

ARTICLE XX.—*Notes on New or Little-known North American Mammals, based on recent additions to the Collection of Mammals in the American Museum of Natural History.* By J. A. ALLEN.

During the last four years about 3000 skins of small mammals, in most cases accompanied by their skulls, have been added to the collection of the American Museum of Natural History. These specimens represent new material, in most cases collected expressly for this Museum. Several of the more important collections received have been made the subject of special papers, already published in this Bulletin. Much of the remaining material has, however, not been critically examined until within the last few months; the more important results of this examination are embodied in the present paper.

The last five years have been eventful in the history of North American mammalogy, following as they do a considerable period of comparative inactivity in this important field. In 1857 was published the great work of the late Prof. S. F. Baird on North American Mammals, forming Volume VIII of the "Reports of Explorations and Surveys to ascertain the most practicable and economical Route for a Railroad from the Mississippi River to the Pacific Ocean," based on the material then extant in the Museum of the Smithsonian Institution, and consisting mainly of specimens collected by the various Government expeditions during the preceding four or five years. The material available for this great work consisted of less than 3000 specimens, a large proportion of which were of very poor quality when compared with the material gathered within the last few years. During the following fifteen years the mammalogical material in the Smithsonian Institution steadily increased, the number of specimens being about threefold greater at the end of this period (1872) than in 1857. Yet very little use had been made of it as the basis of publication, the status of the subject remaining essentially as left by Professor Baird in 1857. No other collection of any magnitude had been formed in the meantime, except that of the Museum of Comparative Zoölogy at Cambridge, which was more local in character and far less important than the one in Wash-

ington. A little revisionary work had, however, been attempted on the basis of the Cambridge collection, as also certain special investigations relating to the subject of individual variation, for which the Cambridge material was especially favorable, since it included large series of specimens of the same species from single localities. While the results of these investigations were highly instructive, and sound in the abstract, they unfortunately led to erroneous conclusions, which only a vast accumulation of well-prepared material could successfully controvert. It was shown that the normal range of individual variation was much greater than had been previously suspected; consequently it was naturally assumed that general size, the size and relative proportion of special parts, including even the number of caudal vertebræ, were unsafe characters for the basis of species, especially when resting on a single specimen, or even on a small number of specimens. In other words, it was found that the range of purely individual variation often overlapped the differences considered in many cases to be specific. In respect to coloration there was found also a wide range of variation in individuals of the same species from the same locality, a large part of which was obviously due to season, and much also to age. It was also found in many instances that specimens from intermediate points between the habitats of supposed distinct species presented intermediate characters, and that the two alleged species evidently intergraded and were thus to be properly recognized as only geographical forms of a single widely distributed species.

These discoveries had much influence on the subsequent revision of various groups of North American mammals, made by various investigators during the following decade, when, in 1874 to 1880, the accumulated materials of the preceding twenty years were again subjected to critical examination. As a result, the status of the components of entire groups was radically changed; not a few species being relegated to synonymy, and many others (in most cases justly) reduced to the rank of subspecies. But still the specimens serving as the basis for this new departure were of a most unsatisfactory character, as regards not only their preparation, but the data accompanying them, when compared with the material of to-day. Distorted, flat, or only partly-filled

skins, with the skulls left in them ; the locality and date of collecting often wholly omitted or only vaguely indicated, and the only available measurements such as could be obtained from the distorted skins,—such was the character of the material then available, contrasting with the carefully made skins, with the skulls separate, accompanied by full field data and measurements taken by the collector from the fresh specimen, forming the basis of our present work. There was thus little opportunity for the recognition of nice points of difference, or for the study of seasonal variation in color, there being rarely any considerable series of specimens from any one locality, and still more rarely series representing opposite periods of the year. With the finer distinctions masked by the bad quality of the specimens, and no clue to seasonal variations in pelage, and with the wide range of normal individual variation strongly in mind, it was not difficult to apparently “match” specimens from widely distant points, and on the strength of this to jump at conclusions which seemed reasonable, and which were apparently warranted by the material then in hand, but which the substitution of large series of properly prepared specimens from single points in place of isolated imperfect examples now show to have been erroneous.

During the last few years more specimens of the smaller species of North American mammals have been collected *annually* than Professor Baird had at his disposition for the basis of his great work published in 1857. Hence the accumulation of material in recent years, when the amount and quality are both considered, affords a basis for work never before available, and its elaboration is yielding results little less than startling to even the best informed among our mammalogists. It is not, then, surprising that those unfamiliar with the resources of to-day look with some disfavor upon what seems to them the “splitting craze” of the day ; yet when confronted with the actual specimens in almost any given case they are forced to admit that the previously discredited “split” seems tenable. While it is true that during the last two years many closely-related forms have been recognized in nomenclature, a large number have been described that have no close relationship to anything previously known, which at least goes to show that our knowledge of the mammalian fauna of North

America is still very imperfect. The standard of division is in reality scarcely different from the gauge by which Baird measured in 1854 to 1857. It is simply that our material is more ample; that new localities have been explored, and thorough systematic field work has taken the place of the wholly fortuitous, sporadic collecting of earlier days. In fact, some of the long-discredited species recognized by Baird in 1857 are found to have an actual basis in nature, a case in point being his *Neotoma micropus*, considered at length later in the present paper. While many of his species have long since been reduced to the rank of subspecies, very few of them are found to rest on a pure misapprehension of characters. Considering his resources, his acuteness and sagacity stand out only the more prominently as time goes on and our knowledge of our mammals advances.

It is hence a serious matter to know how to treat many of the earlier species of Baird and others in cases where the types have been destroyed or where they have become so faded by exposure to light, or deteriorated by long immersion in spirits as to be worthless for purposes of comparison. In some instances the original description is so explicit that, coupled with the locality, there is little difficulty in identifying the form a given name was apparently intended to designate, at least in the case of Baird's species, or those of earlier authors as defined by him in his "Mammals of North America;" cases in point being *Hesperomys texanus*, *H. nebracensis*, *Neotoma micropus*, etc. Where types exist, however, they serve to show, as in the case of *Perognathus hispidus*, and in the *Dipodomys* and *Dipodops* groups, the uncertainty of depending upon descriptions alone, in any group of closely-allied forms. Yet, in cases where the type is not extant, it seems better to fix the name to some form from the vicinity of the original locality which agrees reasonably well with the diagnosis than to discard the name as wholly undeterminable, and accept the status of the form as determined by the revisor who first fixes the name to a known recognizable form, in the same way as, or in accordance with the principle by which an old genus is subdivided and the name retained for a certain portion of the old composite genus, where the authority of the revisor is recognized as fixing the type and status of the original generic name.

The present must be recognized as a renaissance period in the history of North American mammalogy. While our material is so greatly in excess of that of earlier days it is yet meagre in comparison with what is necessary for final work. While it serves to show how rich the field still is, it is as yet tantalizingly deficient. Our work for the present must be in large part tentative. Yet it is necessary to progress that some use be made of it. Should the present methods of field work be continued for the next ten years, the combined material of all the collections then extant would be none too ample for the intelligent treatment of problems that now confront us on every hand. Where we have now a hundred specimens of a given group, thousands more are absolutely necessary to reach conclusions that can be considered as in any way final. In few instances can we satisfactorily trace the relationships between the various members of a group of closely-allied forms, or decide whether certain forms intergrade or have become fully differentiated; whether certain differences are in part seasonal, or merely individual, or are characteristic of the individuals of a more or less limited area, the boundaries of which we can at present only surmise. While a merely cursory examination of a large series of specimens of a group of closely-allied forms is sufficient to show the influence of environment, the character and mode of its action are to a large extent still problems for investigation.

The groups more especially considered in the present paper are the genera *Heteromys*, *Dipodomys*, and *Dipodops* of the family Saccomyidæ, and various forms of the genera *Neotoma*, *Vesperimus*, and *Oryzomys*. Other little-known species of other families are briefly noticed in cases where recent accessions of material throw light upon their status, relationships, or distribution.

I wish here to acknowledge my indebtedness to Mr. F. W. True, Curator of Mammals in the U. S. National Museum; to Mr. Wm. Brewster, Curator of Mammals and Birds in the Cambridge Museum of Comparative Zoölogy, and to Dr. C. Hart Merriam, Chief of Division of Ornithology and Mammalogy, U. S. Department of Agriculture, for the loan of much valuable material, without the aid of which the preparation of this paper would have been impossible.

Heteromys alleni Coues.

? *Heteromys albolimbatus* GRAY, P. Z. S., 1868, p. 205.

?? *Heteromys irroratus* GRAY, *ibid.*, p. 205.

Heteromys longicaudatus? ALLEN, Bull. Mus. Comp. Zoöl., VIII, No. 9, 1881, p. 187.

Heteromys alleni COUES, *ibid.* (ined. MS.).

Ten years ago, in a paper on a collection of mammals made in the State of San Luis Potosi, Mexico, by Dr. Edward Palmer, I recorded (l. c.) a single specimen of *Heteromys* from Hacienda Angostura, Rio Verde, this being the most northern point from which the genus was then known, its previous most northern record being the State of Oaxaca. The specimen was provisionally referred to *H. longicaudatus* Gray, with the following statement: "The present example differs apparently in important features from either of these [*H. desmarestianus* and *H. longicaudatus*], and a detailed description of it is therefore appended." This description was by Dr. Coues, to whom the specimen had been referred some time previously, and who returned it under the MS. name *Heteromys alleni*, with the long description published as above cited. In view, however, of Mr. Alston's conservative treatment of the group, then just published, it seemed to me preferable not to take the chance of adding another nominal species to the number already assumed to exist. Material recently received, however, shows that Dr. Coues was probably justified in his opinion that the San Luis Potosi specimen represented a species not previously recognizably described.

The material before me relating to the genus *Heteromys* consists of four dry skins, two additional skins in alcohol, and three specimens in spirits, all from Costa Rica (see antea, p. 215), and representing *H. longicaudatus*; and also four specimens (skins, two with the skulls separate) representing *H. alleni*. These include the original type of the latter from San Luis Potosi (No. 5889, Mus. Comp. Zoöl.), a specimen from Moro Leon, Guanajuato, Mexico (No. 15,529, U. S. Nat. Mus.), and two from Brownsville, Texas (Nos. 3786 and 3787, Am. Mus. Nat. Hist.), taken Jan. 18 and 28, 1891. The Brownsville specimens most unexpectedly demonstrate the extension of the habitat of the genus northward to the mouth of the Rio Grande in Texas.

H. alleni differs very markedly in coloration from *H. longicaudatus*, and also in having the tail heavily haired and conspicuously penicillate. It may be distinguished at sight from the other recognized species not only by this last character, but by its conspicuously white-edged ears and the broad stripe of fawn color which separates the dark color of the dorsal surface from the pure white of the ventral surface. The very full description given by Dr. Coues (l. c.) leaves nothing further to add. The Brownsville specimens agree closely with the type, except that the tail is less heavily clothed, but this difference is obviously accidental, the hair being worn off and in one of the specimens more or less patchy in its distribution.

The collector's measurements of the Brownsville specimens, taken from the fresh specimen, are as follows :

No. 3787, ♀ ad. Body, 4.50 in.; tail, 5.13; ear, 50. No. 3786, ♀ ad. Body, 4.25; tail, 4.75; ear, 50.

The Moro Leon specimen is similar to the others except that the fawn colored lateral band is indistinct, being present only for a short distance immediately behind the fore limbs.

Our knowledge of the genus *Heteromys* is in a very unsatisfactory state. In 1815 Thompson described* a species under the name *Mus anomalus*, based on a single specimen from the island of Trinidad. In 1823 a second species was described by F. Cuvier, from North America ("Amerique septentrionale"), under the name "*Sacomys anthophile*"† These were the only forms known up to 1843, when Dr. J. E. Gray referred to a specimen from Coban, which he named‡ *Heteromys desmarestianus*, without, however, describing it. In 1868, in a paper entitled "Synopsis of the Species of *Sacomynæ*, or Pouched Mice, in the Collection of the British Museum," he made a revision of the genus *Heteromys*,§ of which he recognized six species, adding four to those above mentioned, as follows : (1) *H. anomalus* (Thompson), from Trinidad; (2) *H. desmarestianus*, from Coban; (3) *H. melanoleucus*, from Honduras (*lege Venezuela apud Alston*||); (4)

* Trans. Linn. Soc., XI, 1815, p. 161, pl. x.

† Mem. du Mus., X, 1823, p. 419, pl. xxvi; Dents des Mam., 1825, p. 187.

‡ P. Z. S., 1843, p. 79.

§ *Ibid.*, 1868, pp. 203-205.

|| Biol. Centr. Am., Mam., 1880, p. 167.

H. longicaudatus, from Mexico ; (5) *H. irroratus*, from Oaxaca, Mexico ; (6) *H. albolimbatus*, from "Mexico ? La Parda (*Feirecier*)" (*lege* "La Parada, Février, 1861," *apud* Alston, l. c.). The last three were based upon specimens collected by Sallé. It appears that these six species were founded on seven specimens, of which two were referred to *H. albolimbatus*. In the same paper (l. c., p. 202) he also described a *Perognathus bicolor*, from "Honduras," which Mr. Alston* has since redescribed as *Heteromys bicolor*, stating that its true habitat is Venezuela ! In 1874 Dr. Peters† described *H. adpersus* from Panama, this making the ninth species of the genus *Heteromys*.

Mr. Alston, in 1880, in the "Biologia" (l. c.) said : "Of several described species of *Heteromys* only four appear to me to be well established—namely, *H. anomalus* (Thompson) from Trinidad, *H. bicolor* (Gray) from Venezuela, and the two following Central American forms : 1. *H. demarestianus* 2. *H. longicaudatus*," of which he gives colored plates. Gray's *H. melanoleucus*, *H. irroratus*, and *H. albolimbatus*, and Peters's *H. adpersus* are all synonymized with Gray's *H. longicaudatus*, since, as he says, "after a careful study, I have been quite unable to find any valid specific distinctions between the specimens" on which they were respectively based. In the same connection he takes occasion to correct a number of errors in Gray's "misleading descriptions." He points out that the characters given by Gray are not to be trusted, but he fails to give us any further information beyond a short diagnosis of less than three lines in length of the two species he proposes to recognize, the only tangible point being that *H. demarestianus* (known only from the type specimen from Coban) is "dull chestnut brown above," and *H. longicaudatus*, "mouse-grey, more or less mixed with tawny." In view of the differences presented by the thirteen specimens before me even these alleged characters fail to have any significance.

The six specimens from Costa Rica (five from Angostura and one from Pacuare) are all without dates except the one from Pacuare, marked as taken May 16, 1876. One of the Angostura

* Ann. & Mag. Nat. Hist., 5th. Ser., VI., 1880, p. 118, 119.

† Monatsb. Ak. Berlin, 1874, p. 357.

specimens (No. 12,903) is labeled "*Heteromys longicaudatus*," with the endorsement on the back of the label, "Identified in Brit. Mus." This is entirely blackish brown above, both the hairs and the spines being of this color for about their apical half, passing gradually into dull grayish white towards the base. Below, soiled yellowish white (perhaps pure white in life). The dusky brown color of the upper surface extends down the fore limbs to the carpus, and on the hind limbs extends over the proximal third of the metatarsus. Feet sparsely haired above, naked below. Ears and tail nakedish, the latter distinctly bicolor, and the annulations plainly visible through the very short sparse hairs, which form a very slight pencil at the tip of the tail. Ears uniform blackish, without any white border. The Pacuare specimen (No. 12,907, ♂ ad.), taken in May, is almost exactly similar in coloration. In neither is there any mixture of tawny or fawn color.

No. 12,905, without date, has the pelage rather fuller and softer, of the same general color as the others, except that the blackish brown of the upper parts is everywhere mixed with pale chestnut brown hairs, finer and softer than the general pelage, and much more numerous on the sides than over the middle region, which is thus distinctly darker and less rufous than the flanks. No. 12,904, also without date, is like the last only the softer hairs are still more abundant and of a brighter or more tawny tint. In none of these specimens is there any fawn-colored lateral stripe separating the dark color of the dorsal surface from the clear white or yellowish white of the ventral surface.

The two alcoholic skins are of but little use as regards coloration, but they present points of interest in respect to the texture of the pelage, one (No. 12,906) having the pelage wholly soft, without spines, while in the other the whole dorsal region is densely clothed with heavy spines, with very scanty underfur.

I believe that these specimens are all referable to one species, which for convenience may be called *H. longicaudatus*, and that the difference in color and in the character of the pelage is due to season and age, *i.e.* that the specimen in soft pelage is young; that the two specimens without any distinct mixture of soft rufous hairs are in summer coat; and that the two, and particularly No.

12,904, with soft tawny hairs intermixed, represent the winter condition. All the specimens agree in having a practically naked tail and uniform dusky ears, in contrast with the specimens from further north with well-haired tails and white-edged ears. Unfortunately the skulls of the Costa Rica specimens are not available for comparison.

Three of the four specimens from the north (Guanajuato north to Brownsville, Texas) were taken in winter (Jan. 18 to Feb. 26); the other is without date. It agrees with the others except in lacking, as already stated, nearly all trace of the fawn-colored lateral band so conspicuous in the other three. The coat is rather thinner, and I suspect it is not in winter—at least not in midwinter—pelage. This particular specimen might be considered as representing Gray's *H. albolimbatus*. His *H. irroratus* may be the same form in thinner pelage. Without the actual types for comparison it is impossible to decide whether either are identical with the *H. alleni* of Coues.

From the foregoing I am led to the following conclusions : (1) That the material before me represents two species, one, *H. 'longicaudatus,'* being Central American (all my specimens are from Costa Rica), and the other, *H. alleni*, Mexican, ranging from Southern Mexico (Oaxaca ?) northward to the mouth of the Rio Grande. (2) That there is much seasonal variation in color and in the texture of the pelage, the exact character of which can be determined only by a much larger amount of material, with the dates of collection carefully noted, than is now available. (3) that the "*Sacomys anthophile*" of F. Cuvier, supposed to have come from "Amerique septentrionale," was probably from Mexico, but wherever from cannot be positively identified. As urged by Dr. Peters, the genus *Sacomys* should doubtless stand as a synonym of *Heteromys*.

***Dipodomys phillipsii* Gray.**

Dipodomys phillipsii GRAY, Ann. and Mag. Nat. Hist., VII, 1841, p. 522 (Real del Monte, Mexico).

Dipodomys phillipsii GRAY, Am. Journ. Sci., XLII, 1842, p. 335 ; List Mam. Brit. Mus., 1843, p. 120. (Same as above.)—AUD. & BACH., Quad. N. Am., III, 1853, p. 137, pl. 130 (from Gray's type).—ALLEN, Bull. Mus. Comp. Zool., VIII, No. 9, March, 1881, p. 187 (San Luis Potosi, Mexico).—? TRUE, Proc. U. S. Nat. Mus., 1886, p. 410 (in part).

Macrocolus halticus WAGNER, Arch. für Naturgesch., 1846, i, p. 176 (Mexico.)

Dipodomys phillipsii ("phillipii" by typ. error) was originally described by Gray in 1841, as the type of the genus *Dipodomys*, here first characterized, from a specimen collected by Mr. John Phillips near Real del Monte, Mexico, a locality said to be not far from the City of Mexico. The species was figured in 1853 by Audubon and Bachman from Gray's original type. These writers also referred to it specimens from California, as was done later by Leconte, Baird, and Coues. Baird's specimens were all from California and Oregon, while Coues referred to it additional specimens from Arizona and New Mexico, and True, in 1888, referred to it also several specimens from Texas.

In 1857 Baird recognized the species of the genus *Dipodomys*, as follows: *D. ordii* Woodhouse, *D. phillipsii* Gray, and *D. agilis* Gambel. His own *D. montanus* (New Mexico) he provisionally referred to *D. ordii*, and Wagner's *Macrocolus halticus* (Mexico) to *D. phillipsii*, while he considered Leconte's *D. heermanni* (Sierra Nevada, Cal.) and *D. wagneri* ("South Carolina") as indeterminable. Coues, in 1875-77, referred all of the previously named forms to *D. phillipsii*, of which he recognized *ordii* as a subspecies.

True, in 1888, in an important paper on the genus *Dipodomys* (l. c.), showed that the specimens hitherto referred to *Dipodomys* were separable into two groups, characterized respectively by the presence or absence of a hallux, and called attention to the fact that *D. phillipsii* Gray was a four-toed form, while *agilis* Gambel was five-toed. He considered this an important specific character, and pointed out other coincident differences characterizing the two groups. He accordingly separated *Dipodomys* into two species: *D. phillipsii* and *D. ordii*, defining their respective habitats.

In 1890 Dr. Merriam* raised these two sections to the rank of genera, restricting the name *Dipodomys* to the four-toed forms, and proposing the generic name *Dipodops* for the five-toed forms. He also described as new a *Dipodops longipes* based on specimens from the Painted Desert, Arizona. A few weeks later† he re-described *D. ordii* as *Dipodops ordii*, and described as new

* North Am. Fauna, No. 3, Sept., 1890, p. 72.

† *Ibid.*, No. 4, Oct., 1890, pp. 41-49.

species *Dipodomys ambiguus* (from El Paso, Texas), *Dipodomys spectabilis* (from Cochise Co., Arizona), and *D. californicus* (from Mendocino Co., California).

Some three years previously Mr. F. Stephens* described a very distinct form from the Mohave Desert, California, as *Dipodomys deserti*; in 1888 Mr. True† added *Dipodomys compactus* from Padra Island, Nueces Co., Texas, which Mr. Thomas‡ later recognized in specimens from Duval Co., Texas, under the designation *Dipodomys agilis compactus* True. In 1890 Dr. Mearns§ described *Dipodomys merriami*, based on specimens from New River, Arizona, and *Dipodomys chapmani*, from Fort Verde, Arizona. I have recently added|| *Dipodops sennetti* from Cameron Co., Texas.

Thus since 1886 the number of species of *Dipodomys* has been raised from two to twelve and the group separated into two genera. The species now recognized stand as follows :

I. *Dipodomys* GRAY, 1841. TYPE, *D. phillipsii* GRAY.

1. *D. phillipsii* GRAY, 1841, Real del Monte, Mexico.
2. *D. deserti* STEPHENS, 1887, Mohave Desert, California.
3. *D. merriami* MEARNS, 1890, New River, Arizona.
4. *D. spectabilis* MERRIAM, Cochise County, Arizona.
5. *D. ambiguus* MERRIAM, El Paso, Texas.
6. *D. californicus* MERRIAM, Mendocino County, California.

II. *Dipodops* MERRIAM, 1890. TYPE, *D. agilis* GAMBEL.

1. *D. agilis* GAMBEL, 1848, Pueblo de los Angeles, California.
2. *D. ordii* WOODHOUSE, 1853, El Paso, Texas.
3. *D. compactus* TRUE, 1888, Padre Isl., Nueces Co., Texas.
4. *D. chapmani* MEARNS, Fort Verde, Arizona.
5. *D. longipes* MERRIAM, Painted Desert, Arizona.
6. *D. sennetti* ALLEN, Cameron Co., Texas.

Of other names applied to animals of this group, it is probable that *Macrocolus halticus* Wagner (1846, from "Mexico") is identical with *D. phillipsii*, it being a four-toed form from Mexico ;

* Am. Nat., XXI, 1887, p. 42, pl. v.

† Proc. U. S. Nat. Mus., 1888, p. 160.

‡ P. Z. S., 1888, p. 448.

§ Bull. Am. Mus. Nat. Hist., II, No. 4, Feb., 1890, pp. 290, 291.

|| *Ibid.*, III, No. 2, April, 1891, p. 226.

as the type was a spirits specimen in bad condition, and ultimately used as a skeleton, it will be impossible to decide the case. Leconte's *D. heermanni* (1853, "Sierra Nevada") and his *D. wagneri* (1853, "South Carolina?") are likewise entirely indeterminable from the descriptions, and the types probably are not now extant. Baird's *D. montanus* (1855, Fort Massachusetts), although described with care, can be located only on the basis of the type, if still extant; otherwise it will be well to accept Baird's own later provisional reference of it to *D. ordii*.

In view of recent developments respecting this group of Pouched Rats, it is of interest in this connection to recall the following words of Professor Baird, published in 1857:* "The colors of body and tail vary very considerably at any rate; and to continue the construction of species on the same data as guided Dr. Leconte and myself two or three years ago, would now necessitate the establishment of half a dozen new ones, to accommodate the present large collection belonging to the Smithsonian Institution."

I have before me at present 25 specimens of *Dipodomys* and 28 of *Dipodops*. These include the nine from San Luis Potosi (Coll. Mus. Comp. Zoöl.) referred by me in 1881 to *Dipodomys phillipsii*. Seven of these are four-toed, and the other two five-toed. The four-toed examples I still refer to *D. phillipsii* Gray, since they were collected not very far from the type locality of the species, and agree as well as could be expected with Gray's description and Audubon's figure. It is, however, probable that the *D. phillipsii* of Leconte, Baird, Coues, True, and most other writers is not that species, even in part, very diverse forms having evidently been included under this name. Indeed, Audubon and Bachman's description, and consequently their *D. phillipsii*, is composite, being taken in part (including the figure) from Gray's type, and in part from a specimen from "California," while their remarks on the habits and distribution doubtless relate to several species!

The seven San Luis Potosi specimens represent a form closely allied to *D. spectabilis* Merriam, which "inhabits a wide range of country," Dr. Merriam giving for it a habitat embracing south-

* Mam. N. Am., p. 414.

eastern Arizona and adjoining portions of Sonora, the southern half of New Mexico, and eastward to Sierra Blanca, Texas, the largest specimens coming from Albuquerque, N. Mexico. The length of the hind foot varies from about 45 mm. to above 55 mm. In the San Luis specimens the hind foot varies from 45-50 mm., averaging about 47.5. In coloration the chief differences appear to consist in the greater distinctness of the supraorbital spot in the San Luis series, and in the upper and lower tail stripes remaining distinct almost to the end of the tail, instead of uniting a little behind the middle. The general size is a little less, but the proportions are apparently the same.

***Dipodops ordii palmeri*, subsp. nov.**

Dipodomys phillipsii ALLEN, Bull. Mus. Comp. Zool., VIII, No. 9, 1881, p. 187 (in part).

Similar in size and proportions and in cranial characters to *D. ordii*, but much darker in coloration, being nearly as dark as the lighter colored specimens of *D. agilis*.

Above brownish ochraceous, much mixed with blackish, the hairs being plumbeous at base, subterminally broadly ringed with rather dull dark ochraceous, and rather broadly tipped with blackish. Below pure white, including the fore limbs (except a buffy ochraceous patch on the posterior surface of the fore arm), and the usual band across the thigh. Hind feet white above and on the sides, soles brownish black, a blackish half-ring at the posterior base of the heel. Tail above and below dusky brown, with the lateral white stripes narrow and extending to the end of the vertebræ, the crest and pencil at the tip dusky brown, not dusky plumbeous as in *D. ordii*. Ears large, scantily haired, with a broad dusky patch on the outer surface of the anterior border, and another terminal dusky patch on the inner surface of the lower posterior border; rest of the ear whitish.

Measurements (approximate from skins).—Total length, 249 mm.; head and body, 92.7; tail vertebræ, 141; tail to end of hairs, 156; hind foot, 35; ear from notch, 11.4.

Skull: Total length, 38; basal length (occip. condyles to incisors), 25.4; greatest mastoid breadth, 24; least interorbital breadth, 13.2; breadth at orbital expansion of maxillaries, 19.3; length of nasals, 11.4; length of lower jaw (condyle to tip of incisors), 17.8; height (angle to coronoid process), 5.8.

Based on two specimens (Nos. 5886 and 5887, Mus. Comp. Zool.), adult males, collected respectively May 1, 1878, and Sept. 1, 1878, at San Luis Potosi, Mexico, by Dr. Edward Palmer, for whom the subspecies is named.

These two specimens, although one was collected in May and the other in September, present no appreciable differences in coloration or other external features. As regards size and cranial characters they closely resemble an El Paso specimen of *D. ordii* (No. $\frac{18142}{25040}$, Dept. of Agriculture, ♂ ad.), kindly loaned me by Dr. Merriam.* They are, however, much darker, with the lower portion of the tibia blackish instead of ochraceous, etc. They thus resemble quite as closely light colored examples of *D. agilis* from San Diego Co., California.

***Dipodops richardsoni*, sp. nov.**

Similar in coloration and general external features to *Dipodops ordii* but much larger, and with important cranial differences.

Above bright ochraceous-buff, strongly varied with blackish-tipped hairs, passing into reddish ochraceous buff, less varied with black, on the sides. Hind limbs externally as far as the heels, colored like the sides of the body; fore limbs everywhere pure white, or more or less suffused with bright yellowish buff on the outer surface as far as the wrists. Thigh band, a large spot over each eye, the whole lower surface of the body and the inside of the limbs pure white. Tail above and below at the surface plumbeous black to the tip, the hairs mixed with white basally; lateral white stripes pure white, narrow at the base of the tail and gradually widening to the tip, and extending to considerably beyond the vertebræ. Ears within ochraceous, mixed with blackish on the apical third, forming an indistinct dusky spot; externally whitish, passing into buff, or buff mixed slightly with dusky on the superior border.

Measurements (approximate from skins): Total length, 289 mm.; head and body, 114.3; tail to end of vertebræ, 144.8; tail to end of hairs, 174.5; hind foot, 40.6; ear from crown, 10.7.

Skull: Total length, 40.6; basal length, (condyle to incisors), 28.2; greatest mastoid breadth, 25.9; greatest malar breadth, 22.4; inter-lachrymal breadth, 13; length of the intermastoid area, 5.1; length of anterior border of same, 3.6; do., posterior border, 3; length of nasals, 14.7; length of lower jaw (point of incisors to tip of condyle), 20.8; height (angle to condyle), 7.6.

Type, $\frac{30225}{33425}$, ♂ ad., Beaver River, Ind. Terr., Oct. 26, 1887, Jenness Richardson and John Rowley, Jr.

The present species is represented by a series of 14 specimens, collected by Messrs. Richardson and Rowley (Museum Expedition of 1887) in the Indian Territory, Oct. 12-26, 1887, the exact locality being on one of the sources of the Beaver River in the

* See North Am. Fauna, No. 4, 1890, p. 45.

extreme northwestern corner of the Territory, in the so-called 'Neutral Strip.' The series is very uniform in respect to coloration, the general color varying but little; some specimens are a little paler or a little brighter than others. While the fore limbs are generally white, a number of specimens have the lower portion of the external surface of the fore-arm more or less buffy, varying from a slight tinge of this color to a conspicuous suffusion over a considerable area. The dark stripe on the lower surface of the tail is also variable in extent, in some specimens running to the end of the tail, in others not passing beyond the basal half.

This species finds its nearest allies in *D. sennetti* of South-eastern Texas, and *D. ordii* of Southwestern Texas, from both of which it differs externally in larger size and somewhat brighter colors. In cranial characters it resembles the former in the robust development of the rostral portion of the skull, and the latter in the greater inflation of the mastoid elements, and the consequent reduction of the intermastoid area. Thus while *D. richardsoni* is much larger than either, it combines the cranial features of both, very much as if the anterior half of the skull of *D. sennetti* had been grafted on to the posterior half of the skull of *D. ordii*.

The fine series of skulls of *D. richardsoni* furnishes a fair test of the individual variability of cranial characters in this group. The variation in size between adults is very slight; the same is also true in respect to the general form of the skull. The only noteworthy variation is in the size of the intermastoid area and the size and form of the interparietal bone. The intermastoid area is subquadrate, with the lateral borders slightly concave, and the anterior border slightly longer than the posterior. Its least breadth varies in different skulls from .06 to .15 in., and its length from .20 to .24. The largest and the smallest of the series present the following dimensions: .15 x .24 in. and .26 x .20.

These variations are shown in the accompanying illustrations (Figs. 1 to 4). The skulls fall into two series in respect to the breadth of the intermastoid area, three having this area very narrow, as shown in Fig. 4; in the other eleven it is broader, as shown in Figs. 1 to 3. These four figures illustrate also the extreme variability of the interparietal, as regards both its size

and form. The variability in coloration above mentioned is not in any way correlated with the variation in the skulls, and is hence in each case doubtless purely individual. It should be further noted that age has nothing to do with the variability of the intermastoid area, this space being relatively the same in skulls not full-grown as in those fully adult.

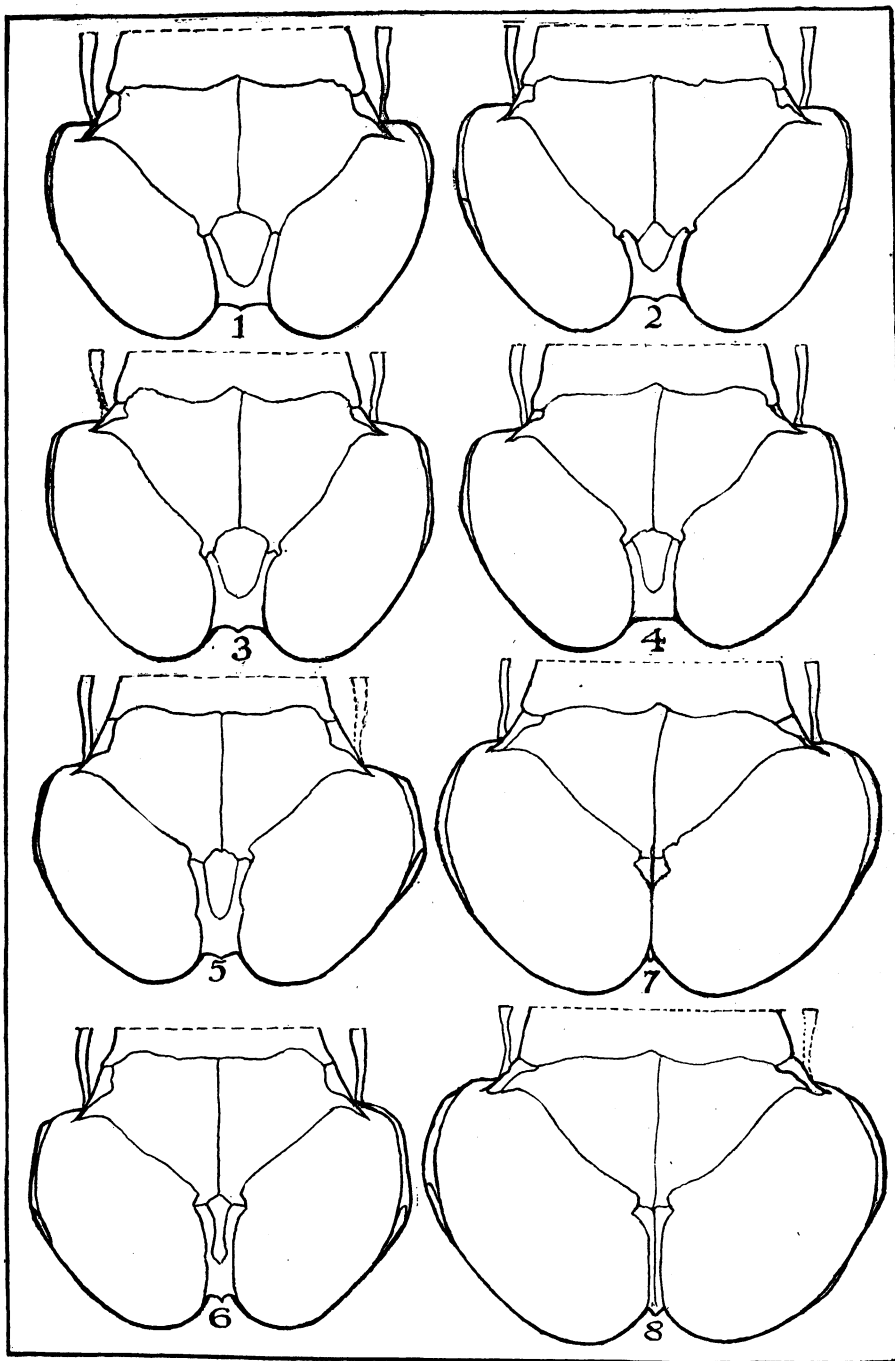
In addition to the series above mentioned I refer to this species a single specimen (♀) from Trego County, Kansas, collected May 7, 1889. It is smaller and paler than the fall specimens from the Indian Territory. (The skull of this specimen has been unfortunately mislaid.) Another specimen from Estes Park, Larimer County, Colorado, collected Feb. 8, 1889, I am unable to distinguish by any feature, cranial or external, from average specimens of the Indian Territory series. In all probability the species will be found to range over the Plains from northern Texas to southern Wyoming and westward to the Rocky Mountains.

The species is named for Mr. Jenness Richardson of the American Museum of Natural History, whose explorations under the auspices of the Museum have added much valuable material to our collections and thrown much light on the distribution of North American mammals.

Of interest in relation to individual variation in cranial characters, are Figs. 7 and 8, showing the extremes of variation in a series of six skulls of *Dipodomys deserti*. In Fig. 7 the inflated mastoids meet on the median line, while in Fig. 8 they are slightly separated. Figs. 5 and 6 show the extremes of variation in a series of seven skulls of *Dipodops agilis*.

Explanation of the Figures.

Fig. 1,	<i>Dipodops richardsoni</i> ,	No. 2339,	♂ ad.
" 2,	" "	No. 2338,	♂ ad.
" 3,	" "	No. 2344,	♀ ad.
" 4,	" "	No. 2345,	♂ ad.
" 5,	<i>Dipodops agilis</i> ,	No. 2604,	♂ ad.
" 6,	" "	No. 2652,	♂ ad.
" 7,	<i>Dipodomys deserti</i> ,	No. 2599,	♂ ad.
" 8,	" "	No. 2600,	♂ ad.



1-4, *Dipodops richardsoni*; 5, 6, *Dipodops agilis*; 7, 8, *Dipodomys deserti*.
(Twice natural size.)

Perognathus (Chaetodipus) femoralis, sp. nov.

Coloration nearly as in *Heteromys alleni*; the pelage less bristly; ears smaller, and tail longer.

Above prevailing tint blackish, faintly suffused with pale grayish buff, more pronounced on the sides, and bounded below by a broad lateral line of dull orange buff. The pelage of the whole dorsal surface consists of coarse hairs and bristles without underfur; the bristly hairs are pale grayish plumbeous basally, subapically broadly ringed with pale buff and tipped with black; they are mixed with coarse grooved spines, some of which are wholly black and others wholly pale buff. Below, whole fore limbs, and inner surface of the hind limbs nearly to the tarsus, white; no light eye-ring nor light spots at base of ears; outer surface of hind limbs blackish to the feet, with long conspicuous yellowish white bristles on the thighs; upper surface of hind feet grayish white; tail sharply bicolor, blackish above and at the tip, grayish white below, sparsely haired and scaly on the basal third, apical third with long hairs and a heavy bushy pencil at the tip.

Measurements (taken by collector before skinning): Total length, 241 mm.; head and body, 89; tail to end of vertebræ, 133; to end of hairs, 152; ear, 9.4; hind foot (from skin), 27.

Skull: Total length, 27.4; basal length (condyle to incisors) 20.8; mastoid breadth, 16.7; zygomatic breadth, 13.2; least interorbital breadth, 7.6; length of nasals, 11.2; interparietal, 8.6 x 4.6; lower jaw, length, 14.7, height (at coronoid), 5.3.

Type, No. 3333, ♂ ad., Dulzura, San Diego Co., California, Feb. 12, 1891.

This species combines the external appearance of a typical *Heteromys* with the cranial characters of *Perognathus*, it having the coloration and the hispid pelage of the former and the swollen mastoids and dentition of the latter. *P. femoralis* finds its nearest relatives in *P. californicus* and *P. armatus* Merriam, but it differs so much in both size and coloration from either as to require no detailed comparison with them.

The subgenus *Chaetodipus* differs from the subgenus *Perognathus* in the direction of *Heteromys*, the present species in external characters presenting a striking resemblance to *Heteromys alleni*, from which it differs mainly in smaller size, relatively shorter and more penicillate tail, and smaller ears. In cranial characters, however, the two forms are widely different.

***Neotoma micropus* Baird.**

(TEXAN WOOD RAT.)

Neotoma micropus was described by Baird* in 1855 from two specimens collected at Charco Escondido and Santa Rosalia, in northeastern Mexico, not far from Matamoras, and redescribed in 1858† from the same specimens. In 1877 Dr. Coues referred‡ *N. micropus* to *N. floridana*, after an examination of the original specimens. He says: "The case of *Neotoma* '*micropus*' presents some difficulty, owing to lack of material; we have nothing additional to Professor Baird's two types. One of these, No. 561, is so young, that the molars are not cut at all! the skull measuring only 1.08, or about half the normal adult average. We will, therefore," he adds, "confine our attention to the other specimen, No. 554. This has the appearance of being mature, or nearly so, except that it is, as stated, in a grayish-slate state of pelage."

In a collection of mammals recently received by the American Museum from Brownsville, Texas—a point about sixty miles east of the original locality—are eleven specimens of a *Neotoma* which at once attracted attention by their "grayish-slate" colored pelage, they being strikingly different from anything I had previously seen, with the exception of three specimens received last year from the extreme northwestern corner of the Indian Territory, presently to be mentioned at length. On comparing the Brownsville specimens with Baird's description of his *N. micropus* it became immediately evident that they were referable to this long lost species, so well characterized at all ages by its slaty gray coloration.

As shown by Dr. Coues, some of the alleged characters of *N. micropus* were elusive, as the supposed smallness of the feet and the disproportionately short tail; also that certain supposed cranial differences are shared by the western forms of the *N. floridanus* group. "The chief character of '*micropus*,'" says Dr. Coues, "rests upon the assumption that the gray pelage No. 554 shows is permanent. Although this presumption is

* Proc. Acad. Nat. Sci., Phila., VII, 1853, p. 333.

† Mam. N. Am., p. 492.

‡ Mon. N. Am. Roden., p. 15.

colored by Dr. Berlandier's testimony,* that naturalist is as liable to be mistaken as another one; and we are satisfied that *Neotoma* 'micropus' is not a valid species."

The Brownsville specimens prove that the slate-gray pelage is not due to immaturity, the skulls showing them to be all adult except one, while the six females give evidence of having suckled young.

The collector's measurements of the ten adult specimens from Brownsville are as follows: Total length, 360 mm.; head and body, 209; tail, 151; ear, 18.

As regards coloration, there is nothing to add to Baird's description. In respect to cranial characters, there are two points to be noted, namely, the heavier dentition and much broader molars, and the less posterior prolongation of the intermaxillaries (as compared with the nasals) in *N. micropus*, in comparison with *N. floridana*.

Since writing the above I have found three additional specimens of *N. micropus* in Mr. Sennett's collection, obtained by one of his collectors (Mr. J. M. Priour) at San Fernando de Presas, in the State of Tamaulipas, about fifty-five miles due south of Charco Escondido. They were collected March 30, 1888; one is an adult male, one an adult female, and the other a not quite adult female. They agree exactly in coloration with the Brownsville specimens, but are apparently rather smaller; the distorted condition of the skins, however, prevents satisfactory comparison as regards measurements. The size of the ears and feet are practically the same as in the Brownsville specimens.

In Mr. Sennett's collection I find also a two-thirds grown male from near Perry's Landing, Brazoria County, Texas, about fifteen miles from the mouth of the Brazos River, collected May 22, 1887, which agrees so closely with the Tamaulipas examples that I have little hesitation in referring it to the same species.

Neotoma micropus has thus an ascertained range extending from the San Fernando River in Tamaulipas northward to Brownsville, Texas, and probably along the coast of Texas to the Brazos River. There is nothing to show how far it may range to

* Cf. Baird, Mam. N. Am., p. 494.

the westward, except that the form occurring in Presidio County, Texas, is *N. mexicana*, as shown by a fine adult specimen in Mr. Sennett's collection, taken Oct. 15, 1887, by Mr. Wm. Lloyd.

Since the above was prepared for the press, Mr. Frank M. Chapman, of the American Museum, has returned from a short collecting trip in Texas, bringing with him, as a part of his collection, 17 specimens of *N. micropus* taken at Corpus Christi, March 21 to April 8, 1891. They are all adult but one, are very uniform in coloration, and agree exactly in this respect with the Brownsville and other specimens already mentioned. Taking the whole series of 30 specimens together, the uniformity of coloration is remarkable. The portion of the year represented extends from January to June.

Twelve Corpus Christi specimens, 6 females and 6 males, all fully adult, average as follows, from measurements taken by Mr. Chapman from the fresh specimens: Total length (nose to end of vertebræ), 360 mm.; head and body, 222; tail vertebræ, 138; hind foot, 39. The males average slightly larger than the females. The length of the tail (vertebræ alone) varies in different fully adult specimens from 137 to 156 mm.

The following observations on the habits of this animal are kindly furnished by Mr. Chapman.

"The Texan Wood-rat (*Neotoma micropus*) is very abundant in the vicinity of Corpus Christi. In suitable localities, the densest of low, scrubby chapparal, one or more nests of this species were always in view, and it was not unusual to find their dwellings beneath some isolated bush or cactus in the prairie. These nests are rude structures, composed of dried horse and cow excrement, sticks and weed-stalks piled together until the whole has assumed an irregularly pyramidal form. They average from two to three feet in height, and have a basal diameter of from three to four feet. There are from two to five openings which lead to the nest proper, a mass of soft, dried grass, situated near the centre of the house, or in one of the chambers which are sometimes excavated beneath it. Long *Opuntia* spines, cut from the growing leaf, are placed about these openings, evidently to prevent the entrance of unwelcome visitors.

"The food of *Neotoma*, so far as I learned during my observations in March and April, consisted of the thick, fleshy leaves of the prickly pear (*Opuntia* sp.), the common cactus of the region. These they ate on the growing plant, and there were few cacti in the vicinity of their haunts which did not show more or less recent evidence of their fondness for its leaves.

"*Neotoma* is nocturnal in its habits and passes the day in retirement in its dwelling, whence it may be aroused by vigorous use of a stick pushed into one of the entrances or through the nest itself. On being thus driven from its nest it takes refuge in a neighboring one.

"It is difficult to say whether one or more pairs inhabit the same dwelling, though it is not improbable their homes may be divided into apartments. Within five days I trapped, at the same nest, four adult specimens of both sexes, catching one each night; and I was told that seven adults have been taken from one nest.

"From two to four young are produced at a birth. Of six adult females taken from March 20 to 30, three were nursing and three contained two, three and four large fœtuses, respectively.

"The abundance of this animal has given rise to a peculiar form of sport among the youth of Corpus Christi. Armed with sticks and accompanied by dogs of various kinds, they visit the chapparal, start the rats from their homes, in the manner previously described, when the dogs generally catch them as they attempt to escape. A more practical method of capture, however, is to place a No. 0 steel-trap at the mouth of an opening to the nest. The rats are apparently unsuspicious, and the trap may be set without any attempt at concealment."—CHAPMAN, *M.S. Notes*.

It seems remarkable that an animal so abundant and so easily captured, and having furthermore so wide a distribution, should have escaped the observation of naturalists for a period of thirty-five years! during which period *Neotoma micropus* was practically a 'lost' species.

***Neotoma micropus canescens*, subsp. nov.**

(PALLID WOOD RAT.)

Four fine adult specimens from the northwestern corner of the Indian Territory resemble the Brownsville and Tamaulipas series,

except that they are much paler and grayer. These examples were taken by Messrs. Richardson and Rowley, of the American Museum, on the North Beaver River, near the boundary line between the Indian Territory and New Mexico, Oct. 17-20, 1889, and consist of three skins and skulls and a specimen in alcohol. While evidently allied to *N. micropus*, they appear to represent an easily recognizable form, characterized by pallid coloration. It may be described as follows:

Similar to *N. micropus* but much paler, the upper parts ashy gray instead of dusky slate gray, with a much less admixture of black. Below whiter, the hairs being pure white to the base instead of plumbeous with the apical portion only white. The sides of the body are much paler and more ashy. The upper surface of the tail is ashy brown instead of nearly black. The faint fulvous tinge of the upper surface in adult specimens of *N. micropus* is almost entirely absent in *canescens*.

Judging from the skulls there is little difference in size, the Brownsville specimens being a little the largest of the whole series.

The alcoholic specimen (δ ad.) of *N. m. canescens* measures as follows: Total length, 340 mm. (13.3 in.); head, 54 (1.37); head and body, 205 (7.05); tail, 135 (5.32); fore foot, 19 (.75); hind foot, 38 (1.50); ear from crown, 25 (.98), from notch, 23 (.91).

MEASUREMENTS OF SKULLS OF *Neotoma micropus* AND *N. micropus canescens*.

No.	LOCALITY.	Sex and Age.	Total Length.	Basal Length.	Breadth.	Nasals.	Lower Jaw.	
							Length.	Breadth.
28228	Brownsville, Texas.	δ ad.	49.8	46.2	24.4	18.5	33.0	14.7
28231		\varnothing ad.	48.8	45.7	25.9	19.3	32.3	14.7
28243								
28219	"	δ ad.	49.0	46.2	26.4	19.8	34.5	15.6
28240								
28248								
28248	San Fernando de Presas, Tamaul.	δ	44.7	40.6	24.6	17.3
2745	"	\varnothing	45.2	40.6	...	17.0
28250*								
28250*								
28251*	Indian Territory.	δ	49.0	45.7	27.4	20.3	34.3	...
28251*	"	\varnothing	46.7	44.7	25.4	18.5	31.2	15.4
28252*								
28252*		δ	44.6	41.9	25.4	17.3	29.7	14.2

* *Neotoma micropus canescens*.

The variation shown in the above table is partly individual but mainly due to differences of age. The two San Fernando speci-

mens are shown by the skulls to be slightly immature, although the skins have the appearance of being those of fully grown individuals.

It is important to note in the present connection that specimens from Central Kansas (Fort Riley, Dr. W. A. Hammond, U. S. National Museum), taken in spring and therefore comparable with the Texas specimens, are very unlike the Texas specimens, but, on the other hand, are almost indistinguishable in coloration from Florida specimens. The tail, however, is much more hairy and rather more sharply bicolor, as noted by Dr. Coues.*

Neotoma cinerea occidentalis (Baird).

A recent comparison of considerable material of the *Neotoma cinerea* group shows clearly that the Northwest Coast form is at least subspecifically separable from true *cinerea* from the Rocky Mountains, as long since pointed out by Professor Baird. Dr. Coues, in reviewing the group in 1877,† was compelled to thus summarize the case of the *N. cinerea* group: "We may, in a rude way, throw the *Neotoma* [*cinerea*] skins before us into three heaps: first, the Arctic ones, thickly clad, short-tailed, dark-colored; secondly, the United States prairie [and Rocky Mountain] ones, thinly clad, short-tailed, bright-colored; thirdly, the Pacific-coast ones, medium clad, long-tailed, dark-colored. If there be more than one 'species,' there certainly are *three*," etc. He preferred, however, to recognize but one.

Sigmodon hispidus texianus (Aud. & Bachm.).

Arvicola texiana AUD. & BACH. Quad. N. Am., III, 1853, p. 229, pl. cxlvii, fig. 2.

Sigmodon berlandieri BAIRD, Proc. Acad. Nat. Sci. Phila., 1855, p. 333; Mam. N. Am., 1857, p. 504; U. S. & Mex. Bound. Surv., II, 1859, p. 44, pl. v, fig. 2, 2a.

Sigmodon hispidus berlandieri ALLEN, Bull. Am. Mus. Nat. Hist., II, 1890, p. 186 (in part); *ibid.*, III, 1891, p. 207 (in text); *ibid.*, p. 224.

A series of ten specimens of *Sigmodon*, collected by Mr. Frank M. Chapman at Corpus Christi, Texas, in March and April, 1891,

* N. Am. Roden., p. 16.

† *Ibid.*, p. 28.

and just received at the Museum, has led to an examination of the status of Audubon and Bachman's *Arvicola texiana*, hitherto currently synonymized with *Sigmodon hispidus*. These authors state that "This was first discovered on the river Brazos, and afterwards seen in the country along the Nueces and Rio Grande, where chapparal thickets afford it shelter." Their description, taken with the habitat and peculiar haunts of the Texan Cotton Rat, in the light of the present large series of specimens (about 130) now available for examination, render it evident that *Arvicola texiana* is the same animal that Professor Baird, two years later, named *Sigmodon berlandieri*. Indeed, Baird himself in 1857 (l. c.) referred to its resemblance to *Arvicola texiana*, and suggested that it "may possibly be the same." Although the type of *S. berlandieri* came from "west of San Antonio," Baird referred to the same species specimens from "Eastern Texas" and northeastern Mexico.

Mr. Chapman contributes the following interesting field notes on the form here under consideration :

"The Texas Cotton Rat (*Sigmodon hispidus texianus*) is an abundant and very generally distributed mammal in the vicinity of Corpus Christi. In habits it so closely resembles *Arvicola riparius* that *Sigmodon* may be said to represent *Arvicola*, so far as its place in the animal economy of a region is concerned.

"Their favorite haunts are open swamps and meadows, where they share with *Oryzomys* the numerous well-worn runways which thread the heavier grass and reeds at the borders of ponds and bays. While occasionally they will take to water, they are much less aquatic than *Oryzomys*.

"So abundant are these animals in the salt marshes of Nueces Bay that in one night, with ten No. 0 traps, I captured nine individuals. They are both diurnal and nocturnal, and for this reason greatly interfere with successful trapping of purely nocturnal mammals. Traps set in the morning may all be sprung by *Sigmodon* before nightfall.

"In the chapparal and cleared fields or pastures *Sigmodon* is not uncommon, but is by no means so abundant as in the marshes.

"Their nests are composed of short, dried grasses, and are placed on the surface of the ground beneath a clump of dense grass, or

where a low-growing bush or cactus affords them opportunity for concealment.

"None of the females taken were pregnant or showed signs of nursing."—CHAPMAN, *MS. Notes*.

***Oryzomys aquaticus*, sp. nov.**

Ten specimens of *Oryzomys* from Brownsville, Texas, collected Feb. 22–March 6, 1891, differ greatly from *O. palustris* both in size and coloration, averaging three inches longer in total length, and being yellowish brown instead of reddish brown above, and buff instead of clear white or grayish white below. Notwithstanding the larger general size, the feet are much smaller than in *O. palustris*. This very distinct form may be characterized as follows :

Above yellowish brown, darker and sparsely lined with blackish mesially, passing into pale yellowish brown on the sides ; below buffy, varying in different specimens from dull buffy white to strong buff. Feet, ears, and tail as in *O. palustris*, but rather paler, especially the latter, which is grayish above instead of blackish.

Average measurements of ten specimens (from the fresh specimen by the collector) : Total length, 284 mm. ; head and body, 140 ; tail vertebræ, 144 ; ear, 10. The corresponding average measurements of ten specimens of *O. palustris*, from South Carolina and Georgia (by Professor Baird* from alcoholics) are as follows : Total length, 209 ; head and body, 103 ; tail vertebræ, 106 ; ear, 13.† The hind foot (measured from skins in both instances) averages 31.7 in full-grown *O. aquaticus* against 34.3 in *O. palustris*.

The skulls are unfortunately too imperfect for satisfactory measurement, the collector having cut away the whole basal portion. Compared with *O. palustris* the skull of *O. aquaticus* is much larger and heavier ; the lower jaw is much more massive ; the dentition is also much heavier, the molariform teeth being nearly twice as large as in old skulls of *O. palustris*.

Type, No. $\frac{3411}{3384}$, ♂ ad., Brownsville, Texas, March 6, 1891.

The relationships of this form, both to the northward and southward, cannot at present be determined, owing to lack of material. The large pale form reported from Kansas by Dr. Coues (Mon. N. Am. Roden., p. 116) may be related to the present form rather than to *O. palustris*. The specimen from Tonila, State of Jalisco,

* Mam. N. Am., p. 484.

† The apparent difference in the size of the ear is shown by comparison of specimens of the two forms to be due to different methods of measurement.

Mexico, formerly referred by me to *O. couesi*, resembles the Brownsville specimens so closely as to be distinguishable mainly by its ventral surface, which is nearly pure white instead of being strongly suffused with buff. It may be, however, that the strong buffy suffusion of the Brownsville specimens is in part seasonal, it probably changing by fading and abrasion to nearly white toward the end of the breeding season.

Just what *H. (O.) couesi* is cannot readily be determined. It seems to agree fairly well with the present species in size and proportions, but not in coloration. The original diagnosis says: "*Upper parts reddish brown*, the fur . . . with broad *rufous tips*, mixed with longer blackish hairs; the flanks *lighter rufous*, gradually shading below into dirty white (or pale fawn) without any distinct line of demarcation; *breast washed with rufous*," etc. The phrases italicised in the above quotation could never be applied to *O. aquaticus*. It seems doubtful whether *H. couesi* is an *Oryzomys* in a strict sense, as Mr. Alston says the "teeth are typically Hesperomine," and "the palate not produced so far back" as in *O. palustris*. Yet, in the 'Biologia' (Mamm., p. 143) he has placed it under *Oryzomys* with *O. palustris*.

It should be further noted that both Coues (l. c., p. 116, footnote) and Alston (Biologia, Mamm., p. 148) have recognized what they call *O. palustris* from Southern Mexico. Dr. Coues's specimen, now before me, I find is quite different from either *O. palustris* or *O. aquaticus*, resembling the latter, however, in coloration more than the former.

***Hesperomys indianus* Wied.=*Mus musculus* Linn.**

Hesperomys indianus WIED, Wiegmann's Arch. für Naturg., 1862, i, p. 111.

Wied speaks of this mouse as common in the fields and thickets about New Harmony, in Indiana, where he observed its tracks in the snow in the month of January. In describing it he compares it especially with the common house mouse of Europe, from which he thought it differed in having a smaller head. The type (No. 575, Am. Mus. Nat. Hist.) is fortunately still extant, and in a good state of preservation, in the Maximilian collection, and proves on examination to be nothing more than a common house

mouse (*Mus musculus*), though slightly more rufescent than average examples of this species. The original label reads as follows: "*Hesperomys indianus* Wied. N. America, Indiana." It is a mounted skin, without skull.

ON THE GENERIC NAME *Hesperomys*, AND THE SPECIFIC NAME
leucopus, AS APPLIED TO CERTAIN NORTH
AMERICAN MURIDÆ.

The Generic Name *Hesperomys* not entitled to Recognition in Nomenclature.—While *Hesperomys* has had currency for fifty years it proves on critical examination to have no substantial basis as a generic name. Its applicability, even if entitled to recognition, to any North American species, has long been held in question, but no one seems to have had the courage to break away from current usage and reject it as strictly untenable in such a connection. Its continued use has in the meantime increased the embarrassment of discarding it, as sooner or later must be done if strict adherence to well-established laws of nomenclature is to be observed.

Hesperomys antedates by three years the promulgation of the Stricklandian Code of Nomenclature. It is thus perhaps not strange that Waterhouse in proposing *Hesperomys* in 1839* should have formed it of five of his own 'subgenera,' proposed two years earlier, plus two of still earlier date, namely *Scapteromys*, *Oxymycterus*, *Abrothrix*, *Calomys*, and *Phyllotis* Waterhouse,† and *Neotoma* and *Sigmodon*, and also including '*Mus leucopus*' of North America. Subsequent writers have attempted to compromise the matter by accepting *Hesperomys*, in a generic sense, as the general name for a group, to include the others in the sense of subgenera, without, however, being able to designate any species, or even section, as typically representing *Hesperomys*. We thus have the anomaly of a 'genus' antedated by a large number of its 'subgenera,' with no section to which *Hesperomys* in a restricted sense can be applied. Various attempts have been made to 'fix' *Hesperomys* proper, but obviously, from the nature of the case, without success. Baird and Coues have each wrestled with the problem in its relation to our North American Vesper or White-

* Zoölogy of the Voyage of the Beagle, I, pt. ii, 1839, p. 75.

† F. Z. S., 1837, pp. 20, 21 and 28.

footed Mice; they both succeeded in showing the inapplicability of the name *Hesperomys*, in a strict generic sense, to any of them, and then finally adopted it for just this group, plus possibly some allied South American forms. Having done this Baird* proceeded to separate under *Hesperomys* several North American subgenera, as *Onychomys* and *Oryzomys*, leaving the *leucopus* group to compose the North American representatives of a restricted *Hesperomys*, to which it had originally only a casual relation. Later Dr. Coues† adopted Baird's new subgenera, and completed the demolition of *Hesperomys* as a North American group by proposing the subgenus *Vesperimus* for the North American species left in it by Professor Baird. Yet as *Onychomys*, *Oryzomys*, and *Vesperimus* were recognized only in a subgeneric sense *Hesperomys* was still retained as a sort of wrapper to enclose and bind them together.

From the foregoing historic summary it is evident that *Hesperomys* has no nomenclatural claims upon any of the North American Muridæ. Dr. Coues in laboring to bolster up such a claim unwittingly exposed its absurdity.‡ As we have now gotten rid of *Hesperomys*, and have names already at hand, and of unequivocal application, for our North American species, there is nothing in the way of their adoption. Although *Vesperimus*, *Onychomys*, and *Oryzomys* were each proposed in a subgeneric sense, the two latter have of late, almost by common consent in this country, risen to the rank of genera, which necessarily leaves *Vesperimus*§ on the same plane.

* Mam. N. Amer., 1857, p. 453.

† Proc. Acad. Nat. Sci. Phila., 1874, pp. 176-178.

‡ He says: "We have only to tie this name [*Hesperomys*] down to the strict value of a genus, pin it to its type, and establish among the numerous species what subgeneric divisions we can. From the circumstances of its founding it is difficult to say what should be considered the type of *Hesperomys*. Waterhouse, in drawing his comparisons between *Mus* and the New World mice, took *M. rattus* and *M. bimaculatus* for such purpose; we may properly therefore elect the latter as technically the type. But when Waterhouse, in 1837, established *Calomys* upon *C. elegans* he included in it both *bimaculatus* and *gracilipes*; and *Eligmodontia* of F. Cuvier is strictly coequal. It becomes a question whether one of these names should not stand in place of *Hesperomys* as restricted; but as the latter is firmly established, as *Calomys* is by the same author, and as *Eligmodontia* is no earlier, there may be no necessity for a change. Resting then upon this strict application of *Hesperomys* to such species as *bimaculatus*, *elegans*, and *gracilipes* [all referred to *Calomys* two years before *Hesperomys* was established], we may enquire how nearly, if at all, the North American Vesper-mice agree with it." He then proceeds to adopt Baird's subdivisions of *Hesperomys*, and to establish *Vesperimus* for the remaining species, adopting *Hesperomys* as a blanket for the whole group!

§ As the common White-footed Mouse of Eastern North America appears to have been named *Musculus leucopus* by Rafinesque (Am. Month. Mag., III, p. 446, Oct., 1818) in 1818, Dr. Coues (Mon. N. Am. Roden., p. 46) has urged that the generic name *Musculus*, "in strict technical conformity with the rules of nomenclature, ought to be adopted" in place of *Vesperimus*, but consented to waive its claims on what he regarded as weighty considerations. While the objections he raised against it have some weight, they are fortunately not the only ones, as *Musculus* was employed for a genus of Mollusks by Klein (Tent. Meth. Ostrac., 1753, p. 127) in 1753. As Klein's names, like Brissou's, are now considered available, Rafinesque's name may be rejected as preoccupied and therefore untenable.

In regard to the status of the name *Hesperomys*, it is gratifying to find that the conclusion here reached has recently been very ably supported by Mr. Oldfield Thomas, who, in urging the essential identity of *Cricetus* with the group so long known under the name *Hesperomys*, says: "This change, large as it is, will be rendered rather less unacceptable by the consideration that the name *Hesperomys* has itself, by the strict laws of nomenclature, no possible claim to adoption, being antedated not only by *Calomys*, Waterh., and the other earlier names of the same author, and by *Eligmodontia*, F. Cuv., but also by *Akodon*, Meyen, founded on a now almost unrecognizable specimen belonging to Waterhouse's subgenus '*Habrothrix*.' That this name would have been brought up and forced into use may be looked upon as certain, and in fact the first step has been taken by the substitution of *Akodon* for *Habrothrix* in Trouessart's list of Rodents."*

I regret much, however, my inability to agree with Mr. Thomas in his conservatism in respect to genera, or rather that he should have carried his conservatism to the verge of absurdity by bringing under one generic name the Cricetine Muridæ of the Old World and the Hesperomine or Sigmodont forms of the New World. While a much closer affinity has been shown by Mr. Thomas to exist between these forms than had been previously generally recognized, it does not follow therefrom that the proposed change of nomenclature is either necessary or even warranted, much less advisable. Convenience must to some extent be considered in classification as well as in nomenclature, the two together being a means to an end. *Cricetus*, in the present Thomasian sense, is made to include not only a large number of Old World forms, but probably not less than 100 'good species' in America alone, a number of which represent groups each of which contain numerous strongly-marked subspecies, the whole aggregating from probably 200 to 250 nameable forms. It is generally conceded that classification is intended to express relationship, and that the various grades of groups, from subspecies up to the higher groups, are intended to indicate degrees of relationship. *Cricetus*, as thus constituted, includes at least a dozen 'subgenera,' many of which have been often accorded the rank of genera. The

* P. Z. S., 1888, p. 134.

assemblage thus includes very diverse elements, although the extremes are connected by gradual stages, with only here and there well-marked breaks. But is it conducive to exact expression of relationship to designate respectively *Oryzomys palustris* and *Cricetus frumentarius* as *Cricetus palustris* and *Cricetus frumentarius*? If we wish to be more exact than this in expressing in nomenclature the relations of the heterogeneous elements making up this wilderness of forms we must necessarily adopt a trinomial form of nomenclature by the introduction of the subgeneric name (in parenthesis) between the generic and specific names, resulting, in the case of subspecies, in a quadrinomial name with one of its elements enclosed in parenthesis.

On the other hand, does it tend to place in clearer light the relationship of such genera as *Tylomys*, *Neotoma*, and *Sigmodon* to the other Sigmodont mice by leaving them out of the *Cricetus* assemblage while *Onychomys*, and especially *Oryzomys*, is included in it, and the whole set in apposition as a generic group against *Tylomys* or *Neotoma*?

So far as North American forms are concerned I must confess myself content, for the present at least, to treat *Vesperimus*, *Onychomys*, and *Oryzomys* as genera, in deference not only to convenience as regards the nomenclature of their respective constituents, but as regards explicitness in defining their actual relationships.

There doubtless never will be unanimity among naturalists respecting the exact measure of a generic group; the lumpers and splitters will naturally disagree in reference to genera and subgenera just as they do on species and subspecies. While a blunt tool may satisfy the one class, only a keen one will meet the necessities of the other.

The Specific Name *leucopus*, as applied to the White-footed Mice of Eastern North America, antedated by *americanus* of Kerr.—The substitution of little-known names for those that have been long in current use is always greatly to be deplored, but when under the strict rules of nomenclature the necessity arises, it seems better to make the change without further delay, since, sooner or later, the issue will be forced by some stickler for rigid adherence to nomenclatural law, and the

temporary postponement only aggravates the inconvenience when in time the change comes to be made. The particular point here at issue was raised by Dr. Coues in 1875* and 1877,† but owing to his inability to verify a needed reference he (unavoidably perhaps) allowed an obvious case of infringement of the law of priority to pass uncorrected. Had the change been made then the new name would long since have become current and familiar.

As is well known, Robert Kerr published in 1792 an English version of Gmelin's Linnæus, with many additions, under the title, "The Animal Kingdom, or Zoological System of the Celebrated Sir Charles Linnæus;—Class I, Mammalia: containing a complete Systematic Description, Arrangement, and Nomenclature, of all the known Species and Varieties of the Mammalia, or Animals which give suck to their Young; being a translation of that part of the Systema Naturæ, as lately published, with great improvements, by Professor Gmelin of Goettingen. Together with Numerous Additions from more recent Zoological writers, and Illustrated with Copper plates." The work is very rare in libraries, abroad apparently as well as in this country. The only copy I have seen is in the Library of the Boston Society of Natural History.‡ It is an important work, although a compilation, since a number of systematic names originated here, though in many cases attributed to Shaw and Turton, and in others wholly overlooked by subsequent writers. It is also interesting to note that Kerr adopted a system of trinomial nomenclature for the designation of varieties similar to that now so currently in use.

Pennant, in his "Synopsis of Quadrupeds" published in 1771, gave an excellent description of our White-footed Mouse, apparently from a New York specimen in the museum of Sir Ashton Lever, which description is the basis of Kerr's *Mus agrarius americanus*, cited by Coues in 1874, 1875, and 1877, in his well-known papers on the North American Muridæ, he adopting the name *americanus* for the species in 1875, and receding from this adoption in 1877, pending final verification of the Kerr reference, taken by him at second hand.

* Rep. Zool. of Wheeler's Exp. & Surv. West of 100th Merid., V, 1875, p. 102.

† Mon. N. Am. Roden., 1877, p. 51.

‡ Cf. Oldfield Thomas, Ann. & Mag. Nat. Hist., 5th Ser., IV, 1879, pp. 396-397; Allen, Hist. N. Am. Pinnipeds, 1880, p. 344, and Bull. U. S. Geol. Survey, VI, No. 3, 1882, p. 481.

Pennant under "No. 230, FIELD [RAT]." gives: "a. AMERICAN," which he describes as follows: "R[AT]. with very long whiskers, some white, others black: ears large, naked and open: from the head to the tail, along the middle of the back, a broad dark stripe, ferruginous and dusky: the cheeks, space beneath the ears, and sides, quite to the tail, orange-colored: underside, from nose to tail, of a snowy whiteness: feet white: hind legs longer than those of the *European* kind: tail dusky above, whitish beneath. *New York*."* This description is repeated in his "History of Quadrupeds" (1781), and also in his "Arctic Zoölogy" (I, 1784, p. 131), here slightly changed verbally and with the addition of "Length about four and a half inches, of tail four inches;" and, "Inhabits *Hudson's Bay* and *New York*."

Hence the pertinency of Kerr's name *americanus* to what has of late been known as *Hesperomys (Vesperimus) leucopus* is beyond question.

The name *leucopus* dates from Rafinesque, 1818, who describes a *Musculus leucopus*, giving no further habitat than is implied in the general title of his paper, which purports to describe, among other things, nine new species of Bats and ten new species of "Wild Rats," met with by him in "a journey through the Western Region of the United States," namely, the lower Ohio Valley and the Pine Barrens of Kentucky. None of these can be positively identified, though two or three may be guessed at with some degree of certainty, among which is his *Musculus leucopus*, which he thus describes:

"*Musculus leucopus*, R. (White-feet Mouse.) Body brownish, fallow above, white beneath, head fallow, ears large, blackish, tail as long as the body, pale brown above, gray beneath, legs and feet white. Length 5 inches."

To complete the record I append the following transcript from Kerr, as above cited, showing the basis of *Mus agrarius americanus*:

"473. β . AMERICAN RUSTIC MOUSE.—*Mus agrarius americanus*.

"Has a broad stripe along the middle of the back of a mixed dusky and ferruginous colour; the cheeks, space beneath the ears, and sides, are orange coloured; and all the under parts of the body, the legs and feet, are pure white. Penn. Hist. of Quad. n. 302. β .

* Synopsis of Quadrupeds, 1771, p. 303.

"Inhabits New-York.—The ears are large, open, and naked ; the whiskers very long, some of the hairs being white and others black ; the hinder legs are somewhat longer than the fore ; the tail is dusky above, and whitish beneath."

The name and principal synonymy of this species will hence stand as follows :

Vesperimus americanus (Kerr).

(WHITE-FOOTED MOUSE.)

American Field Rat, PENNANT, Synopsis Quad., 1771, p. 303 (New York) ; Hist. Quad., 3d ed., II, 1793, p. 185 ; Arct. Zool., I, 1784, p. 131.

Mus agrarius americanus KERR, An. King., I, 1792, p. 231 (based on Pennant, as above).

Hesperomys (Vesperimus) americanus COUES & YARROW, Expl. & Surv. W. 100th Merid., V, 1875, p. 102.

? *Musculus leucopus* RAFINESQUE, Am. Month. Mag., III, 1818, p. 446.

Mus leucopus RICHARDSON, Faun. Bor.-Am., I, 1829, p. 142 (in part).—DEKAY, Nat. Hist. New York, Zool., I, 1842, p. 82.

Hesperomys leucopus LECONTE, Proc. Acad. Nat. Sci. Phila., 1853, p. 412. Also of Baird, Coues, and most subsequent authors.

Mus agrarius GODMAN, Am. Nat. Hist., II, 1826, p. 88 (not of Gmelin ; description apparently copied from Pennant).

Arvicola emmonsii DEKAY, Rep. Quad. Mass., 1840, p. 61.

Vesperimus nudipes Allen.

Since describing this large Costa Rican species,* from a single adult female preserved in spirits, I have received from Mr. George K. Cherrie a skin, with the skull, of a second specimen apparently referable to the same species. It is a somewhat smaller and also a much younger animal, but I perceive no differences that warrant its specific separation. The teeth are entirely unworn, instead of well-worn, as in the former specimen, and the general condition of the skull is that of a nearly full-grown adult. In the softness of the pelage and in coloration the two specimens are nearly identical, and the original diagnosis requires qualification in only the following particulars : The feet are not entirely naked as in the adult, but the upper surface is clothed with very short glistening gray hairs, barely concealing the skin, while the lower part of the tibia and upper portion of the metatarsus is similarly clothed with very short dusky fur. The "flesh-color" ascribed to the feet in the original description proves due to immersion in spirits, and to the nakedness of these parts in

* This Bulletin, III, No. 2, p. 213 (author's separates issued April 17, 1897).

the type. The tail is wholly naked and finely annulated, as originally described. The "pale chestnut" or fawn-colored breast patch is a conspicuous feature.

The skull is about two-tenths of an inch shorter in total length, and proportionately narrower, with the dimensions of particular parts correspondingly less, except the length of the molar series, which is barely less than in the adult.

This specimen is labeled "near San José, Costa Rica, Dec., 1890, George K. Cherrie."

Vesperimus difficilis, sp. nov.

Similar in size and proportions to *V. megalotis*, as regards relative length of body and tail, but with much smaller ears, much larger hind feet, and very different coloration.

Above dusky brown, faintly washed with pale cinnamon fulvous, with a broad band of strong buffy cinnamon on the sides of the body, paler and more ashy on the nape and shoulders; beneath white at the surface with the basal two-thirds of the fur deep plumbeous; a narrow eye-ring and a spot at the base of the whiskers blackish; tail sharply bicolor, blackish above, white below, well-haired and penicillate. Fore feet dull whitish to above the wrist; hind feet similar, with the extreme base of the metatarsus dusky, like the legs. Ears very large, dusky, foliaceous, nearly naked (very fine short hairs may be seen with a lens), very faintly edged with gray; a large inner lobe at the base. Soles naked as far as the last tubercle and on the inner edge nearly to the heel; outer toe of pes very short. Whiskers very long, mixed black and white.

Measurements (approximate from skin): Total length, 201 mm.; head and body, 92; tail vertebræ, 103, pencil at tip, 6; hind foot, 25.4; ear from notch, 21.3.

Skull: Total length, 29.7; basal length, 24.1; greatest (zygomatic) breadth, 14.7; length of lower jaw (condyle to tip of incisor), 18.3; height (angle to coronoid process), 6.6.

Type, No. $\frac{11288}{11288}$, ♂ ad., Sierra de Valparaíso, Zacatecas, Mexico, July 27, 1889, Dr. Audley C. Buller.

This species belongs to the large-sized, big-eared group of North American Vesper Mice, finding its nearest ally apparently in *V. megalotis* Merriam,* from Arizona, from which it differs in having much smaller ears, much larger hind feet, and much darker coloration, the dorsal surface being suffused faintly with a dull tint of reddish brown instead of being strongly suffused with

* North Am. Fauna, No. 3, Sept., 1890, p. 64.—I am indebted to Dr. Merriam for the loan of one of his original specimens of *V. megalotis* (No. $\frac{11288}{11288}$, ♀ ad.).

yellowish brown. The skull indicates a somewhat larger animal, with relatively stronger dentition. The skull is broader in proportion to its length; the palatal region is conspicuously broader, the lower jaw and the whole dental armature much heavier.

Compared with *V. melanophrys* Coues,* from Southern Mexico, it is a much smaller animal, the feet being fully one-fifth smaller, and very different in coloration, while the skull differs notably in many characters.† While much smaller, the tooth row is longer and the individual teeth of the molar series are much larger; the rostral portion of the skull is narrower and weaker, and the maxillary branch of the zygomatic arch much more slender. In short, *V. difficilis* is apparently beyond question entirely distinct from either *V. megalotis* or *V. melanophrys*, though somewhat intermediate between them in certain features, and apparently much nearer the former than the latter.‡

***Vesperimus nasutus*, sp. nov.**

Ears large, foliaceous, nearly naked; feet long and slender; tail sharply bicolor and well clothed; soles naked to behind the last tubercle, probably wholly naked in summer.

Above dusky with a strong suffusion of pale grayish buff, which on the sides deepens into yellowish buff, forming a strongly defined lateral band extending from the base of the whiskers to the base of the tail; beneath clear white, the basal half of the fur blackish plumbeous. A narrow eye-ring and a spot at the base of the whiskers blackish; feet white tinged with flesh-color; the dusky color of the hind leg extends to the upper portion of the metatarsus; tail blackish above, white below.

Measurements (as taken by the collector before skinning): Total length, 190 mm.; head and body, 85.7; tail, 104.7; ear, 69. From skin: Total length, 193.3; head and body, 87.9; tail vertebrae, 95.2; tail to end of hairs, 105.4; hind foot, 22.4; ear from notch, 19.6.

Skull: Total length —? (imperfect); basal length (condyle to incisors), 22.4; greatest width, 14.5; length of nasals, 11.9; length of lower jaw, 17.8; height (angle to coronoid process), 64.

Type, No. $\frac{2387}{17}$, ♂ ad., Estes Park, Larimer Co., Colorado, Jan. 20, 1891.

* Mon. North Am. Roden., 1877, p. 102.—I am indebted to Mr. True for the loan of the type, No. 10,183, ♀ ad., Sta. Efígenia, Tehuantepec, July 11, 1871.

† From a hasty comparison of the *skin* of the single specimen on which *V. difficilis* is now based with the *skin* of the type of *V. melanophrys* Coues I referred it (this Bulletin, II, p. 187) with some misgivings to that species. A recent re-examination and careful comparison of both the skins and skulls of the two forms, with much additional material bearing on the problem, shows them to be very different; and my former repugnance to describing a new form of Vesper Mouse from a single specimen yields to the new evidence a more careful examination discloses.

‡ For further remarks on the character and affinities of *V. melanophrys*, see a paper soon to appear in Proc. U. S. Nat. Mus., Vol. XIV, 1891.

This species is allied to *V. megalotis* (Merr.) and *V. truei* (Shuf.),* though smaller than either. It differs from the former almost inappreciably in cranial characters and dentition, except that the rostral portion of the skull is stouter, and the whole skull is shorter and broader. As regards external characters, the ears are smaller, the general coloration is grayer and paler, with less of the buffy suffusion. From *V. truei* it differs in the possession of a longer and slenderer hind foot, much longer and less hairy tail, and very greatly in its much paler and grayer coloration.

V. truei, *V. megalotis*, *V. difficilis*, and *V. nasutus* form a group of rather nearly allied forms, occupying the great Rocky Mountain plateau region from northern Colorado to central Mexico, and represent the much larger and darker *V. californicus* group of southern California. Apparently no specimens of any of these interior forms had been seen by mammalogists till *V. truei* was described by Dr. Shufeldt in 1885. Three of them are at present known from single specimens, from widely separated localities. While as now known they present differences not to be accounted for by either individual or seasonal variation, it seems probable that the examination of more abundant material, including specimens from many intermediate localities, may eventually show these forms to be merely geographic phases of a widely distributed species.

***Vesperimus mearnsii*, sp. nov.**

Above dusky grayish brown, with a faint suffusion of fawn, the latter becoming strongest on the sides of the body, and varying in intensity and breadth in different specimens, but rarely forming a well-defined lateral stripe, even at the border of the pure white of the lower surface. Whole top and sides of the head, including eye-region, uniform with the rest of the dorsal surface. Below pure white, with the extreme base of the fur grayish plumbeous. Middle of the breast often marked with a spot of clear pale fawn, varying in size in different specimens from a slight trace to a large diamond-shaped spot three-fourths of an inch long by half an inch in width. (Four out of eight specimens have the fawn-colored breast spot, while the other four show no trace of it.) Ears large, dusky, naked except the outer basal third, and very narrowly edged with white. Tail dusky gray above, rather lighter below, and hence only very indistinctly bicolor, very sparsely haired (generally the annulations are distinctly visible),

* Proc. U. S. Nat. Mus., 1885, p. 407, pl. xxi.—I am indebted to Mr. True for the loan of the type (No. 33783, ♂ ad., Fort Wingate, N. Mex., Mch. 14, 1885), for examination in the present connection.

and very scantily tufted at the end. Feet soiled grayish white; soles hairy behind the last tubercle.

Measurements (as made by the collector before skinning—average of 5 specimens, 2 ad. males and 3 ad. females): Total length, 178.6 mm.; head and body, 98.6; tail, 80; ear, 13.7; hind foot (from skin), 20.8; ear from notch (from skin), 15.2.

Skull: Total length, 25.4; basal length (cond. to incis.), 21.6; greatest width, 13.2; nasals, 10.7; lower jaw (incis. to condyle), 15.7; height at coronoid, 6.6.

Type, No. $\frac{3400}{8678}$, ♀ ad., Brownsville, Texas, Feb. 4, 1891.

Vesperimus mearnsii is based on seven specimens collected at Brownsville, Texas, Jan. 27 to March 11, 1891. An exactly similar specimen (No. 2367, Coll. Am. Mus., adult male) was collected at Fort Verde, Arizona, Oct. 15, 1885, by Dr. E. A. Mearns. It is rather more thinly haired than the Brownsville winter specimens, not having fully acquired the winter coat. It has a large fawn-colored patch on the breast, but the lower surface is more or less grayish, with the pure white of the winter coat appearing in irregular patches.* In other respects it is exactly like an average winter specimen from Brownsville, Texas. The species has thus apparently a rather extended range, although I have as yet met with no specimens from any point except the two localities above named.

It differs strikingly in coloration and general appearance from any of the numerous forms of the *V. leucopus* group thus far described, it being very different from either *sonoriensis* or *texasus*, of which I have before me good series of each. It seems to be the exact counterpart in the genus *Vesperimus* of Baird's *Neotoma micropus* in the genus *Neotoma*; both are apparently abundant in the immediate vicinity of Brownsville. It is a little larger than *V. l. texasus*, being fully as large, if not larger, than restricted *sonoriensis*, which seems to range into southwestern Texas and south into Mexico.

V. mearnsii is readily distinguishable from either of these, and indeed from any other known form, by its peculiar dusky grayish-brown coloration. The brown chest-spot occurs, among North American species, so far as known to me, only in the big-eared *californicus* and *megalotis* groups, and then only rarely.

* The back of the label bears the following, in Dr. Mearns's handwriting: "A very remarkable beast, having a brown spot on breast, and somewhat resembling *Mus musculus*. Caught in Post Hospital. E. A. M."

In cranial characters there is nothing very tangible to distinguish it from the other small forms of *Vesperimus*.

***Vesperimus americanus sonoriensis* (Leconte).**

Hesperomys sonoriensis LECONTE, Proc. Acad. Nat. Sci. Phila., VI, 1852-3, p. 413 (Oct., 1853).—BAIRD, Mam. N. Am., 1857, p. 474 (in part only); U. S. & Mex. Bound. Surv., II, pt. ii, 1859, p. 43 (in part).

Hesperomys (Vesperimus) leucopus sonoriensis COUES, Proc. Acad. Nat. Sci. Phila., 1874, p. 179 (in part only).

Hesperomys leucopus sonoriensis COUES, Mon. N. Am. Roden., 1877, p. 79 (in part only).—MERRIAM, N. Am. Fauna, No. 3, Sept., 1890, p. 66.

Hesperomys leucopus deserticolus MEARNs, Bull. Am. Mus. Nat. Hist., II, No. 4, pp. 185, 187, Feb., 1890.

Hesperomys sonoriensis was described by Leconte in October, 1853, from a single immature example collected by the U. S. and Mexican Boundary Commission at Santa Cruz, State of Sonora, Mexico, a point only a few miles south of the present Arizona boundary. This specimen (No. 146, U. S. Nat. Mus.) is now before me, having been kindly loaned me by the authorities of the U. S. National Museum for examination. This was originally the sole basis for the species. As stated by Dr. Coues (N. Am. Roden., p. 79) "it is a young animal about three-fourths grown, in gray pelage identical with that of the same age of *leucopus*. While nothing, therefore, can be predicated upon its absolute size or its color, it may be known at a glance from ordinary *leucopus* by the shortness of the tail."

Professor Baird, in 1857 (l. c.), referred specimens to *sonoriensis* from El Paso, Texas, Fort Thorne, New Mexico, and from various points in Colorado, Wyoming, the Dakotas, and Montana, these specimens, as compared with '*leucopus*,' agreeing in pallid coloration and short tails. Some of these specimens are now before me, among them one of the Fort Thorne specimens (now No. 5566, Mus. Comp. Zoöl.=543, U. S. Nat. Mus.), which series Baird practically took as representing Leconte's *H. sonoriensis* (cf. N. Am. Mam., p. 475); his own diagnosis of *H. sonoriensis* was based on specimens from "the Upper Missouri" (cf., *ibid.*, p. 474, last paragraph). On a preceding page (p. 462), under *H. leucopus*, he apparently referred to these specimens under the designation "*Hesperomys sonoriensis*, var. *nebracensis*." But this "var. *nebracensis*" is not characterized, nor does the name appear

to occur elsewhere in the work, not even in the index. *H. sonoriensis*, as provisionally recognized by Professor Baird, is a large, stout, short-tailed, pale form, ranging from "Sonora along the Rocky Mountains and Black Hills to the Saskatchewan, or even further north," but with the intimation that the Sonoran and New Mexican animals might be different from those from the Upper Missouri and northward.

Hesperomys (Vesperimus) leucopus sonoriensis of Coues is practically the *H. sonoriensis* of Baird. The name *sonoriensis*, however, when applied in this wide sense, evidently covers, in the light of material now available for study, a group of forms, more or less closely allied, and in all probability intergrading where their habitats adjoin, yet in the main characterizing distinct physiographic regions. The form found, for example, in eastern Montana is quite different from the form inhabiting the desert lands of Sonora and Arizona. A still different form inhabits the wooded mountain district of Arizona, and another still occupies southern and eastern Texas. It hence becomes important to establish and restrict, if possible, the various names already applied to the different forms of this wide-spread group of short-tailed mice of the *sonoriensis* type.

An attempt to do this was recently made by Dr. Mearns (this Bulletin, II, pp. 284-287, Feb., 1890), but unfortunately with but partially satisfactory results. While discriminating with creditable precision the several forms treated, too little attention seems to have been paid to the literature of the subject, resulting in what seems to me a misapplication of some of the earlier names. His *sonoriensis*, for example, can not well be the *sonoriensis* of Leconte, or even of Baird and Coues, at least in a strict sense, the *sonoriensis* of these writers being a pallid desert form, while *sonoriensis* of Mearns is the much larger, darker-colored mountain form of the San Francisco Mountain wooded region, recently described by Dr. Merriam* as *Hesperomys leucopus rufinus*, the true *sonoriensis* being renamed by Dr. Mearns (l. c.) *Hesperomys leucopus deserticolus*. The two forms are very different (Dr. Mearns and Dr. Merriam have each, independently and on the basis of wholly different material, separated them); and it is

* N. Am. Fauna, No. 3, p. 65.

entirely against the probabilities of the case that the mountain form was the form obtained on the plains about Santa Cruz by the naturalists of the Boundary Commission and named *sonoriensis* by Dr. Leconte. Besides, I am informed by Dr. Merriam that prior to his determination of what *sonoriensis* should be he had taken the pains to have specimens collected from all about the type locality of the species. Besides, his determination of *sonoriensis* agrees with what has been currently accepted as *sonoriensis*.

It may be added in this connection that I have before me authentic specimens of Merriam's *H. l. rufinus* and Mearns's type (and other examples) of his *H. l. sonoriensis*, and that they are strictly identical; also the type of Mearns's *H. l. deserticolus* and an authentic specimen (No. $\frac{17931}{24842}$, U. S. Nat. Mus.) of Merriam's *H. l. sonoriensis*, which are also identical. Also much other corroborative material bearing on the general question.

***Vesperimus americanus nebracensis* (Mearns).**

Hesperomys leucopus nebracensis MEARNS, Bull. Am. Mus. Nat. Hist., II, No. 4, p. 285, Feb., 1890.

Hesperomys sonoriensis BAIRD, Mam. N. Am., 1857, p. 474 (in part).

In the American Museum Collection are two series of White-footed Mice, consisting each of eight specimens, strictly comparable as regards season, the one from central Montana, the other from the extreme northwestern corner of the Indian Territory.* On the first was based Dr. Mearns's *Hesperomys leucopus nebracensis*; on the other, his *Hesperomys leucopus texanus*. Mearns's *H. l. nebracensis* is evidently what Baird at one time intended to name *nebracensis*, but which he failed to formally designate and describe. Hence the name *nebracensis* as used by Baird in this connection is a *nomen nudum*, and really dates from Mearns's use of it in 1890, as above. This form is a member of the *sonoriensis* group, and apparently a strongly marked one, at least as regards coloration.

***Vesperimus americanus texanus* (Woodhouse).**

Hesperomys texana WOODHOUSE, Proc. Acad. Nat. Sci., Phila., Feb., 1853, p. 242; Sitgreaves's Rep. Expl. Zuñi and Colorado Rivers, 1854, p. 48, pl. ii.

* Both were collected by Museum Expeditions—the first by Elliot and Richardson in October, 1887, the other by Richardson and Rowley in October, 1889.

Hesperomys texanus BAIRD, Mam. N. Am., 1857, p. 464 (at least in part).

Hesperomys leucopus texanus MEARNS, Bull. Am. Mus. Nat. Hist., II, No. 4, p. 285, Feb., 1890.

As already indicated, *H. l. texanus* of Mearns is based on a series of specimens collected in October in the extreme western part of the Indian Territory adjoining New Mexico. While very different from the Montana series, they are not so easily distinguished from September specimens of true *sonoriensis* from Arizona. They are perhaps a little more strongly colored and more mixed with black on the median line of the back.

Hesperomys texanus was described by Woodhouse in 1853 from a specimen (without date), from "near El Paso," on the Rio Grande, Texas. Baird, in 1857, referred to it an alcoholic example from Fort Bliss, New Mexico, other specimens from near El Paso (El Paso and Waco Tanks, N. M.), and from the lower Rio Grande (Brownsville, Texas, and Charco Escondido, Mex.). Coues, in 1887, enumerates practically the same set of specimens, but declines to recognize *texanus* as distinguishable from ordinary *leucopus*. The type was a skin preserved in alcohol, which, Mr. True kindly informs me, is either not now extant, or has been misplaced in the collection and cannot be found. He has, however, kindly sent me another Woodhouse specimen (No. 4748, Nat. Mus.), a skin, labeled by Prof. Baird "*Hesperomys texana*. W. Texas, Dr. Woodhouse." This agrees exactly with the type of Dr. Mearns's description of his *Hesperomys leucopus texanus* (l. c.). Presumably the Woodhouse specimen, though not the type, correctly represents the *H. texana* of Woodhouse, as it certainly does Baird's *H. texanus*, and thus practically establishes the correctness of Dr. Mearns's identification. Doubtless if the type were at hand it would be of little use, after nearly forty years immersion in alcohol.

***Vesperimus americanus rufinus* (Merriam).**

Hesperomys leucopus rufinus MERRIAM, N. Am. Fauna, No. 3, p. 65, Sept., 1890.

Hesperomys leucopus sonoriensis MEARNS, Bull. Am. Mus. Nat. Hist., II, No. 4, Feb., 1890, pp. 285, 287 (not *H. sonoriensis* Leconte, Baird, and previous authors generally).

As already said, the form of *V. americanus* found in the wooded San Francisco mountain region of Arizona is very different from

the form of the adjoining deserts. Dr. Merriam compares it with *americanus* ('*leucopus*') proper of the Adirondack region of New York, which it strikingly resembles in color, while differing strongly in other features. I have had the opportunity of placing side by side specimens from the two regions and noting their close similarity in coloration. I also find that specimens of *rufinus* when placed in a series of winter specimens of *Vesperimus americanus gossypinus* from Florida present no differences in coloration sufficient to attract the eye, except in the sharply bi-colored tail of the former as compared with the nearly unicolor tail of the latter.

These facts serve to emphasize the statement already made (antea, p. 265), that specimens of our smaller mammals, from very remote localities, may occasionally be 'matched' with great closeness, as regards coloration, while really very different forms, separated by wide areas where neither of the two forms compared occur. If conditions of pelage and coloration due to age and season be ignored, as well as important geographical considerations, it would be easy to claim intergradation where in reality not only none exists, but where it would be physically impossible.

Similarity of environment at localities widely separated, and physiographically isolated from each other, not unfrequently results in superficial features of resemblance, as notably in coloration, among closely-allied forms, of which the *V. americanus* group presents a striking illustration.

Dr. Coues, in 1877, in summarizing the results of his careful examination of several hundred specimens of what he considered true *Vesperimus 'leucopus'* from eastern North America,—Labrador to the Carolinas and west to Kansas,—said: "In the matter of color, there is positively nothing in this whole series that we cannot exactly match among Massachusetts skins [of which he had a series of about 80 from Middleboro, Mass., alone]. And yet it is curious to observe that almost every considerable geographical area within the limits represented in the table [accompanying tabulated list of specimens] produces a slight strain or breed of its white-footed mice—some difference of color indescribable in words, but which strikes the eye that is very

familiar with the subject. The Nova Scotian animal and the Virginian, the Illinois and the Kansas, are always distinguishable. We venture to assert that we can distinguish in North America about *twenty kinds of* *Hesperomys leucopus* upon characters at least as constant, reliable, and tangible as those hitherto held to define the greater part of the 'species' that have been in vogue of late years."

When it is recalled that Dr. Coues's material was poor in quality as compared with that now available, and that he rarely had large series of specimens from distant regions which were strictly comparable, it speaks well for his discrimination that he was able, in a certain sense, to foreshadow what will be doubtless the final outcome of our studies of the group, based on material sufficient to disclose the real state of affairs in this wide spread, protean type, ranging as it does from ocean to ocean, and from the Arctic Regions to within the tropics, and thus exposed to the widest possible range in conditions of environment, as regards both temperature and humidity, and the resulting modifications of the fauna and flora of such widely diverse portions of the North American continent. But the time has not yet come for a satisfactory revision of the group, to attempt which at least 20,000 specimens are requisite, collected so as to fully represent the seasonal phases of pelage obtaining at hundreds of more or less widely separated localities. With the great accession of material since Dr. Coues wrote on the group, present workers can see more clearly than it was possible for him then to perceive, that the assertion he ventured to make has a very tangible basis.

***Sciurus hudsonius californicus* Allen.**

Sciurus hudsonius californicus ALLEN, Bull. Am. Mus. Nat. Hist., III, No. 1, 1890, p. 165.

Respecting the range of this subspecies, based on a series of eight specimens from Placer County, Cal., I stated (l. c.) that its habitat would probably be found to extend over a considerable area in California. I have since had opportunity of seeing specimens in the U. S. National Museum and in the collection of Dr. C. Hart Merriam from various points northward to Lassen, Shasta, and Siskiyou Counties, showing it to be the characteristic [August, 1891.]

form of the *S. hudsonius* group over a large part of Central and Northern California.

***Lepus cinerascens* Allen.**

This species was recently described (this Bulletin, Vol. III, p. 159, Oct., 1890) from a single specimen, collected at San Fernando, Los Angeles County, California, March 22, 1890, by Mr. E. C. Thurber. The Museum has recently received, through Mr. C. K. Worthen, eight additional specimens, as follows: Two adult males, San Diego Co., Cal., June 16 and 26, 1889, and another male, Dulzura, July 30, 1890. Also, same locality, adult male and female, Jan. 2 and Jan. 30; adult male, Feb. 6; and two adult females, March 10 and March 16, 1891. The January and February specimens are a little darker than the type, taken March 22, with which the other two March specimens nearly agree. The three summer specimens differ from the type in the pelage being shorter and finer, and the coloration slightly more fulvous, *i. e.*, less bleached. The differences, however, are too slight to require more particular mention, the validity of the characters originally given for the species being satisfactorily confirmed.

The collector's measurements from the fresh specimens average as follows: Five males, head and body, 12.03 in.; tail, 1.44; ear, 3.10. Three females, head and body, 12.63 in.; tail, 1.50; ear, 3.15.

***Spilogale indianola* Merriam.**

Spilogale indianola MERRIAM, N. Am. Fauna, No. 4, Oct., 1890, p. 10.

Spilogale indianola? ALLEN, Bull. Am. Mus. Nat. Hist., III, No. 2, 1891, p. 219 (April, 1891).

Spilogale indianola was founded on two skulls from Indianola, Matagorda Bay, Texas, collected in 1851 by J. H. Clarke. As the skins were not preserved Dr. Merriam was unable to give any account of the external characters of the animal. A few weeks since I provisionally referred (*antea*, p. 219) to it a skin from Tamaulipas, Mexico (exact locality not known), of which a full description was given. The skull, unfortunately, was too imperfect to afford any basis for comparison with the type. Since this account was published, the Museum has received a skin (with

the skull) from Corpus Christi, Texas, collected by Mr. Frank M. Chapman, April 5, 1891. This specimen, an adult male, agrees almost exactly in coloration with the Tamaulipas specimen. The chief differences consist in the white markings being even more restricted than in the Tamaulipas example, the white patch in front of the ear being reduced to an obscure tuft of white hairs, discoverable only on close examination. There is also less white at the base of the tail (merely a small tuft of white hairs on either side of the median line, separated by a broad area of black), and the white markings on the thighs and lower back are more restricted.

Mr. Chapman's measurements of the Corpus Christi specimen, taken before skinning, are as follows: Total length to end of tail hairs, 650 mm.; to end of tail vertebræ, 560; head and body, 342; tail to end of vertebræ, 218; to end of hairs, 410; hind foot, 46.

The skull measures as follows: Total length (condyle to front of premaxillary), 53.8; greatest zygomatic breadth, 32.3; greatest mastoid breadth, 29.2; least interorbital breadth, 14.2; length of lower jaw (front of incisors to condyle), 34.3; height at coronoid process, 17.3.

Through the kindness of Mr. F. W. True, I have before me the type (skull, No. 1621, Nat. Mus.) of *S. indianola* for comparison with the Corpus Christi specimen. The two skulls are not quite comparable as regards age, the Indianola specimen being considerably younger (a 'young adult') than the Corpus Christi example, the latter having well-developed occipital and sagittal crests, while in the former the occipital crest has begun to develop while the sagittal is not yet indicated. In the Corpus Christi specimen the occipital crest is extended as a ridge along the lateral border of the mastoids—a feature lacking in the Indianola skull, and evidently due to the greater age of the Corpus Christi skull. The Indianola skull is also smaller, and though unmarked for sex is doubtless that of a 'young adult' female, while the Corpus Christi skull is that of an old adult male. With these facts in mind, the two skulls may be considered as exact counterparts, the smaller size being attributable to sex and the other slight differences to difference in age.

In size and coloration *S. indianola* appears to differ little from *S. ringens* Merriam (judging from the description of the latter), with which it naturally find its nearest relationship.

***Felis eyra* Desm.**

Among the numerous specimens of mammals from Brownsville, Texas, recently received through Mr. C. K. Worthen, is a fine example of *Felis eyra*, labeled "♂, Rio Grande, Cameron Co., Texas, Feb. 5, 1889." On questioning the correctness of the alleged locality I am assured by Mr. Worthen that his collector states emphatically that the specimen was taken at the assigned locality; the collector adds that while the species is now rare there it is still taken occasionally. So far as known to me this is the first authentic record of the capture of *Felis eyra* north of the Rio Grande.