Lower premolar about the size of last molar, its crown squarish, slightly narrower externally than internally.

General remarks.—In size, proportions, and (?) color *P. inornatus* closely resembles *P. apache*. Its skull also bears a striking resemblance to that of *apache*, but is narrower interorbitally and has shorter and more slender nasals. The lower premolar, however, is very different, being about the size of the last molar instead of only half as large, and its crown is squarish instead of subtriangular as in *apache*. From *P. longimembris* it is easily distinguished by its much larger size.

Very probably this is the species described by Baird as *P. parvus*. His specimen was very young and was mounted. Its mutilated and faded remains afford no positive characters, but the length of its hind foot [18^{mm}, as given by Baird], and the circumstance that it came from Kings River, Tulare County, Cal., a locality only a few miles distant from Fresno, suggest the probability of its identity with the present species.

PEROGNATHUS OLIVACEUS sp. nov.

Type $\frac{4876}{5623}$ ♂. Kelton, Utah, October 24, 1888. Vernon Bailey.

Measurements.—Total length to end of vertebræ, 184; tail to end of vertebræ 101; pencil, 9 (taken in flesh by collector); hind foot, 23; ear from crown, 5 (measured from the dry skin).

General characters.—Size rather large; ears medium, with antitragal lobe large, about as high as broad; tail slightly penicillate, not noticea-

bly crested, its vertebræ longer than head and body; soles haired on posterior fourth; pelage soft and silky.

Color.—Above, yellowish-brown, finely mixed with black, and tinged with olive, though not so distinctly as in *P. fasciatus*; below, pure white to roots of hair. Tail bicolor: above, proximal half like the back, distal half becoming sooty-brown; below, white. There is a distinct white spot on the inferior margin of the ear which reaches up to the base of the antitragal lobe.

Cranial and dental characters.—Skull rather large, moderately arched; mastoids greatly developed (ratio of mastoid breadth to basilar length of Hensel 72.4; of intermastoid breadth 29.1); interparietal rounded shield-shaped (ratio of length to breadth 70.5); nasals not reaching quite so far back as nasal branches of premaxillaries; audital bullæ separated anteriorly by less than full breadth of basisphenoid; mastoid border of parietal longest. Coronoid process of mandible moderately long. Lower premolar slightly smaller than last molar; its crown squarish, slightly narrower externally than internally; first and second molars subequal.

General remarks.—*P. olivaceus* looks like an overgrown *P. fasciatus*. It has the same soft, silky fur, the same white spot below the ear, and, though to a less degree, the same olive tinge which is so unusual among mammals. But it is much larger than *fasciatus*, has a penicillate tail, and a different skull.

PEROGNATHUS OLIVACEUS AMÆNUS subsp. nov.

Type No. $\frac{5193}{3}$ ♂. Nephi, Utah, November 23, 1888. Vernon Bailey.

Measurements.—Total length, 178; tail vertebræ, 93 (taken in the flesh by collector); pencil, 9; hind foot, 24.5; ears from crown, 4 (measured from the dry skin).

General characters.—Size rather large; ears small, with antitragal lobe large, a little higher than broad; tail penicillate, not crested, its vertebræ longer than head and body; soles haired on posterior fourth; pelage soft and silky.

Color.—Above, yellowish-brown, finely mixed with black, and faintly tinged with olive; sides pale salmon, fading gradually into the white of the under parts, which is suffused with the same color; hairs of belly plumbeous at base. Tail indistinctly bicolor: above, proximal half colored like back, but paler; distal half becoming sooty-brown; below, whitish. There is a small spot of yellowish-white on the inferior margin of the ear.

Cranial and dental characters.—Very similar to *P. olivaceus*, but skull a little broader posteriorly, and interparietal relatively broader (ratio of length to breadth 66).

General remarks.—*P. olivaceus amænus* differs from *P. olivaceus* in having smaller ears with the light spot on inferior margin much less con-

spicuous; in having the fur of the belly plumbeous at base and suffused with salmon, instead of pure white, and in having the hind foot longer and the tail shorter.

PEROGNATHUS MONTICOLA Baird.

Perognathus monticola Baird, Mammals N. Am., 1857, 422-423. Type from (?) St. Mary's Mission, Montana.

Type $\frac{158.5}{45.1}$ ♀ ad. U. S. National Museum. St. Mary's Mission (?), west of Rocky Mountains.

Measurements.—(From Baird) Head and body 76; tail 78 + (tip broken off); hind foot 21.*

General characters.—Size medium, a little smaller than *P. olivaceus*; ears medium; antitragus lobed; tail not crested-penicillate; its vertebræ slightly longer than head and body; pelage moderately soft.

Color.—(From Baird) Above, mixed cinnamon and dusky; beneath, white; hairs below as well as above, plumbeous at base; a pale cinnamon lateral stripe; outside of fore leg dusky to the wrist; tail bicolor.

Cranial and dental characters.—Skull a little smaller than that of *P. olivaceus*, a little larger than *fasciatus*; vault of cranium arched about as in *olivaceus*. Mastoids largely developed, projecting slightly behind plane of occiput; audital bullæ united anteriorly by symphysis; interparietal pentagonal, relatively broader than in *formosus*, but not so broad as in *fasciatus* and *flavescens* (ratio of length to breadth 68.0); mastoid border of parietal longest; coronoid process of mandible slightly longer than in *olivaceus*, but not so long as in *fasciatus*. Lower premolar smaller than last molar, its crown a little longer than broad, and narrower anteriorly than posteriorly.

General remarks.—*P. monticola* is a perfectly good species, which has escaped notice since 1853, when the type and only known specimen was collected by Dr. George Suckley. Its skull indicates affinity with *P. olivaceus*. In coloration it now resembles *P. penicillatus*, but it is so worn and faded from long exposure to light and dust that little dependence can be placed on its present color. The practice of mounting and exhibiting type specimens can not be too strongly condemned. It is a relic of barbarism which modern museums can not afford to perpetuate.

PEROGNATHUS FORMOSUS sp. nov.

Type No. $\frac{520.3}{130.3}$ ♂ ad. St. George, Utah, January 2, 1889. Vernon Bailey.

Measurements.—Total length to end of vertebræ, 195; tail vertebræ, 111, pencil 16; hind foot, 26 (taken in flesh by collector); ear from crown, 6 (measured from the dry skin).

* This is the present measurement of the hind foot in the mounted specimen, and consequently must be a little less than in life. Baird's measurement (.80 inch) is a little too short.

General characters.—Size large; ears very large; antitragal lobe considerably higher than broad; tail vertebræ a fourth longer than head and body; tail penicillate, and crested above on the terminal third; soles entirely naked to end of heels; pelage moderately soft, not so fine as in *P. olivaceus*, and not so harsh as in *penicillatus*.

Color.—Above, grizzled yellowish-brown, with an abundant admixture of black-tipped hairs (this color reaching down on the arms to the elbows); below, white to roots of hairs; lateral line, faint and narrow; tail, bicolor: above, proximal third colored like back, then gradually becoming darker until the distal half is dark sooty-brown; below, yellowish-white, except the pencil, which is dark on both sides.

Cranial and dental characters.—Mastoids largely developed (ratio of mastoid breadth to basilar length of Hensel 76; of inter-mastoid breadth 31.2); interparietal pentagonal, with posterior angles rounded, considerably broader than long (ratio of length to breadth 69); audital bullæ meeting anteriorly in a symphysis; mastoid border of parietal longest; mastoid bar of squamosal reduced to a mere spicule, which disappears above the meatus; coronoid process of mandible minute and depressed—not nearly so prominent as in *olivaceus*. Upper premolar broader than first molar; lower premolar larger than last molar, its crown about as broad as long, conspicuously narrower anteriorly than posteriorly, its posterior cusp nearly as broad as second molar; last lower molar smaller than usual in the group.

General remarks.—This elegant species, which I have named *Perognathus formosus*, is the largest of the subgenus *Perognathus*, from all other members of which it differs in the possession of a very long and heavily crested tail, the vertebræ alone measuring one-fourth more than the head and body. Its ears also are very long, about equaling those of *Chatodipus californicus*, and its soles are entirely naked. In fact, from its external characters no one would suspect it to belong to the subgenus *Perognathus* at all. To use a "Cousinism," it has the skull of a *Perognathus* in the skin of a *Chatodipus*.

PEROGNATHUS INTERMEDIUS sp. nov.

Type no. $\frac{5300}{000}$ ♂ ad. Mud Spring, Arizona, February 26, 1889. Vernon Bailey.

Measurements.—Total length, 183; tail vertebræ, 106; pencil, 18; hind foot, 21 (taken in flesh by collector); ear from crown, 4.5 (from dry skin).

General characters.—Size intermediate between *spinatus* and *penicillatus*; tail vertebræ much longer than head and body; tail crested-penicillate; soles naked; ears thicker and darker than in *penicillatus*; antitragal lobe large; higher than broad; lateral stripe present; soles naked; pelage coarse, with slight tendency to become bristly on rump (bristles about as in *obscurus*).

Color.—Above, drab-gray, faintly suffused with pale fulvous and coarsely lined with blackish; lateral line, pale fulvous; below, includ-

ing fore legs and feet, white to roots of hairs. Tail, bicolor; sooty-brown above, whitish beneath.

Cranial and dental characters.—Skull intermediate in size between *penicillatus* and *spinatus*, slightly more arched than that of *penicillatus*; mastoids relatively larger than in either *penicillatus* or *spinatus*; audital bullæ separated by a little less than full breadth of basisphenoid; interparietal strap-shaped, much more than twice as broad as long (ratio of length to breadth 38.2), its anterior margin only very slightly convex; nasals ending posteriorly about on a line with nasal branch of premaxillaries; median and frontal borders of parietal subequal. Coronoid process of mandible rather small. Lower premolar a little larger than last molar; its crown about as long as broad; noticeably narrower anteriorly than posteriorly. Owing to the nearly straight anterior margin of the interparietal, the parietals are unusually long in the median line, measuring as much along the sagittal suture as along the frontal border.

General remarks.—In size and coloration *P. intermedius* closely resembles *P. spinatus*, but it has a distinct, though pale, lateral stripe. It has a few small bristles on its rump, but nothing like the long grooved spines of *spinatus*. Its lower premolar is much larger than that of *spinatus*, and squarish instead of subtriangular. It differs from *penicillatus* in size, coloration, and the tendency to develop bristles; also in the greater size of the mastoids, and in other cranial proportions. From *P. obscurus* it may be distinguished by its larger size, longer tail, coarser pelage, and by cranial characters. Perhaps its closest affinities are with *P. fallax*, from San Bernardino, Cal., from which it differs in being smaller, and in the smaller size of its ears, hind feet, and rump bristles, and in the nearly straight anterior edge of the interparietal.

PEROGNATHUS FALLAX sp. nov.

Type $\frac{1\frac{1}{2}}{2\frac{1}{2}}$ ♂ ad. U. S. National Museum. From San Bernardino, Cal., April 21, 1887. F. Stephens.

Measurements.—Head and body, 79; tail vertebræ, 104 (taken in flesh by collector); pencil, 15; hind foot, 24; ear from crown, 6 (taken from dry skin).

General characters.—Size large; tail crested-penicillate, its vertebræ much longer than head and body; ears large, thicker than in *penicillatus*; antitragal lobe much higher than broad; soles naked; pelage moderately soft (about as in *penicillatus*), becoming bristly on the rump. The bristles are arranged and colored as in *spinatus*; they are larger than in *obscurus*, but not so large as in *spinatus*.

Color.—Above, dark grizzled yellowish-brown, profusely lined with black; lateral line pale fulvous, covering the upper surface of the fore leg; below, white to base of hairs. Tail bicolor: above, sooty-brown; below, white.

Cranial and dental characters.—Skull large and broad, much arched; mastoids rather small (ratio of mastoid breadth to basilar length of Hensel, 73.7; of intermastoid breadth, 44.9), but slightly larger than in *penicillatus*; interparietal more than twice as broad as long (ratio of length to breadth, 45.6); audital bullæ separated anteriorly by nearly full breadth of basisphenoid; nasals emarginate posteriorly, extending nearly as far back as nasal branch of premaxillaries; frontal border of parietal longest, median and posterior subequal. Coronoid process of mandible very short, not rising to the level of the condyle. Upper tooth row strongly curved, the convexity outward. Lower premolar larger than last molar, its crown slightly longer than broad, and narrower anteriorly than posteriorly.

General remarks.—In size, length of ear, and coloration this species is intermediate between *penicillatus* and *californicus*. It is nearly as dark above as *californicus*, and has the lateral stripe and rump bristles of that species. Its skull, on the other hand, is clearly of the *penicillatus* type. At the same time it is more arched than that of *penicillatus*, and the plane of the occiput is a little fuller posteriorly. The coronoid process of the mandible is very short and low, and the crown of the lower premolar longer than broad, as in *californicus*.

PEROGNATHUS OBSCURUS sp. nov.

Type No. $\frac{2340}{2848}$ ♀ ad. From Camp Apache, Grant County, New Mexico, April 30, 1886. A. W. Anthony.

Measurements.—Total length, 168^{mm} (measured in flesh by collector; other measurements from dry skin); tail vertebræ about 92; pencil, 11; hind foot, 21; ear, from crown, 4.

General characters.—Size rather small, slightly smaller than *spinatus*; tail crested-penicillate, its vertebræ considerably longer than head and body, but relatively shorter than in *penicillatus*; ears large, moderately well haired; antitragal lobe higher than broad; tragus evident; hind feet large and broad; soles naked; whiskers very long, reaching to middle of body; pelage rather soft; hairs of rump very long with tendency to develop bristles.

Color.—Above, drab, suffused with pale fulvous, finely and profusely lined with blackish; a pale fulvous lateral stripe; below, including fore legs and feet, white to base of hairs, suffused with very pale fulvous or salmon.

Cranial and dental characters.—Skull rather large and flat, very broad interorbitally; mastoids small (ratio of mastoid breadth to basilar length of Hensel, 74.7; of intermastoid breadth, 45.9); audital bullæ separated anteriorly by full breadth of basisphenoid; interparietal strap-shaped, more than twice as broad as long (ratio of length to breadth 46.6); nasals extending posteriorly nearly as far as nasal branch of premaxillaries; median and frontal borders of parietal longest and subequal. Coronoid process of mandible small. Lower premolar much

larger than last molar, its crown broader than long, and narrower anteriorly than posteriorly.

General remarks.—*P. obscurus* is one of the few known species besides *spinatus* which show any tendency toward the development of spines in the pelage, but the small bristles on its rump are hardly more than a step in the direction of the large spines of *spinatus*. It differs further from *spinatus* in its smaller size, larger head, broader hind foot, shorter tail, finer pelage; in the presence of a pale fulvous lateral stripe and a suffusion of the same color throughout; in having a larger and flatter skull; in having the audital bullæ separated by full breadth of basisphenoid; in having the lower premolar larger than the last molar and its crown longer than broad.

PEROGNATHUS SPINATUS sp. nov.

Type No. $\frac{5449}{6137}$ ♂ ad. From Lower Colorado River, California, 25 miles below the Needles, March 23, 1889. Vernon Bailey.

Measurements.—Total length, 179; tail vertebræ, 104; pencil, 15; hind foot, 21 (taken in flesh by collector). Ear from crown, 3.5 (measured from dry skin).

General characters.—Size, rather small; tail crested-penicillate, its vertebræ a fourth longer than head and body; ears moderate, scant haired; antitragal lobe large; whiskers long; soles naked; pelage very coarse, becoming spinous on the rump.

Color.—Above, clear drab-gray, grayest on the sides, coarsely lined with blackish; no lateral stripe; under parts, including fore legs and feet, creamy white to roots of hairs. Tail sharply bicolor—above, dusky; below, white to end of vertebræ; pencil dusky all round.

Cranial and dental characters.—Skull of medium size, considerably smaller and more arched than that of *penicillatus*; mastoids small (ratio of mastoid breadth to basilar length of Hensel, 73.9; of intermastoid breadth, 48.4); interparietal broadly and flatly pentagonal, more than twice as broad as long (ratio of length to breadth, 47.9); audital bullæ separated by less than full breadth of basisphenoid; nasals ending posteriorly about on a line with nasal branch of premaxillaries; anterior, posterior, and median borders of parietals subequal; palatines noticeably thinner than rest of palate. Coronoid process of mandible very small. Upper molar series straight. Lower premolar smaller than last molar, its crown subtriangular, broader than long, and very much narrower anteriorly than posteriorly.

General remarks.—*Perognathus spinatus* may be distinguished at a glance from all other known species of the *penicillatus* group by the large size of the spines on its rump. These spines are arranged in three groups, and are of two kinds, namely: (a) elongated black-tipped bristles, with fine awn points, occupying the middle region of the rump on and near the median line; and (b) long white spines occupying the sides of the rump and situated a little posteriorly to the first mentioned. The

white spines are about 12^{mm} in length, and project far beyond the hairs. All the spines are grooved longitudinally. *P. obscurus* and *P. intermedius* also have rump spines, but they are much smaller and less conspicuous than in *spinatus*. *Perognathus spinatus* is the type of the subgenus *Chatodipus* described in the early part of this paper (see p. 5).

PEROGNATHUS PENICILLATUS Woodhouse.

Perognathus penicillatus Woodhouse, Proc. Acad. Nat. Sci. Phila., 1852, 200. Type from San Francisco Mountain, Arizona.

Perognathus penicillatus Woodhouse, Rept. Expd. Zuni and Colorado Rivers, Sitgreaves, 1853, 49-50, pl. 3 (based on same specimen as above).

Baird, Mammals N. Am., 1857, 418, 419, pl. xx, Fig. 5.

Coues, Proc. Acad. Nat. Sci. Phila., 1875, 257-292.—Coues, Monographs N. Am. Rodentia, 1877, 504-509.

Type No. 2676 ♂ ad. U. S. National Museum (*mounted*, skull inside.) From San Francisco Mountain, Arizona, 1851. Dr. S. W. Woodhouse.

Measurements (from Woodhouse).—Head and body, 89^{mm}; tail vertebræ 115 [pencil, 15]; hind foot 25.5.

General characters.—Size large; tail crested-penicillate, its vertebræ much longer than head and body; ears rather large, nearly naked; anitragal lobe higher than broad; soles naked; pelage moderately coarse

Color.—Above, "dull light yellowish-brown, or tawny, lined with dark brown;" below, including fore legs and feet, white to base of hairs; no lateral stripe. Tail bicolor: above, "dark brown;" below, white; pencil brown all round.

Cranial and dental characters.—Unknown (skull inside of mounted specimen).

General remarks.—The above described type of *P. penicillatus* (still in the U. S. National Museum) agrees almost precisely in size, proportions, and coloration (allowing a little for fading) with a recent specimen from the Lower Colorado, which will be here described in order to put on record its cranial characters so that they may be available for comparison with those of other members of the penicillatus group.

No. $\frac{5531}{206}$ ♂ ad. From Lower Colorado River, Arizona (Norton's, about 25 miles north of Yuma), March 28, 1889. Vernon Bailey.

Measurements (taken in flesh by collector).—Total length, 207; tail vertebræ, 115; pencil, 17; hind foot, 25; ear from crown, 5.5 (taken from dry skin).

General characters.—Size, large; tail, crested-penicillate; its vertebræ longer than head and body; ears large, nearly naked; anitragal lobe higher than broad, a small tragal lobe; sole naked; whiskers long, extending beyond shoulders; pelage moderately coarse, not becoming bristly on rump; no spines anywhere.

Color.—Above, drab-gray, faintly suffused with light tawny, and finely lined with dusky; below, including fore legs and feet, pure white to base of hairs; no lateral stripe. Tail sharply bicolor: above, dusky; below, white; pencil dusky all round.

Cranial and dental characters.—Skull large, rather flat; mastoids small (ratio of mastoid breadth to basilar length of Hensel 69.1; of intermastoid breadth 45); audital bulke separated anteriorly by full breadth of basisphenoid; interparietal broadly pentagonal, more than twice as broad as long (ratio of length to breadth 46.6); nasals not reaching so far back as nasal branch of premaxillaries; anterior and posterior borders of parietals subequal in length. Coronoid process of mandible moderately developed, rather thick. Lower premolar larger than last molar; crown broader than long,* narrower anteriorly than posteriorly; first molar a little larger than second; third about half as large as second.

General remarks.—It must be borne in mind that the skull of Woodhouse's type has not been examined, and consequently that there is a possibility,† however remote, that it differs in important particulars from the one here described. This point can not be absolutely settled until either the skull is removed from the mounted type or additional specimens are collected from the type locality, San Francisco Mountain, Arizona. This locality is about 230 miles distant from the point on the Lower Colorado River where the specimen here described was obtained.

PEROGNATHUS HISPIDUS Baird.

Perognathus hispidus Baird, Mamm. N. Am., 1857, 421-422 (type from Charco Escondido, Mexico).

Type No. $\frac{577}{1696}$ ♀ U. S. National Museum. From Charco Escondido, Mexico. Collected by Lieut. D. N. Couch.

Measurements.—Head and body, 79^{mm}; tail, 72+ (terminal portion broken off); hind foot, 21.5 (taken in flesh by collector); ear from crown, 4.5 (measured from dry skin).

General characters.—Size, rather large, about equaling *P. formosus*; hind foot remarkably broad and short; tail probably a little longer than head and body, not crested-penicillate; ears moderate, thick; antitragus lobed; soles naked; pelage harsh, but not much coarser than in *P. paradoxus*.

Color.—"Above, mixed cinnamon and black," not unlike *paradoxus*; a fulvous lateral stripe; under parts, including fore legs and feet, white to roots of hair. Tail distinctly bicolor: above, dark; below, whitish.

Cranial and dental characters.—Skull large; vault of cranium nearly flat; mastoids moderately developed—larger than in the *penicillatus*

* Specimens from the Colorado Desert in California, and from the Lower Colorado River region in Arizona from Fort Mojave northward, have the crown of the lower premolar longer than broad, while those from the region about Yuma have the crown broader than long. Possibly these two forms are deserving of separation, but it is deemed best to await the actual determination of this and other characters until specimens of *penicillatus* are secured from the type locality (San Francisco Mountain).

† This possibility is suggested by the very close external resemblance of *P. formosus* and *P. californicus*, species which really belong to widely different sections of the genus, as shown by their cranial characters.

group, but not so large as in *olivaceus* and *fasciatus*; interparietal broadly pentagonal (ratio of length to breadth 54.2); audital bullæ separated anteriorly by full breadth of basisphenoid; nasals not extending so far posteriorly as nasal branch of premaxillaries. Coronoid process of mandible long and sharp; condylar ramus nearly horizontal, upper edge turned down posteriorly. Lower premolar larger than last molar, its crown squarish; second lower molar a little larger than first.

NOTE.—Professor Baird included under the head of *P. hispidus* another specimen, collected at Matamoros, Mexico, by Dr. Berlandier, which I am by no means convinced is specifically the same. This specimen (No. $\frac{6796}{15795}$ U. S. National Museum) is not considered here. The above description, both of skin and skull, rests solely on Baird's type from Charco Escondido. Its skull, unfortunately, is broken in two transversely at the fronto-parietal suture. Both ends remain, however, together with the jaws, so that the important characters may still be seen.

PEROGNATHUS PARADOXUS sp. nov.

Perognathus fasciatus Baird [*not* of Max. Wied], Mammals N. Am., 1857, 420–421.

Type $\frac{240}{1544}$ ♀. Trego County, Kansas, October 17, 1884. A. B. Baker.

Measurements.—Head and body, 100; tail vertebræ, 105; hairs, 2.5 (taken in flesh by collector); hind foot, 26; ears from crown, 5.5 (from dry skin).

General characters.—Largest known species; ears large, with anti-tragal lobe higher than broad; tail a little longer than head and body, not crested or penicillate; soles naked along the median line, but hairs on sides of heel concealing the bare portion; pelage harsh; whiskers short.

Color.—Above, yellowish-brown, coarsely lined with black; sides fulvous; under parts, including fore feet, white to base of fur. Tail bicolor: above, fuliginous; below, whitish.

Cranial and dental characters.—Skull large and heavy, moderately arched, much higher than that of any other species, with a slightly elevated supra-orbital ridge or bead; mastoids relatively small (ratio of mastoid breadth to basilar length of Hensel 66.2; of intermastoid breadth 37.9); interparietal large and broadly pentagonal (ratio of length to breadth 56.3); audital bullæ separated by less than full breadth of basisphenoid; nasals ending posteriorly almost on a line with nasal branch of premaxillaries; median border of parietal longest; coronoid process of mandible long, hooked, and directed strongly outward. Lower premolar about the size of last molar (possibly a little smaller), its crown squarish, a little narrower anteriorly than posteriorly. Second molar slightly larger than first. [This is much more noticeable in the young before the cusps have been worn down.] Arranged in order of size, the lower molariform series stands as follows, beginning at the largest: m 2, m 1, m 3, pm.

General remarks.—This is the species which Baird wrongly identified as *P. fasciatus* Max. Wied, by which name it has been known to the

present time, as already explained in the introductory portion of this paper. It is the largest of the group. Its skull departs somewhat from the type exhibited by the other species, as may be seen from the accompanying figure. This is due principally to the mastoids, which are relatively smaller than those of any other species except *californicus*. As in *californicus*, also, the cranium is conspicuously broader just in front of the auditory meatus than posteriorly; in all other species it is only slightly broader at this point. The well-marked supra-orbital bead is found in no other species, though it exists also in the subspecies *spilotus*.

Baird's original specimen from Chihuahua (No. 1061, U. S. Nat. Mus.) agrees surprisingly well with specimens from western Kansas, the only noticeable difference being that its tail is less distinctly bicolor, is more heavily haired, and the hairs are somewhat longer.

PEROGNATHUS PARADOXUS SPILOTUS subsp. nov.

Type, skin, 5293 ♀ ad. From Gainesville, Cook County, Texas; October 8, 1886.
G. H. Ragsdale.

Skull 23096 ♀ yg. ad. U. S. Nat. Mus. Gainesville, Cook County, Texas. G. H. Ragsdale.*

Measurements.—Total length, 196; tail, 95 (taken in flesh by collector); hind foot, 23; ear, from crown, 5 (from dry skin).

General characters.—Size a little smaller than *P. paradoxus*; proportions about as in that species; soles naked.

Color.—Above, dark yellowish-brown, heavily and coarsely lined with black. Fulvous side stripe darker and broader than in *paradoxus*, encroaching well upon the belly and including the fore legs. Tail sharply bicolor: above, fuliginous; below, yellowish-white. The ears are ornamented by a blackish spot near the middle of the incurved upper surface.

Cranial and dental characters.—Skull slightly smaller than that of *paradoxus*; narrower (ratio of mastoid breadth to basilar length of Hensel, 63; of intermastoid breadth, 37.3); nasals narrower anteriorly, and extending posteriorly as far as the nasal branch of the premaxillaries; supra-orbital bead as in *paradoxus*; interparietal smaller and more rounded posteriorly (ratio of length to breadth 57.5); audital bullæ separated anteriorly by less than breadth of basisphenoid, as in *paradoxus*; basioccipital narrower anteriorly; frontal border of parietal longest. Mandible lighter, with condylar ramus shorter and directed much more obliquely upward; angle less spreading. Dentition as in *P. paradoxus*.

General remarks.—*Perognathus paradoxus spilotus* is a well-marked

* Unfortunately, my skins of *P. paradoxus spilotus* are not accompanied by skulls. The National Museum, however, has a skull (No. 23096) from the same locality, which has furnished the basis for the present description.

subspecies, which may be easily distinguished by its darker coloration, by the blackish spot on each ear, by the shortness of its hind foot, and by the fact that the tan-colored lateral stripe extends out on the fore leg to the wrist, while in *P. paradoxus* the fore leg is entirely white. Its darker coloration and spotted ears make it a much handsomer animal than *P. paradoxus*.

PEROGNATHUS CALIFORNICUS sp. nov.

? *Cricetodipus parvus*. Peale, Rept. Mamm. and Ornith., U. S. Expl. Expd., Wilkes, VIII, 1848, 52-54.

Type $\frac{5}{8} \frac{13}{17}$ ♀. Berkeley, California. Nov. 8, 1888. T. S. Palmer and Charles A. Keeler.

Measurements.—Total length, 186^{mm} (end of tail broken off); hind foot, 24; ear, 6. [Another specimen from same place, No. 5613 ♂: Total length, 195; tail vertebræ, 101; hind foot, 24; ears, 6.5.]

General characters.—Size, large; ears very large, with antitragal lobe considerably higher than broad; tail vertebræ longer than head and body; tail slightly crested and penicillate; pelage harsh, with white spines on the sides of the rump; soles broad, naked to heel.

Color.—Above, dark grizzled yellowish-brown, lined with black; below, white to base of hairs; a pale fulvous lateral stripe; color of the back reaching elbows. Tail sharply bicolor, sooty-black above, white beneath.

Cranial and dental characters.—Skull long and narrow, much arched; mastoids very small (ratio of mastoid breadth to basilar length of Hensel, 74; of intermastoid breadth, 48); interparietal large, convex posteriorly, about twice as broad as long (ratio of length to breadth, 50.5), occiput projecting considerably behind mastoids; audital bullæ separated anteriorly by full breadth of basisphenoid; nasals deeply emarginate posteriorly, not reaching quite so far back as nasal branch of premaxillaries; anterior and posterior borders of parietal longest and subequal; coronoid process of mandible short; condylar ramus nearly horizontal. Lower premolar slightly larger than last molar; its crown longer than broad and narrower anteriorly than posteriorly; anterior cusp well separated from posterior; first molar larger than second; third more than half as large as second.

General remarks.—This species, which has been heretofore confounded with *P. monticola* of Baird, resembles *P. formosus* in size and color, though darker, and having a shorter, less crested, and more sharply bicolor tail, which is blackish above from the very base, instead of on the terminal half only. Its skull differs materially from that of any other member of the group, and approaches *P. paradoxus* more closely than any other species. The white spines on the sides of the rump are about as large as in *P. fallax*.

PEROGNATHUS ARMATUS sp. nov.

Type $\frac{67.2}{33.2}$ ♀ ad. Mount Diablo, California, March 28, 1882. W. E. Bryant.

Measurements.—Total length, about 160; head and body, about 70; tail vertebræ, about 90; pencil, 15; hind foot, 24; ear from crown, 7 (from well-made skin).

General characters.—Size a little smaller than *P. californicus*; ears very large, with antitragal lobe higher than broad; tail crested-penicillate; its vertebræ much longer than head and body; soles broad, naked to heel; pelage coarse, with white spines on the flanks and sides of the rump.

Color.—Above, very dark-grizzled yellowish-brown, heavily lined with black (much darker than any other species); below, white to roots of hairs; a very pale fulvous lateral stripe, which reaches upper surface of fore leg. Tail sharply bicolor: above, sooty; below, white; pencil, dark all round.

Cranial and dental characters.—The occipital portion of the skull is absent, together with part of the interparietal, so that no important measurements or ratios can be taken. The mastoids are small, and the audital bullæ are separated anteriorly by nearly the full breadth of the basisphenoid. The parietals are longer on the sagittal suture than in *californicus*; in fact, the anterior, median, and posterior borders of the parietal are fairly subequal. Coronoid process of mandible short and stout. Lower premolar larger than last molar, its crown longer than broad, with the anterior cusp well separated from the posterior, as in *californicus*.

General remarks.—*P. armatus* differs from *P. californicus* in smaller size, with relatively larger hind feet and ears; in darker color, and in the forward extension of the white spines along the flanks almost to the middle of the body. The color of the upper parts does not extend so far down on the sides as in *californicus*. The greater length of the parietals along the median line is another character of importance.

Possibly future collections will show that *P. armatus* grades into *P. californicus*. If so, it will have to stand as a subspecies.

UNDETERMINED SPECIES.

In order to complete the present revision of the group I here introduce descriptions of the three remaining species which have been named but which I have not seen. Whether they all refer to the same species, and what their nearest congeners are, can not be determined from the material now at hand. None of their skulls have been described. All three came from the Pacific province, from northern California northward.*

* Nearly fifteen years ago Coues made the following statement, which is equally true to-day: "Specimens of any Saccomyine form from Oregon and Washington Territory are at present special desiderata."

PEROGNATHUS PARVUS (Peale).

Cricetodipus parvus Peale, Rept. Mamm. and Ornith., U. S. Expl. Expd., Wilkes, VIII, 1848, 52-54.

The type of Peale's *Cricetodipus parvus* is supposed to be not extant. It was a very young animal, as shown in an early part of the present paper (under *History and Nomenclature*, p. 3, foot-note), and its measurements indicate that it was one of the larger species of the group.

Following is Peale's original description :

Head ovate; the snout elongate, pointed, and covered with hair, excepting the nostrils, which are small and convolute; lips large, tumid, and covered with short hairs; whiskers numerous, white; a tuft of white hairs or bristles on the chin; cheek-pouches spacious, opening outside of the mouth, and reaching from the upper lip to the throat; the cavity extending backwards to the ears, and lined with hair; eyes medium size; ears small, round, and fringed with hairs; fore legs small, the feet moderate, margined with bristly hairs; the nails short, curved, excepting that of the thumb, which is orbicular, or resembling the human thumb-nail; hind legs long; the feet large and strong, five-toed; the middle one slightly longer than the rest; inner toe shortest, reaching only to the end of the metatarsal bones of the others; all the nails short, pointed, and slightly curved; tail long, tapering, and clothed with short silky hairs. Color above, sepia-brown; beneath, white; a dark line crosses the cheeks beneath the eyes.

Length of the head and body, $1\frac{9}{10}$ inch; head from the nose to the occiput, $\frac{1}{10}$ inch; ears, $\frac{3}{10}$ inch; tail, $2\frac{3}{10}$ inches; fore leg from the elbow, $\frac{9}{10}$ inch; fore foot, $\frac{3}{10}$ inch; tibia, $\frac{7}{10}$ inch; hind foot, $\frac{8}{10}$ inch; metatarsus, $\frac{5}{10}$ inch.*

A single specimen of this singular animal was obtained in Oregon, but no notes were furnished by the person who obtained it. The formation of its hind legs leaves but little room to doubt that its habits are similar to the jumping mice, *Meriones Labradorius* (Richardson), which are inhabitants of the same region. Its singularly large head, which equals its body in bulk, its ample cheek-pouches, long hind legs, and long tail, present a general form which is peculiar and altogether very remarkable. On dissection, the stomach was found to contain a pulpy matter, which appeared to be the remains of a bulbous root; the liver is very large, and consists of five foliaceous lobes; we were not able to detect any gall-bladder. The specimen is a female, and presents the rudiments of a fourth molar tooth in each side of the lower jaw, which would eventually have replaced the front ones, already much worn. (Peale, Rept. Mamm. and Ornith., U. S. Expl. Expd., Wilkes, VIII, 1848, 53-54.)

PEROGNATHUS LORDI (Gray).

Abromys lordi Gray Proc. Zool. Soc. London, May, 1868, 202 (type from British Columbia).

Gray's description of this animal is as follows :

Fur soft, abundant, gray-washed, with blackish tips; chin and under side of body whitish; tail tapering, gray, with blackish-brown upper surface and tip; hair of the back dark lead-colour, with a short gray band and minute black tip. * * * The teeth destroyed. Length of body and head 3 inches; of tail 3 inches. It differs from *Dipodomys phillipsii* and other species of that genus in having no white spot over the eye at the base of the ear, or white band across the thigh.

*The most important of these measurements, reduced to millimeters, are: Head and body, 43; head from nose to occiput, 23; tail, 58; hind foot, 20.5.

Mr. Oldfield Thomas, curator of mammals in the British Museum, has had the kindness to re-examine, at my request, the type of *Abromys lordi*, and his letter in regard to the same has reached me just as this manuscript is about to go to press. Mr. Thomas writes:

I have the type of *Abromys lordi* before me. It is a *Perognathus*, and, so far as I can make out from Coues's description, is the same as *P. monticola*.* Its dimensions are: Head and body, 74^{mm}; tail vertebræ (perfect), 81^{mm}; hind foot with claw, 21.8; ear from crown, 6.5. The ear appears to be just as Coues describes, with a marked antitragus, but no anterior projecting lobule. The distance from the tip of the nasals to the back of one of the bullæ is 25.5^{mm}.

PEROGNATHUS MOLLIPILOSUS Coues.

Perognathus monticola Coues, Proc. Acad. Nat. Sci. Phila., 1875, 293-296.

Perognathus mollipilosus Coues, Proc. Acad. Nat. Sci. Phila., 1875, 296 (provisional name, based on specimen from Fort Crook, Cal.).—Coues, Monographs N. Am. Rodentia, 1877, 509-512 (same as above).

Type No. 7251 ♀, U. S. National Museum, Fort Crook, Cal.†

Measurements.—(From Coues) Head and body, 64; tail vertebræ, 82; hind foot, 20.5.

General characters.—(From Coues) Size rather small; tail vertebræ longer than head and body; tail not crested-penicillate; "antitragus with a great, flat, rounded, upright lobe"; pelage very soft and smooth; soles naked.

Color.—(From Coues) "Above yellowish-cinnamon lined with blackish, the latter predominating; below, white"; "color of upper parts descending on the fore leg to the wrist"; a pale fulvous lateral stripe; "tail bicolor to correspond with the body colors."

Cranial and dental characters.—(Not given.)

General remarks.—My opinion is that this animal will prove to be identical with *P. lordi*, and both may be the same as *P. parvus* of Peale.

* As I have already pointed out, *P. monticola* of Coues is a very different animal from *P. monticola* of Baird, and must stand as *P. mollipilosus*, which see.

† This specimen should be in the National Museum, but Mr. F. W. True, curator of mammals, informs me that its number is wrong, and that it cannot be found.

PLATE I.

(All double natural size.)

1. (4445) ♂ *Perognathus fasciatus* Max. Wiel. *Duplicate type.* Fort Buford, Dak.
2. (5027) ♂ *Perognathus fasciatus flavescens* Merriam. *Type.* Kennedy, Nebr.
3. (5047) ♂ *Perognathus flarus* Baird. Mason, Tex.
4. (3572) ♂ *Perognathus longimembris* Coues. San Bernardino, Cal.
5. (4934) ♂ *Perognathus apache* Merriam. *Type.* Apache County, Ariz.
6. (23790) ♂ *Perognathus inornatus* Merriam. *Type.* Fresno, Cal.
7. (5827) ♀ *Perognathus californicus* Merriam. *Type.* Berkeley, Cal.

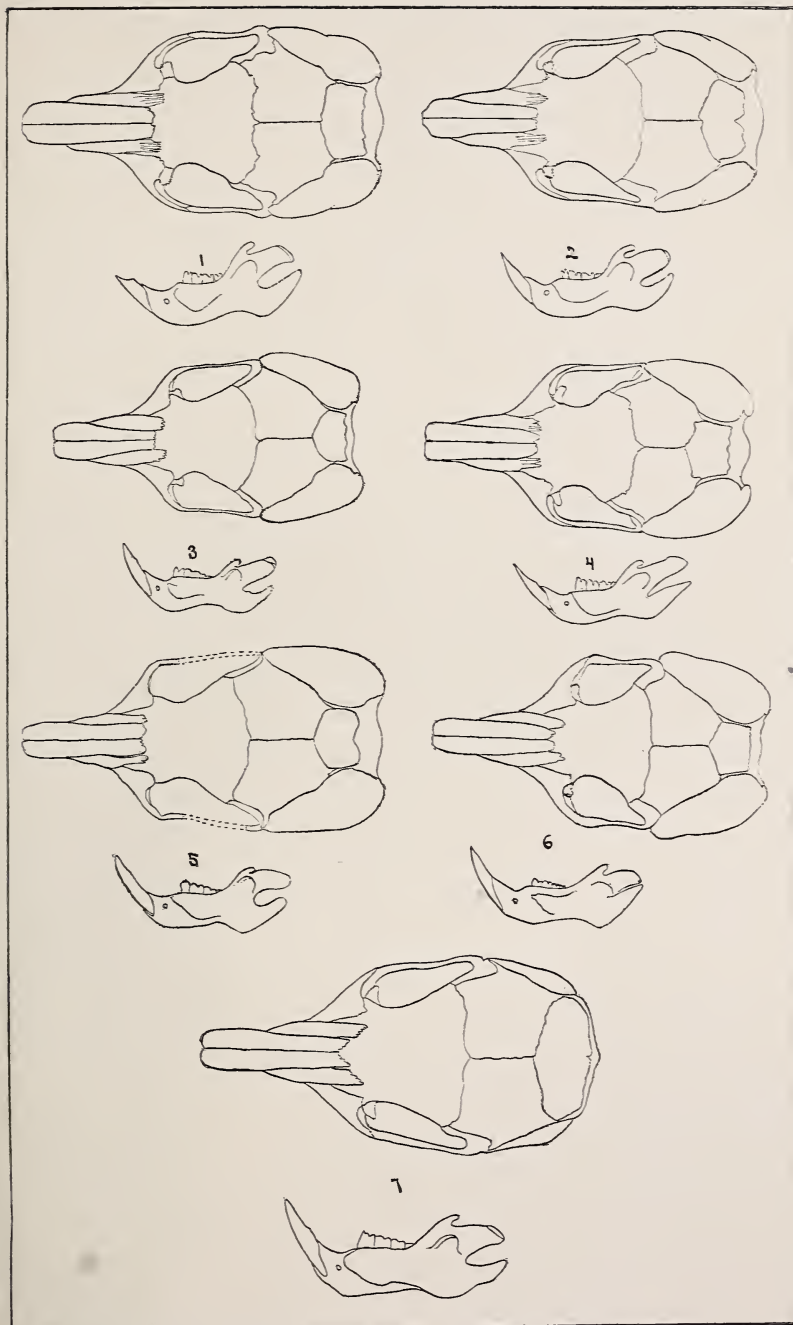


PLATE II.

(All double natural size.)

8. (5623) ♂ *Perognathus olivaceus* Merriam. *Type.* Kelton, Utah.
9. (5795) ♂ *Perognathus olivaceus amoenus* Merriam. *Type.* Nephi, Utah.
10. (1585) ♀ *Perognathus monticola* Baird. *Type.* St. Mary's Mission, Montana.
11. (5908) ♂ *Perognathus formosus* Merriam. *Type.* St. George, Utah.
12. (23634) ♂ *Perognathus fallax* Merriam. *Type.* San Bernardino, Cal.
13. (6000) ♂ *Perognathus intermedius* Merriam. *Type.* Mud Spring, Arizona.

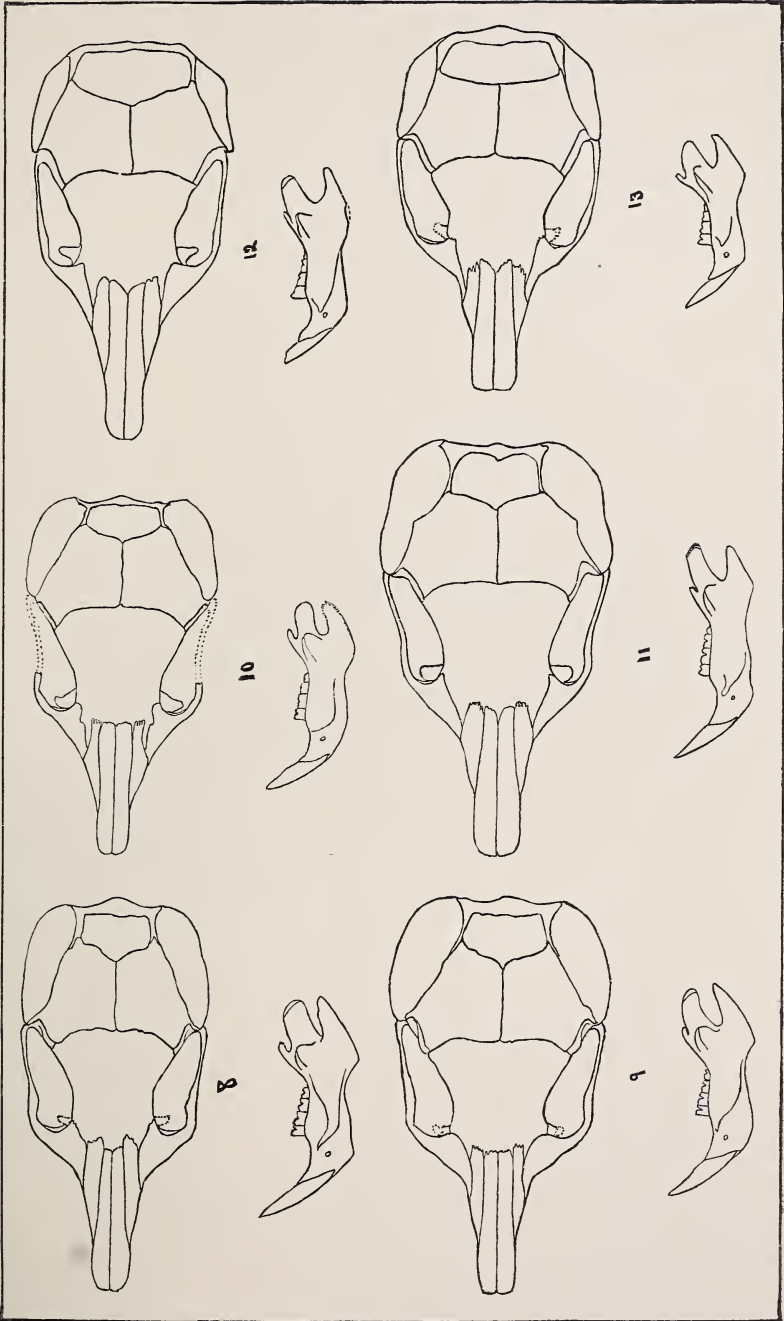


PLATE III.

(All double natural size.)

14. (2848) ♀ *Perognathus obscurus* Merriam. *Type.* Grant County, N. Mex.
15. (6137) ♂ *Perognathus spinatus* Merriam. *Type.* Lower Colorado River, Arizona.
16. (6206) ♂ *Perognathus penicillatus* Woodhouse. Lower Colorado River, Arizona.
17. (1696) ♀ *Perognathus hispidus* Baird. *Type.* Charco Escondido, Mexico.
18. (1544) ♀ *Perognathus paradoxus* Merriam. *Type.* Trego County, Kans.
19. (23096) ♀ *Perognathus paradoxus spilotus* Merriam. *Type.* Cook County, Tex.

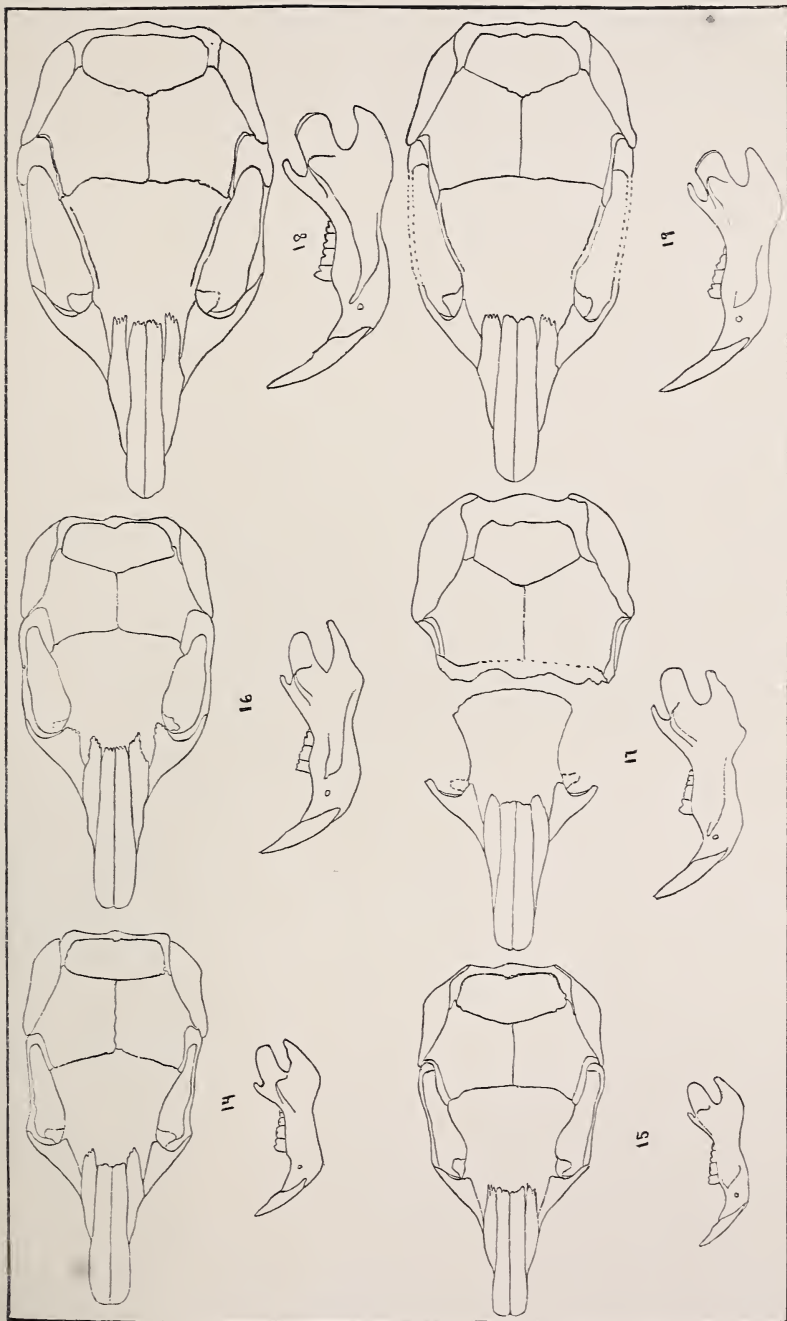


PLATE IV.

(Enlarged about ten times.)

Perognathus (Chætodipus) obscurus Merriam. (All from Apache, Grant County, New Mexico.)

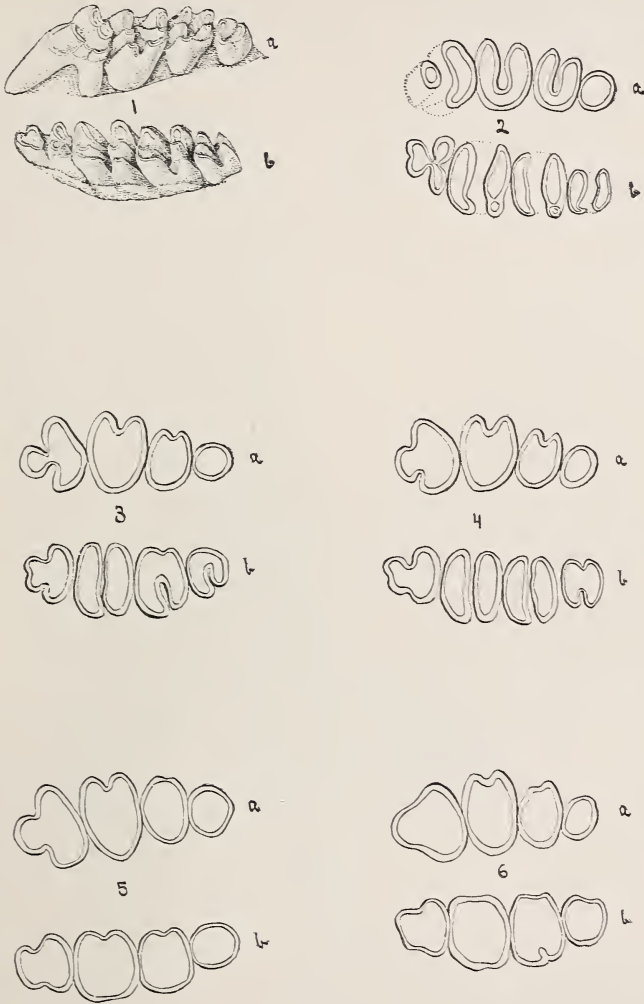
a = left upper molariform series.

b = left lower molariform series.

Fig. 1 (skull No. 2855). *Young* (viewed obliquely from the side). Shows the long deciduous premolar in the under jaw, and also the tri-tuberculate cusps of the molars, which are early worn away, leaving the crowns flat (as shown in the succeeding figures).

Figs. 2, 3, 4, 5, and 6 are *camera lucida* outlines of the crowns of the teeth, showing successive stages of wear. In Fig. 2 the permanent lower premolar has just reached the level of the crowns of the other teeth.

Fig. 2 (skull No. 2854); 3 (2853); 4 (2851); 5 (2848 *type*); 6 (2849).



Perognathus (Chastodipus) obscurus Merriam.

From Grant County, New Mexico.

Molariform teeth showing the changes of form and outline resulting from the wearing down of the crowns with age.

