

A SYSTEMATIC ACCOUNT OF THE GRASSHOPPER MICE.

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INTRODUCTION.

The nomenclatorial history of the Grasshopper Mice, or Scorpion Mice, begins with 1841, when Maximilian, Prince of Wied, in his *Reise in das innere Nord-America*, described *Hypudaeus leucogaster* from what is now the State of North Dakota. Coues, in the *Monographs of North American Rodentia*, 1877, recognized two species, *Hesperomys (Onychomys) leucogaster* (Maximilian) and *Hesperomys (Onychomys) torridus* Coues. The only definite synopsis of the group since that date was published by Merriam in 1889.¹ In this paper *Onychomys* was for the first time properly diagnosed and given full generic rank. Four species and one subspecies were recognized. The latest list of North American mammals,² published in 1912, includes 19 named forms, 11 of which stand as full species. Four subspecies have since been described.

In the present revision of the genus two names are placed in synonymy, one is revived and one new subspecies is described. These changes leave the total number of recognized forms at 23, a net increase of 4 since 1912. While the number of races has been increased, the number of actual species has been reduced to two, the *leucogaster* and *torridus* of Coues's report of 1877. Such changes appear to be the inevitable result of study of the magnificent series of American mammals now preserved in our museums, particularly the collection of the Biological Survey. With a suite of specimens such as these collections afford, direct intergradation between many supposedly distinct species is apparent, and with the increase in the number of geographical races a decrease in the number of recognizable species is to be expected.

¹ North Amer. Fauna, No. 2, pp. 1-5. Oct. 30, 1889.

² Miller, Bull. 79, U. S. Nat. Mus., pp. 126-129. Dec. 31, 1912.

This revision of *Onychomys* is the result of the study of 1,562 specimens,¹ almost all of which have been modern well-made skins with perfect skulls. A few alcoholic specimens and skeletons have been examined. Except in a few cases the material has been sufficient to work out the ranges of the subspecies in a fairly satisfactory manner, though good series of specimens, including a sufficient number of adults, from certain regions, will modify somewhat the boundary lines between forms as at present mapped. All of the 23 existing type-specimens have been examined.

FORMS, CHARACTERS, AND PELAGES.

One of the results of the reduction in the number of distinct species to two, and the increase in the number of geographical races of each of these, is the increased difficulty in finding hard and fast, easily defined, conspicuous characters to diagnose these two species. While the two groups of subspecies as two specific units occupy an immense range, one to the north and one to the south, the actual area of overlapping is small.² At these points of overlapping, where intergradation could, but does not, take place, the two species are well differentiated externally, there is never the least doubt concerning the species to which a specimen belongs, and a working key to the species in this overlapping area could be made on a great number of simple differences, both external and cranial. Since all the numerous and widely diversified forms have been found to intergrade indirectly with either *leucogaster* or *torridus*, however, all of the superficial characters which hold good to identify the species at the few overlapping points fail with some far removed form, which, although intergrading indirectly with only one of the early named species, may really resemble in any one or any combination of such characters some race of the other species with which it has no real conspecific relationship. The teeth present the best characters by

¹ The material examined is from collections as follows:

United States National Museum, Biological Survey collection.....	1,041
United States National Museum proper.....	163
American Museum of Natural History, New York.....	118
Museum of Vertebrate Zoology, University of California.....	83
Field Museum of Natural History, Chicago.....	70
Museum of Comparative Zoology, Cambridge.....	35
Academy of Natural Sciences, Philadelphia.....	31
University of Nebraska, Lincoln.....	15
Kansas University Museum of Natural History, Lawrence.....	5
Biological Survey of South Dakota.....	1
Total number of specimens.....	1,562

² In only four cases do forms of the two species overlap in distribution, for comparatively limited areas in each case, as follows:

O. l. brevicaudus and *O. t. longicaudus* in western Nevada and Mono County, California.

O. l. ruidosæ and *O. t. torridus* in southwestern Arizona, northern Sonora, southern New Mexico, northern Chihuahua, and extreme western Texas.

O. l. arcticeps and *O. t. torridus* in the Pecos Valley, New Mexico and Texas.

O. l. albescens and *O. t. torridus* in northern Chihuahua.

which to diagnose the two species of *Onychomys*, for though the peculiarities they exhibit are less easily discerned than are the superficial differences that have heretofore answered, they are, of course, of far greater importance and phylogenetic meaning.

The subspecies of each group are closely related and intergradation is in almost every case shown by the material examined. The races are, in the main, well marked over a considerable territory and usually exhibit some conspicuous deviation in color accompanied by variations in dimensions or relative cranial characteristics.

The marked diversity in color of skins of *Onychomys* from almost any locality has given rise to a general impression that true dichromatism is, in a measure, responsible for the wide differences exhibited. That such is not the case has been one of the general results of the present study. Cases of supposed dichromatism represent various stages in a definite sequence of pelages, shown by a comparison of animals of various ages as determined by the relative wear of the teeth. In *torridus* and its subspecies this sequence of pelages is especially complex and, in both groups, abrasion and fading, combined with a gradual moult and renewal, has made the study of the pelages an interesting problem. In an account of the various subspecies it is necessary in nearly every case to describe fully the color of several stages of pelage, so widely do individuals of the same form differ with age and season.

MEASUREMENTS.

In the tables of measurements appended only the dimensions of fully adult animals have been considered. Measurements of selected specimens showing considerable tooth wear and from as many localities as possible have been used. The total length, tail, and foot measurements are from collector's notes, made from fresh specimens. The length of ear has been taken from the dry skin. The cranial and dental measurements were made with sliding calipers registering tenths of a millimeter. Condylbasal length was taken from condyion to alveolar point, *not* to most anterior point of the premaxillæ.

ACKNOWLEDGMENTS.

An intelligent revision of the grasshopper mice would not have been possible without assembling the collections from various museums for study. Thanks are due the custodians of several mammal collections for the loan of material, which has, in several cases, included types and type series. To Dr. J. A. Allen, of the American Museum of Natural History, New York; to Mr. Joseph Grinnell, Museum of Vertebrate Zoology, University of California; to Mr. Charles B. Cory and Mr. W. H. Osgood, Field Museum of Natural History, Chicago; to Mr. Samuel Henshaw and Mr. Outram

Bangs, Museum of Comparative Zoology at Harvard; and to Dr. Witmer Stone, Philadelphia Academy of Sciences, I am indebted for the loan of valuable material, all of which was assembled by the Biological Survey, through the courtesy of Mr. E. W. Nelson. In the lists of specimens examined I have indicated the source of all material from localities not represented in the United States National Museum collections. Mr. Vernon Bailey, of the Biological Survey, has given me much information regarding physiographical conditions in localities from which the small number of specimens examined hardly warranted the mapping of boundaries of forms, without intimate knowledge of the country.

SYSTEMATIC DISCUSSION.

Genus *ONYCHOMYS* Baird.

1857. *Onychomys* BAIRD, Gen. Rep. North Amer. Mamm., p. xxviii and p. 457 (subgenus of *Hesperomys* Waterhouse).

1874. *Onichomys* GIGLIOLI, Boll. Soc. Geogr. Italiana, vol. 11, p. 326.

Type-species.—*Hypudaeus leucogaster* Wied.

Diagnosis.¹—Form stout, tail comparatively short, thick, and tapering to an obtuse point, the end usually white. Fore feet larger than in *Peromyscus*, five-tuberculate. Hind feet with only four tubercles, all phalangeal; the sole densely furred from heel to tubercles. Mammæ, pectoral, 1-1; inguinal, 2-2 = 6. Nasals wedge-shaped, terminating posteriorly considerably behind the end of the nasal branch of the premaxillaries. Coronoid process of mandible well developed, rising high above the condylar ramus and directed backward in the form of a large hook. First and second upper molars large; third less than half the size of the second. First upper molar with two internal and three external cusps, the anterior cusp when unworn unequally divided at summit into two or three cusplets, narrow, and on a line with the outer cusp row, leaving a distinct step on the inside. Second upper molar with two internal and two external cusps, and a narrow antero-external fold. Last upper molar broader than long or subcircular in outline. First lower molar with an anterior; two internal and two external cusps, and a postero-internal loop. Second lower molar with two internal and two external cusps, an antero-external and a postero-internal fold. Third lower molar scarcely longer than broad, subcircular in outline.

Color pattern.—Sharply bicolor; head, back, and upper sides colored; underparts white, with line of demarcation sharply drawn; lanuginous tufts at bases of ears commonly whitish or buffy and contrasting with general color of head and ears; arms, hands, inner sides of legs, and feet whitish; tail usually bicolor, with tip whitish.

¹ With slight modification, taken from Merriam, North Amer. Fauna, No. 2, pp. 3-4. October, 1889.

Geographic distribution.—Western North America, from the Great Plains of Alberta, Saskatchewan, and Manitoba south to central Mexico (Aguas Calientes and San Luis Potosi); east to western Minnesota and eastern Kansas. Absent from large areas in the higher Rockies and the Pacific Coast region. (See fig. 1.)

Remarks.—*Onychomys* differs from *Peromyscus*, its nearest generic relative, in its more hypsodont molars, and in the position and shape of the front cusp of m^1 , which is distinctly in the outer row of cusps, more coniform, less broadened transversely, and with the unworn



FIG. 1. DISTRIBUTION OF THE GENUS ONYCHOMYS.

summit less inclined to division into cusplets; m^3 is more reduced; and the coronoid process is greatly lengthened. Although it externally resembles *Cricetulus* much more than it does *Peromyscus*, it is as shown by a study of the teeth, separated from the old-world genus by both *Peromyscus* and *Baiomys*. The latter, with its close approach to the six-tuberculate pattern in m^1 , appears, of the three groups, the nearest to *Cricetulus*. Osgood¹ has pointed out certain peculiarities of resemblance between the subgenus *Podomys*, of *Peromyscus*, and *Onychomys*; and has suggested the possibility that *Podomys* is an intermediate form between *Onychomys* and typical *Peromyscus*. The reduction in the number of plantar tubercles in *Podomys* is probably of no importance in this connection, but the higher-crowned teeth and the relative position of the anterior cusp of the first molar

¹ North Amer. Fauna, No. 28, p. 227. Apr. 17, 1909.

are characters that make the closer relationship seem very probable. Though distinctly belonging with *Peromyscus*, *Podomys* is the nearest approach within that genus to *Onychomys*.

LIST OF SPECIES AND SUBSPECIES WITH TYPE-LOCALITIES.

Onychomys leucogaster.

<i>O. l. leucogaster</i> (Wied).....	Fort Clark, North Dakota, p. 434.
<i>O. l. missouriensis</i> (Audubon and Bachman)....	Fort Union, Montana, p. 438.
<i>O. l. arcticeps</i> Rhoads	Clapham, New Mexico, p. 439.
<i>O. l. breviaudus</i> Merriam	Blackfoot, Idaho, p. 441.
<i>O. l. fuscogriscus</i> Anthony.....	Ironside, Oregon, p. 443.
<i>O. l. melanophrys</i> Merriam	Kanab, Utah, p. 444.
<i>O. l. fuliginosus</i> Merriam	Black Tank, Arizona, p. 447.
<i>O. l. ruidosæ</i> Stone and Rehn	Ruidoso, New Mexico, p. 448.
<i>O. l. capitulatus</i> Hollister.....	Grand Canyon, Arizona, p. 450.
<i>O. l. albescens</i> Merriam.....	Samalayuca, Chihuahua, p. 450.
<i>O. l. longipes</i> Merriam.....	Concho County, Texas, p. 451.
<i>O. l. breviauritus</i> Hollister.....	Fort Reno, Oklahoma, p. 453.

Onychomys torridus.

<i>O. t. torridus</i> (Coues)	Camp Grant, Arizona, p. 456.
<i>O. t. perpallidus</i> Mearns.....	Yuma County, Arizona, p. 459.
<i>O. t. pulcher</i> Elliot.....	Morongo Pass, California, p. 461.
<i>O. t. longicaudus</i> Merriam.....	St. George, Utah, p. 463.
<i>O. t. clarus</i> Hollister.....	Keeler, California, p. 465.
<i>O. t. tularensis</i> Merriam.....	Bakersfield, California, p. 466.
<i>O. t. ramona</i> Rhoads.....	San Bernardino Valley, California, p. 468.
<i>O. t. macrotis</i> Elliot	San Pedro Martir Mountains, Lower California, p. 469.
<i>O. t. yakiensis</i> Merriam.....	Camoa, Sonora, p. 470.
<i>O. t. canus</i> Merriam	San Juan Capistrano, Zacatecas, p. 471.
<i>O. t. surrufus</i> nobis.....	Miquihuana, Tamaulipas, p. 472.

BRIEF SYNOPSIS OF THE CHARACTERS OF SPECIES AND SUBSPECIES.

Size averaging larger; tail relatively short, usually less than half the length of head and body; skull averaging larger, with comparatively narrow interorbital region; teeth higher crowned, unworn cusps of m^1 higher than long; m^3 larger, subcircular; m^1 usually less than half the length of tooth row..... ***O. leucogaster***.

Color of adults in fresh pelage light; distinctly buffy or cinnamon; not fuscous, sooty, or brownish.

Hairs of underparts entirely white, without dark underfur.. *O. l. albescens*, p. 450.

Hairs of underparts white, with gray underfur.

Size small (hind foot 17-20 mm.; skull, condylobasal length, 23.8-26.0); color grayish-buff..... *O. l. breviaudus*, p. 441.

Size large (hind foot 18.5-23; skull, condylobasal length, 24.8-27.7); color pinkish-cinnamon-buff.

Color duller and paler; face lighter..... *O. l. arcticeps*, p. 439.

Color richer and darker; face darker..... *O. l. melanophrys*, p. 444.

Color of adults in fresh pelage dark; fuscous, sooty, or brownish; not distinctly buffy or cinnamon.

Ear tufts white or whitish, conspicuously different from color of crown.

Size smaller, with smaller skull (condylobasal length, 24.4-25.2; breadth braincase, 12.4-12.9); ears larger (14.5-15.8)..... *O. l. fuscogriscus*, p. 443.

- Size larger, with larger skull (condylobasal length, 25.4–28.0; breadth braincase, 12.9–13.6); ears smaller (12.6–15.8).
 Color paler; the young much grayer, less blackish; hind foot less than 22 mm.....*O. l. missouriensis*, p. 438.
- Color darker; the young more blackish, less gray; hind foot 22 mm.....
*O. l. leucogaster*, p. 434.
- Ear tufts cinnamon-brown or smoky, not conspicuously different from color of crown.
- Skull elongated, with high braincase.
 Ear large (15.0–16.9 mm. from notch).....*O. l. longipes*, p. 451.
 Ear small (11.9–13.9 mm. from notch).....*O. l. breviauritus*, p. 453.
- Skull not elongated; braincase flattened.
 Color very dark; more sooty, less brown.....*O. l. fuliginosus*, p. 447.
 Color less dark; more brownish, not sooty.
- Size larger (skull, condylobasal length, average, 26.2; zygomatic breadth, 14.8).....*O. l. ruidosa*, p. 448.
 Size smaller (skull, condylobasal length, average, 25.1; zygomatic breadth, 14.0).....*O. l. capitulatus*, p. 450.
- Size averaging smaller; tail relatively long, usually more than half the length of head and body; skull averaging smaller, with comparatively wide interorbital region; teeth lower crowned, unworn cusps of m^1 longer than high; m^3 smaller, broadened transversely; m^1 usually more than half the length of tooth row....*O. torridus*.
- Color of adults in fresh pelage pale pinkish-cinnamon; not drab, brown, nor decidedly dark pinkish-cinnamon.
- Anterior palatine foramina short, not extending backward to plane of fronts of first molars.....*O. t. longicaudus*, p. 463.
- Anterior palatine foramina longer, extending backward fully to plane of fronts of first molars.
- Size larger (total length, 146–161; tail, 57–58; hind foot, 20–22).....
*O. t. perpallidus*, p. 459.
- Size smaller (total length, 120–146; tail, 37–53; hind foot, 18–20.5).
 Color very pale pinkish-cinnamon.....*O. t. pulcher*, p. 461.
 Color rich, intense pinkish-cinnamon.....*O. t. clarus*, p. 465.
- Color of adults in fresh pelage brown, drab, or decidedly dark pinkish-cinnamon; not pale pinkish-cinnamon.
- Color of adults grayish-drab; not brown or cinnamon.
- Ear small (14.0–15.1).....*O. t. tulorensis*, p. 466.
 Ear large (15.2–17.1).....*O. t. canus*, p. 471.
- Color of adults brown or dark pinkish-cinnamon; not grayish-drab.
- Head and face, in fresh, full pelage, dark brown, much darker than back; general coloration darker.
- Size smaller (total length, 137–148; hind foot, 19–21); ear small (14.2–15.4).....
*O. t. ramona*, p. 468.
- Size larger (total length, 148–155; hind foot, 21–22); ear large (16.7–16.8)....
*O. t. macrotis*, p. 469.
- Head and face, in fresh, full pelage, light brown, not conspicuously darker than back; general coloration lighter.
- Ear tufts in full pelage white, conspicuous; ear small (12.0–15.8).....
*O. t. torridus*, p. 456.
- Ear tufts in full pelage buffy-cinnamon, not conspicuous; ear large (15.2–17.8).
 Size larger, with longer tail (55–64); audital bullæ large.....
*O. t. surrufus*, p. 472.
 Size smaller, with shorter tail (47–57); audital bullæ small.....
*O. t. yakiensis*, p. 470.

ONYCHOMYS LEUCOGASTER (Wied).

(Synonymy under subspecies.)

Diagnosis.—Size averaging considerably larger than in *Onychomys torridus*, stouter and heavier built; tail relatively short, usually less than half the length of head and body. Skull averaging larger than in *torridus*, with comparatively narrow interorbital region. Teeth, as compared with teeth of *torridus*, higher crowned; unworn cusps of m^1 higher than long; the anterior cusp more coniform, with less indication of incipient division at summit into two or three cusplets; m^1 less narrow and elongated, stouter and relatively short; m^3 larger than in *torridus*, longer than wide, or subcircular with longitudinal and transverse diameters nearer equal; the crown surface usually about one-third that of m^2 (sometimes nearly one-half, rarely about one-fourth); owing to the shortening of m^1 and the enlargement of m^3 , m^1 is almost invariably less than half the length of tooth row.

Geographic distribution.—Western United States and Canada and northern Mexico. From the Great Plains of Alberta, Saskatchewan, and Manitoba south into Sonora, Chihuahua, and Tamaulipas, Mexico. East to western Minnesota and eastern Kansas; west to central Washington and Oregon, extreme northern and eastern California, and, in Arizona, to the Grand Canyon. Absent from large areas in the higher Rockies, the Pacific coast region, the Colorado and Mohave Deserts, and the extreme southwestern United States in general (fig. 2).

Subspecies.—Twelve well marked geographical races of *Onychomys leucogaster* are recognized. Most of these forms occupy large areas which correspond well with the mapped zones and faunal regions of the Western States. Two local variations from lava-bed and sand-dune districts are imperfectly known. The most differentiated forms are from the northwestern and extreme southeastern parts of the range.

ONYCHOMYS LEUCOGASTER LEUCOGASTER (Wied).

1841. *Hypudaeus leucogaster* WIED, Reise in das innere Nord-America, vol 2, p. 99.
1857. *Hesperomys leucogaster* BAIRD, Gen. Rep. North Amer. Mamm., p. xxviii.
1857. *Onychomys leucogaster* BAIRD, Gen. Rep. North Amer. Mamm., p. 459.
1857. *Hesperomys (Onychomys) leucogaster* BAIRD, Gen. Rep. North Amer. Mamm., p. 480.
1885. *[Onychomys] leucogaster* var. *pallidus* HERRICK, Geol. and Nat. Hist. Surv. Minnesota, 13th Ann. Rep. (1884), p. 183. (Lake Traverse, near sources of the Minnesota and Bois des Sioux Rivers, South Dakota.)
1885. *[Onychomys] pallidus* HERRICK, Geol. and Nat. Hist. Surv. Minnesota, 13th Ann. Rep. (1884), p. 184.
1888. *Cricetus leucogaster* THOMAS, Proc. Zool. Soc. London, 1888, p. 133.
1888. *[Alomys] leucogaster* JORDAN, Mar. Vert. Anim. North. U. S., ed. 5, p. 321.
1912. *Onychomys leucogaster leucogaster* MILLER, Bull. 79, U. S. Nat. Mus., p. 127. December 31.

Type-locality.—Mandan Indian village, near Fort Clark, Missouri River, North Dakota; near site of present town of Stanton, Mercer County, North Dakota.

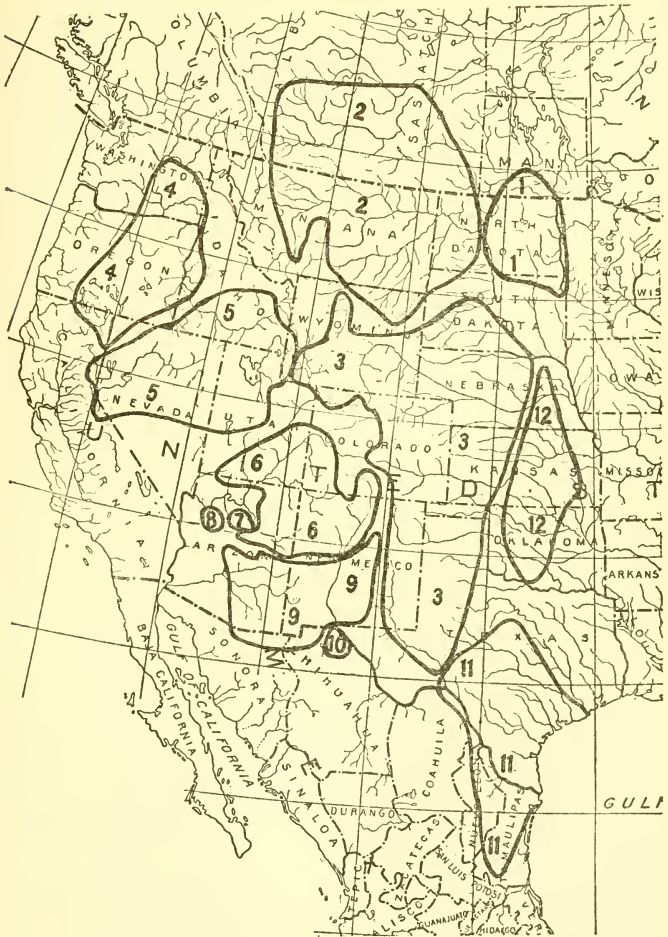


FIG. 2.—DISTRIBUTION OF THE SUBSPECIES OF *ONYCHOMYS LEUCOGASTER*.

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|---------------------------------|-------------------------------|---------------------------------|
| 1. <i>O. l. leucogaster</i> . | 5. <i>O. l. brevicaudus</i> . | 9. <i>O. l. ruidosæ</i> . |
| 2. <i>O. l. missouriensis</i> . | 6. <i>O. l. melanophrys</i> . | 10. <i>O. l. albescens</i> . |
| 3. <i>O. l. arcticus</i> . | 7. <i>O. l. fuliginosus</i> . | 11. <i>O. l. longipes</i> . |
| 4. <i>O. l. fuscogriseus</i> . | 8. <i>O. l. capitulatus</i> . | 12. <i>O. l. breviauritus</i> . |

Geographic distribution.—Southern Manitoba, eastern North Dakota, northeastern South Dakota, and parts of extreme western Minnesota, west to Minot and Fort Clark, North Dakota. Transition zone.

General characters.—Size large, slightly greater than in the neighboring forms, *missouriensis* and *arcticeps*; coloration much darker, the young especially blackish. Skull large; in adult with braincase shortened anteriorly and lengthened, more overhanging, posteriorly.

Color.—*Adult in fresh pelage* (55462, Devils Lake, North Dakota, August 5): Upperparts dark drab-brown, finely lined with darker; top of head and broad area along center of back especially dark, more lined by dark brown hair tips; nose grayish-drab; underfur of upperparts broadly blackish-slate; lanuginous tufts at bases of ears pure white, very conspicuous; outer sides of ears blackish-brown on front half, whitish posteriorly; lining of ears white; tail drab-brown for two-thirds its length above, the terminal third and under side whitish. Lower sides, lower cheeks, and entire underparts white, sharply marked from color of upper sides and back, the hairs of chin, throat, and arms white to bases; underfur of middle chest and belly narrowly blackish-slate; arms and hands, inner sides of legs, and feet white; outer sides of legs with narrow stripe of color like back extending to near foot. *Adult in worn and faded coat, before renewal* (180025, Hankinson, North Dakota, July 23): Like fresh coat but much shorter haired and with less distinct dark area along back. Entire upperparts uniform dark drab-brown, with little streaking from hair tips, the darker tips of longer hairs having disappeared; ear tufts virtually wanting, of same color as head and not noticeable; markings of ears, legs, and tail less conspicuous than in fresh pelage. Underparts grayish-white, the underfur showing through the white of thinly haired breast and belly. *Adult, melanistic phase* (180024, Hankinson, North Dakota, July 23): Entire upperparts glossy brownish-black, the hair tips only slightly browner than the underfur. Underparts slightly paler, with blotches of pure white on throat, breast, and arms. *Juvenile* (189252, Traverse, South Dakota, July 4): Nose, head, and center of back to tail dark blackish-brown; sides slightly paler, more grayish; no lighter colored ear tufts; black markings of forward part of outer ear conspicuous. Underparts white, mixed with grayish from the underfur. *Post-juvenile pelage* (202088, Fort Clark, North Dakota, July 24): More slaty-black, less brownish, than the first pelage. Upperparts dark grayish-drab, sides lighter; ear tufts whitish, conspicuous; underparts very sharply marked from color of sides, whitish with slate-gray underfur on chest and belly. Much darker than the young of *missouriensis* or *arcticeps*.

Skull.—The skull of *Onychomys leucogaster leucogaster* is larger than that of any other form of *Onychomys*. It slightly exceeds in general

measurements any of the skulls of other subspecies in the *leucogaster* group. The frontal region is highly arched, the braincase is short and broad, the interorbital region greatly constricted, and the occiput elongated. (Plate 15.)

Measurements.—Averages and extremes of three adult specimens from North Dakota: Total length, 164 (160–168) millimeters; tail vertebrae, 42 (38–47); hind foot, 22 (22–22); ear from notch in dry skin, 14.0 (13.3–14.4). Skull: Condylbasal length, 27.4 (26.2–28.0); zygomatic breadth, 16.2 (15.1–17.3); interorbital breadth, 4.6 (4.5–4.7); breadth of braincase, 13.3 (13.2–13.4); length of nasals, 11.4 (10.5–12.3); length of mandible, 16.7 (15.9–17.3); maxillary tooth row, 4.5 (4.4–4.6). For detailed measurements of specimens, see page 474.

Type-specimens.—Nothing is known of the later history of the specimens on which Wied based his account of *Hypudaes leucogaster*.

Remarks.—This subspecies reaches its extreme type of dark coloration in southeastern North Dakota, northeastern South Dakota, and at Brown Valley, Minnesota. At some points in this region a few specimens are partially melanistic. There are obviously only two recognizable forms on the northern plains, the large pale subspecies to the westward, *missouriensis*, and the large dark subspecies near the eastern limits of the range. A good series of specimens from the type localities of *missouriensis*, *leucogaster*, and *pallidus*, prove the distinctness of the first two and the identity of *pallidus* with true *leucogaster*. Specimens from Fort Clark, the type-locality of *leucogaster*, are easily nearest the dark form, are widely different in color from *missouriensis*, and plainly represent the eastern race. The younger specimens from Fort Clark are especially dark, like young from the Traverse Lake region, and are quite different from the young of *missouriensis*.

The whereabouts of the type-specimen of Herrick's *O. l. pallidus* can not be ascertained. Prof. Charles E. Johnson, of the University of Minnesota, writing under date of September 19, 1913, says:

No one in the department seems to know what became of Herrick's material, whether he took it with him when he left Minnesota or whether it has been lost or destroyed in subsequent movings and shiftings in the department.

Fortunately the collection of the Biological Survey contains four topotype specimens of "*pallidus*," as well as other material from near-by localities.

Specimens examined.—Total number 55, from the following localities:

NORTH DAKOTA: Bottineau, 5 (Field Mus.); Devils Lake, 3; Fort Clark, 18 (topotypes); Grace, 1; Hankinson, 8; Linton, 2; Minnewaukon, 1 (Field Mus.); Minot, 2 (Field Mus.); Pembina, 1; Sherbrooke, 1.

SOUTH DAKOTA: Sisseton, 7; Traverse, 4 (topotypes of "*pallidus*.")

MINNESOTA: Brown Valley, 2.

ONYCHOMYS LEUCOGASTER MISSOURIENSIS (Audubon and Bachman).

1851. *Mus missouriensis* AUDUBON and BACHMAN, North Amer. Quad., vol. 2, p. 327, pl. c.
 1862. *Mus missouriensis* WIED, Verz. der auf seiner Reise Nord-Am. beob. Säug., p. 161, in synonymy.

Type-locality.—Fort Union, Montana.

Geographic distribution.—Southeastern Alberta, southern Saskatchewan, northern and eastern Montana, western North Dakota, and northeastern Wyoming. North to Calgary, Alberta, and Carlton, Saskatchewan; east to Glenullin, North Dakota; south up the Missouri River to Bozeman, Montana, and up the branches of the Powder and Little Missouri Rivers into northeastern Wyoming. Chiefly arid Transition.

General characters.—Size large, only slightly less than in true *leucogaster*, with smaller hind foot. Coloration in all pelages much lighter than in *leucogaster*, the immature especially paler than young of the more eastern form. Darker, less buffy, than *arcticeps*.

Color.—*Adult in full winter pelage* (189237, Dickinson, North Dakota, February 14): Upperparts dark wood-brown, the head and middle parts of body heavily darkened by the color of the darker brown hair tips; underfur dark neutral-gray; lanuginous ear tufts pure white and very conspicuous, as are also the black and white markings on outer side of the ear. Lips, lower cheeks, arms, hands, lower legs, feet, lower sides, and entire underparts pure white, very sharply marked from color of upperparts. *Adult in early summer* (168548, Buford, North Dakota, May 8): Like winter pelage but less bright in color, the rich wood-browns faded and worn to drab and buff; the head and back dark grayish-brown; and the white of underparts mixed with gray of the underfur. *Juvenile* (69045, Medicine Hat, Alberta, October 13): Very much lighter and grayer, less blackish, than the young of *leucogaster*. Upperparts mouse-gray, streaked with darker hair tips; white ear tufts and black and white markings on the ears conspicuous. *Post-juvenile pelage* (168546, Buford, North Dakota, May 5): Like the juvenile but browner, less ashy mouse-gray; the back and sides uniformly colored, without distinctly darker dorsum.

Skull.—The skull is slightly smaller and less highly arched than that of true *leucogaster*; the interorbital constriction is less, and the braincase comparatively larger.

Measurements.—Averages and extremes of eleven adults from Alberta, Montana, North Dakota, and Wyoming: Total length, 150 (141–161); tail vertebræ, 39 (29–45); hind foot, 20.8 (20.0–21.5); ear from notch in dry skin, 14.2 (12.6–15.8). Skull: Condylbasal length, 26.1 (25.4–26.6); zygomatic breadth, 15.3 (14.9–16.0); interorbital breadth, 4.7 (4.5–4.9); breadth of braincase, 13.2 (12.9–13.6); length of nasals, 10.9 (10.4–11.0); length of mandible, 15.6 (14.9–15.9);

maxillary tooth row, 4.4(3.9–4.6). For detailed measurements of specimens see page 474.

Type-specimen.—Regarding the specimens on which their description and figure were based, Audubon and Bachman say:

This pretty little animal was discovered for us by Mr. Denig, during our sojourn at, and in the neighborhood of Fort Union in 1843. It was in full summer pelage, having been killed on the 14th of July. * * * The next day after they were brought in, we left the fort on an expedition to the Yellow-Stone River * * *¹.

It is not known if, after the drawings were made, the specimens were preserved or not.

Remarks.—This subspecies is chiefly distinguished from true *leucogaster* by its lighter color in all pelages. It attains its extreme pallor in Saskatchewan, but is, on the whole, very uniform in color over all the mapped range. Specimens from Dickinson, North Dakota, show the nearest approach to *leucogaster*, but are distinctly nearest to *missouriensis*. In the southeastern parts of its range, *missouriensis* blends directly into *O. l. arcticeps*.

Specimens examined.—Total number 62, from localities as follows:

ALBERTA: Calgary, 2; Medicine Hat, 1.

SASKATCHEWAN: Carlton, 1; Osler, 3 (Mus. Comp. Zool.).

MONTANA: Bozeman, 2; Fort Custer, 8; Fort Union, 1; Great Falls, 1; Johnson's Lake, 2; Mountain Sheep Buttes, 1; Pass Creek, 1; Powderville, 1; Robare, 1; Tilyou's Ranch, 3.

NORTH DAKOTA: Buford, 8; Dickinson, 3; Fort Buford, 11; Gullin, 1.

WYOMING: Arvada, 4; Little Powder River, 2; Moorcroft, 5.

ONYCHOMYS LEUCOGASTER ARCTICEPS Rhoads.

1896. *Onychomys leucogaster brevicauda* ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 8, p. 253. November 25. (Specimens from Wyoming and Colorado.)

1898. *Onychomys arcticeps* RHOADS, Proc. Acad. Nat. Sci. Philadelphia, 1898, p. 194. May 3.

1907. *Onychomys brevicaudus* CARY, Proc. Biol. Soc. Washington, vol. 20, p. 25. March 27.

Type-locality.—Clapham, Union County, New Mexico.

Geographic distribution.—Upper Sonoran Great Plains, from Wyoming and South Dakota to Texas. North to the Big Horn River in Wyoming and to the Cheyenne River in South Dakota; east to Bone-steel, South Dakota, and Trego County, Kansas; south to Fort Lancaster, Texas; and west to Bear River Divide in southwestern Wyoming, Golden and Salida, Colorado, and Santa Rosa, New Mexico.

General characters.—Like *O. l. missouriensis*, but paler, more buffy in color; much lighter than *leucogaster*, *ruvidosæ*, or *breviauritus*. Resembles *O. l. melanophrys* but is less bright in coloration and is slightly smaller, with smaller hind foot and ear.

Color.—*Adult in full pelage* (18644, Valentine, Nebraska, April 14): Upperparts avellaneous, with a wash of brighter pinkish-cinnamon

¹ Viviparous Quadrupeds of North America, vol. 2, p. 328, 1851.

over much of back, rump, and hips; paler on face, shoulders, and back of ears; ear tufts white but rather inconspicuous against the general light coloration of head; markings of outer side of ears much subdued, brown on forward half, whitish, scantily haired posteriorly. Arms and hands, lower legs and feet, and entire underparts, pure white, the underfur of lower breast, sides, and belly faintly darkened with pale gray. Tail white with narrow stripe of brownish above for two-thirds its length. *Adult in short summer coat* (54452, Colby, Kansas, June 28; breeding female): Entire upperparts light drab, finely lined by the darker brownish hair tips; underparts grayish-white, the gray underfur showing through the white of hair tips on the scantily furred breast and belly. No lanuginous ear tufts. *Adult in fall coat* (150985, Gaume's Ranch, Baca County, Colorado, November 28): Upperparts avellaneous, everywhere finely streaked and darkened by the blackish hair tips; top of head and middle of back and rump slightly darker than face and sides; ear tufts buffy; underparts white. *Juvenile* (54455, Colby, Kansas, June 28): Above uniform light mouse-gray, the hairs pale gray at bases, darker gray in middle, and lightly tipped with pale brownish-gray. Underparts grayish-white; no ear tufts. *Young adult, or postjuvenile, in early winter* (8529, Philadelphia Acad. Sciences, type; Clapham, New Mexico, November 7): Like adult in summer but darker and richer colored, more brownish; the long full hairs of head and back with broad subterminal bands of dark buff and tips of blackish; lower sides brownish; underparts whitish; the underfur dark neutral-gray.

Skull.—Almost precisely as in *missouriensis*.

Measurements.—Averages and extremes of 35 adults from South Dakota, Nebraska, Kansas, Colorado, New Mexico, and Texas. Total length, 151 (131–170); tail vertebræ, 42 (34–53); hind foot, 20.9 (18.5–23.0); ear from notch in dry skin, 13.4 (12.4–14.9). Skull: Condylbasal length, 26.4 (24.5–27.7); zygomatic breadth, 15.4 (14.4–16.6); interorbital breadth, 4.6 (4.2–5.0); breadth of braincase, 13.0 (12.4–13.7); length of nasals, 11.2 (10.1–12.2); length of mandible, 15.6 (14.6–16.8); maxillary tooth row, 4.6 (4.3–4.8). For detailed measurements of specimens see page 474.

Type-specimen.—No. 8529, Academy of Natural Sciences, Philadelphia. Skin and skull of young male (teeth unworn and basal suture open) in fresh fall pelage of the immature. Collected November 7, 1893, by Ernest E. Thompson. Rhoads Collection, No. 1529.

Remarks.—Specimens of *O. l. arcticeps* from South Dakota and northern Nebraska are absolutely indistinguishable from specimens collected on the Staked Plains in New Mexico and Texas. Intergradation with neighboring forms takes place wherever the ranges meet and it is sometimes difficult to identify immature or poorly furred specimens with any particular form. Skins from Santa Rosa, New

Mexico, show a decided approach toward *ruidosæ*, and specimens from Paladora Canyon, Texas, are strongly tending toward *breviauritus*. In general, however, the race is well defined and occupies the greater part of the arid Upper Sonoran region of the Great Plains.

Specimens examined.—Total number, 331, from localities as follows:

SOUTH DAKOTA: Bonesteel, 1; Buffalo Gap, 1; Corral Draw, 1 (Amer. Mus.); Minniechaduzza River, 1; Pine Ridge, 2; Smithville, 1; South fork White River, 1; Stanley County, 1 (State Biol. Surv. S. Dak.).

WYOMING: Aurora, 1 (Amer. Mus.); Big Sandy, 7; Bitter Creek, 20 (Amer. Mus. and Field Mus.); Bordeaux, 1; Bridger Creek, 1; Bridger's Pass, 2; Bull Lake, 1; Casper, 5; Cheyenne, 1; Chugwater, 1; Cumberland, 1; Fontenelle, 4; Fort Bridger, 1; Green River, 1; Grey Bull, 1; Kemmerer, 3; Kinney Ranch, 2; Medicine Bow Mountains, 1; Mountain View, 4; Newcastle, 1; Owl Creek Mountains, 1; Saratoga, 4; Sun, 5; Superior, 1.

NEBRASKA: Birdwood Creek, 2; Callaway, 4; Cherry County, 1; Cody, 2; Fort Niobrara, 1; Haigler, 5; Kennedy, 7; Lakeside, 4; Lincoln County, 3; Mitchell, 6 (Univ. of Nebr.); Myrtle, 2; Niobrara River, 12; Perch, 19 (Amer. Mus. and Field Mus.); Snake River, 1; Thomas County, 4; Valentine, 9; Warbonnet Canyon, Sioux County, 4 (Univ. of Nebr.).

COLORADO: Burlington, 2; Canadian Creek, 5; Cañon City, 1; Cheyenne Wells, 1 (Amer. Mus.); Colorado Springs, 16 (Field Mus., Amer. Mus., Univ. of Calif., and Mus. Comp. Zool.); Denver, 1 (Amer. Mus.); Gaume's Ranch, Baca County, 1; Golden, 1; Greeley, 2; Higbee, 1; Hugo, 2; La Junta, 1; Las Animas, 1; Lay, 1; Limon, 2; Loco, 2; Longmont, 1; Loveland, 14; Monon, 1 (Mus. Comp. Zool.); Pawnee Buttes, 2; Roggen, 1; Salida, 1; Snake River, 2; Sterling, 3; Three Forks, 1 (Amer. Mus.); Wray, 3 (Amer. Mus.).

KANSAS: Colby, 5; Ellis, 1; Logan County, 6 (Amer. Mus. and Kans. Univ.); Meade, 1; Pendennis, 9; Trego County, 15.

TEXAS: Amarillo, 1; Fort Lancaster, 1; Hereford, 2; Lipscomb, 12; Miami, 1; Mobeetie, 1; Monohans, 2; Paladora Canyon, 2 (Field Mus.); Texline, 12; Washburn, 2.

NEW MEXICO: Carlsbad, 4; Clapham, 4 (Phila. Acad. Sci., including type; Mus. Comp. Zool.); Clayton, 1; Fort Sumner, 2; Koehler Junction, 1; Roswell, 6; Santa Rosa, 6.

ONYCHOMYS LEUCOGASTER BREVICAUDUS Merriam.

1891. *Onychomys leucogaster brevicaudus* MERRIAM, North Amer. Fauna, No. 5, p. 52. July 30.

Type-locality.—Blackfoot, Bingham County, Idaho.

Geographic distribution.—Southern Idaho, extreme southwestern Wyoming, northwestern Utah, and west across the northern half of Nevada into Lassen, Plumas, and Mono Counties, California.

General characters.—Smallest of the subspecies of *leucogaster*, with small hind foot and short tail. Coloration darker than in *arcticeps*, lighter than in *fuscogriseus*.

Color.—*Adult in fresh winter pelage* (24897, Reese River, Nevada, November 24): Upperparts rich glossy avellaneous, the face, head, back, and rump darkened by streaking of the brownish hair tips; sides, hips, and lower rump more cinnamon color; ear tufts pure white at bases, buffy above; ears sharply marked dark brown and white; tail grayish-brown above, with white tip. Entire underparts, including whole of arms, hands, lower cheeks, inner sides of legs, and the feet pure white. *Adult in summer* (23086, type, Blackfoot, Idaho, July 15): Like winter specimens but faded, less glossy; the hair tips worn away and the gray of underfur showing through the worn pelage, greatly modifying the general color. Ear tufts not noticeable and color of ears greatly subdued. *Juvenile* (94668, Golconda, Nevada, July 3): Almost precisely like the young of *O. l. arcticeps*, but black markings on ears more conspicuous. *Immature* (22996, Blackfoot, Idaho, July 12): Like the juvenile but less ashy, more mouse gray; the ear markings less conspicuous, the ear tufts whiter.

Skull and teeth.—Compared with skulls of *missouriensis* and *arcticeps*, the skull of *brevicaudus* is short, flat, and comparatively broad, with short and stout rostrum and much flattened brain case. In size it averages less than skulls of any other subspecies of *leucogaster*. The teeth are also slightly smaller than in the other races.

Measurements.—Averages and extremes of 17 adults from Idaho, Utah, and Nevada: Total length, 141 (130–155); tail vertebræ, 39 (31–42); hind foot, 19.1 (17–20); ear from notch in dry skin, 15.6 (14.4–16.7). Skull: Condylbasal length, 24.8 (23.8–26.0); zygomatic breadth, 14.3 (13.4–14.8); interorbital breadth, 4.9 (4.7–5.1); breadth of braincase, 12.8 (12.3–13.3); length of nasals, 10.0 (9.4–10.5); length of mandible, 14.4 (13.7–15.0); maxillary tooth row, 4.0 (3.8–4.2). For detailed measurements of specimens see page 475.

Type-specimen.—No. $\frac{23086}{332}$, United States National Museum, Biological Survey Collection. Skin and skull of adult male (teeth much worn). Collected July 15, 1890, by Vernon Bailey and B. H. Dutcher. Original number 1442.

Remarks.—This is a small, well marked subspecies, with a rather extensive distribution in the Great Basin. It intergrades with *arcticeps* in southwestern Wyoming, and with *fuscogriseus* all along the northwestern border of its range. It is quite impossible to determine many single specimens from the border line between the distribution of *fuscogriseus* and *brevicaudus*, but in the main the limits of the two subspecies have been well worked out. Juvenile examples are especially helpful, as the color differences between the two races are particularly developed in the young.

Specimens examined.—Total number, 117, from localities as follows:

IDAHO: Big Lost River, 1; Blackfoot, 6, type and paratypes; Glenn's Ferry, 5; Minidoka, 5; Montpelier Creek, 1; Murphy, 1.

WYOMING: Bear River, 3; Cokeville, 1; Evanston, 6.

UTAH: Kelton, 1; Nephi, 7.

NEVADA: Austin, 7; Battle Mountain, 1; Bull Run Mountains, 1; Carlin, 1; Carson Sink, 1; Cottonwood Range, 1; Elko, 9; Flowing Springs, 1; Gardnerville, 1 (Mus. Comp. Zool.); Golconda, 3; Halleck, 12; Holbrook, 2 (Mus. Comp. Zool.); Monitor Valley, 1; Mountain City, 4; Osobb Valley, 2; Pine Forest Mountains, 1 (Univ. of California); Pyramid Lake, 3; Rabbit Hole Mountains, 2; Reese River, 3; Silver Creek, 1; Wadsworth, 2; Wells, 1; Winnemucca, 2.

CALIFORNIA: Amedee, 6; Benton, 1 (Univ. of California); Long Valley, 4; Mono Lake, 2; North Hot Springs, Mono County, 1 (Mus. Comp. Zool.); Sierra Valley, 4.

ONYCHOMYS LEUCOGASTER FUSCOGRISEUS Anthony.

1913. *Onychomys leucogaster fuscogriseus* ANTHONY, Bull. Amer. Mus. Nat. Hist., vol. 32, p. 11. March 7.

Type-locality.—Ironsides, Malheur County, Oregon; 4,000 feet altitude.

Geographic distribution.—Eastern Washington and Oregon, western Idaho, and northeastern California. South to Klamath Lake and the Madeline Plains.

General characters.—Closely related to *O. l. brevicaudus*, but darker in color; the young especially darker.

Color.—Similar in all pelages to *O. l. brevicaudus*, but averaging considerably darker. *Adult in summer* (88958, Swan Lake Valley, Oregon, June 13): Upperparts dark reddish-brown, rich and glossy; darkest medially, more brownish on sides and hips. Ear tufts conspicuously whitish; arms white; outer sides of legs to feet color of rump; tail blackish-brown above with grayish-white tip, white below. Younger adults vary from dark grayish-brown to rich light purplish-gray. *Juvenile* (11008, Univ. of Calif. Mus., Warner Mountains, California, July 28): Much darker, more blackish, than young of *brevicaudus* of same age. Above dark mouse gray, in some lights almost black; legs intensely colored to feet.

Skull.—The skull is essentially as in *O. l. brevicaudus*. (Plate 15.)

Measurements.—Averages and extremes of seven adults from Washington, Oregon, and California: Total length, 143 (138–149); tail vertebræ, 38 (34–40); hind foot, 19.2 (18.0–21.0); ear from notch in dry skin, 15.0 (14.5–15.8). Skull: Condylbasal length, 24.9 (24.4–25.2); zygomatic breadth, 14.1 (12.6–15.0); interorbital breadth, 4.8 (4.6–5.0); breadth of braincase, 12.7 (12.4–12.9); length of nasals

10.1 (9.8–10.3); length of mandible, 14.5 (14.2–14.9); maxillary tooth row, 4.1 (4.0–4.4). For detailed measurements of specimens see page 476.

Type-specimen.—No. 33544, American Museum of Natural History, New York. Skin and skull of young adult female (teeth little worn), still in immature pelage. Collected August 20, 1912, by H. E. Anthony. Original number, 121.

Remarks.—This is a subspecies closely related to *O. l. brevicaudus*, and differing only in color. It intergrades with *brevicaudus* in the western Snake River Valley and all along the adjoining ranges of the forms. The palest specimens I have referred to *fuscogriseus* come from the northern Plains of the Columbia. Some of these skins are nearly as light colored as true *brevicaudus*.

Specimens examined.—Total number, 78, from the following localities:

WASHINGTON: Asotin, 1; Baird, 3; Coulee City, 7; Douglas, 2; Mabton, 4; Pasco, 4; Rattlesnake Hills, 1; Touchet, 2.

OREGON: Alvord Valley, 1; Buck Creek, 1; Goose Lake Valley, 1; Harney, 2; Heppner, 2; Ironside, 10 (type and paratype, Amer. Mus.); Klamath Basin, 2; Klamath Falls, 3; Narrows, 2; Plush, 2; Swan Lake Valley, 2; Tule Lake, 1; Umatilla, 5; Willows Junction, 1.

IDAHO: Nampa, 2; Weiser, 1.

CALIFORNIA: Dry Creek, Warner Mountains, 9 (Univ. of Calif.); Madeline Plains, 3; Picard, 1; Sugar Hill, Modoc County, 2 (Univ. of Calif.); Tule Lake, 1.

ONYCHOMYS LEUCOGASTER MELANOPHRYS Merriam.

1889. *Onychomys leucogaster melanophrys* MERRIAM, North Amer. Fauna, No. 2, p. 2. October 30.
1890. *O[nychomys] melanophrys pallescens* MERRIAM, North Amer. Fauna, No. 3, p. 60. September 11. (Moki Pueblos, Navajo County, Arizona; type in U. S. National Museum.)
1890. *Onychomys melanophrys pallescens* MERRIAM, North Amer. Fauna, No. 3, p. 61. September 11.
1890. *O[nychomys] melanophrys* MERRIAM, North Amer. Fauna, No. 3, p. 61. September 11.
1895. *Onychomys leucogaster pallescens* ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 7, p. 225. June 29.
1896. *Onychomys pallescens* MEARNs, Proc. U. S. Nat. Mus., vol. 18, No. 1081. Advance sheet, p. 4. May 25.
1901. *Onychomys melanophrys* MILLER AND REHN, Proc. Boston Soc. Nat. Hist., vol 30, p. 67. December 27.
1912. *Onychomys melanophrys melanophrys* MILLER, Bull. 79, U. S. Nat. Mus., p. 127. December 31.

Type-locality.—Kanab, Kane County, Utah.

Geographic distribution.—South central and southeastern Utah, southwestern Colorado, northeastern Arizona, and northwestern New Mexico. North in the Grand River Valley to Fruita, Colorado,

and in the Rio Grande Valley to northern Costillo County, Colorado. West to Kanab, Utah, and Flagstaff, Arizona; east in New Mexico to Santa Fe and the Sandia Mountains; south to Acoma and the Zuni River.

General characters.—A bright colored race; in perfect pelage rich pinkish-cinnamon above. Much lighter colored than *ruidosæ*, *fuliginosus*, or *capitulatus*, its geographical neighbors. Darker and richer colored than *arcticeps*, of the Great Plains.

Color.—*Adult in full winter pelage* (57201, Bluff City Utah, November 8): Upperparts pinkish-cinnamon, finely lined with darker brownish; darkest on top of head, lower back, and rump; lower sides and hips almost pure pinkish-cinnamon. Nose lighter than head; ear tufts pale buffy; ears blackish, rimmed with white; eyebrows dark brown; tail pale brownish-gray at base above, tip and below white. Entire underparts pure white, hairs of lower breast, belly, and sides with underfur narrowly pale slate-gray. *Adult in late spring* (186479, Moki Pueblos, Arizona, May 18; type of "*pallescens*"): Much faded and paler than in fresh coat, the rich pinkish-cinnamon faded to cinnamon-buff and the darker hair tips of back much worn away; ear tufts less conspicuous than in winter. *Juvenile* (166709, Kanab, Utah, September 21): Almost precisely like the young of *O. l. arcticeps*, but very slightly paler, the face lighter, and the underparts pure white. Paler than young of *O. l. ruidosæ*. *Young adult* (161202, Kanab, Utah, September 20): Much grayer than old adults in fall, without pinkish-cinnamon on back and sides. Above drab, finely lined with darker; the back and rump lightly washed with a glossy cinnamon-drab. Underparts white.

Many old adults, among them some of the oldest specimens examined, with the teeth very much worn, do not acquire the bright pinkish-cinnamon pelage, even in winter, but remain in a coat much like that of the young adult and immature but darker. Since I have found no evidences of real dichromatism in the examination of many hundreds of specimens of *Onychomys*, and in every form each difference of color has proved a step in a true sequence of pelages, moults, and wear, I am inclined to believe that this single case of what otherwise might be regarded as dichromatism is in reality a senile pelage. Aged animals, in other words, appear not to renew into the highly colored fresh pelage of adults in the prime of life, but take on a pelage resembling that of the immature.

Skull.—Essentially as in *ruidosæ*. (Plate 15.)

Measurements.—Averages and extremes of 12 adults from Utah and Colorado: Total length, 154 (145–163); tail vertebræ, 44 (39–55); hind foot, 21.9 (21.0–23.0); ear from notch in dry skin, 14.7 (13.9–

15.4). Skull: Condylobasal length, 25.9 (24.8–27.3); zygomatic breadth, 15.1 (14.1–16.1); interorbital breadth, 5.0 (4.7–5.3); breadth of braincase, 12.7 (12.3–13.1); length of nasals, 10.9 (10.3–11.4); length of mandible, 15.4 (14.8–15.9); maxillary tooth row, 4.6 (4.4–4.8). For detailed measurements of specimens, see page 476.

Type-specimen.—No. 186477, United States National Museum. Skin and skull of adult male (teeth little worn), in full winter pelage. Collected December 22, 1888, by Vernon Bailey. Original number 458. Merriam collection number $\frac{51899}{8994}$. The colors, especially of tail, feet, and ears, have been destroyed by painting with corrosive sublimate and exposing to fumes of carbon bisulphide, which has turned them a dark plumbeous color.

Remarks.—This form intergrades with *ruidosæ* wherever the ranges meet. Specimens from New Mexico average slightly larger and have slightly longer ears than skins from Utah and Colorado, but the coloration is remarkably uniform over the mapped range of the subspecies.

The abundant material now in the collection makes it clear that *O. l. melanophrys* and *Onychomys melanophrys pallescens* Merriam are indistinguishable. The type of *pallescens*, from Moki Pueblos, northeastern Arizona, is in the faded spring pelage. The type and topotypes of *melanophrys* can be almost exactly matched in color by numerous specimens from Wingate, and even as far east as the Sandia Mountains, New Mexico.

In fresh pelage *O. l. melanophrys* is a handsome mouse, and it differs conspicuously in color from all the other races of *leucogaster*. It is most like *O. l. arcticeps* from the Great Plains, but is decidedly richer and darker colored.

Specimens examined.—Total number, 147, from localities as follows:

UTAH: Bluff City, 2; Hanksville, 1; Kanab, 15, including the type; River View, 1; Thurber, 1.

COLORADO: Antonito, 1; Conejos River, 2; Coventry, 1; Fruita, 5; Medano Ranch, 15 miles northeast of Mosca, 3; Naturita, 2.

ARIZONA: Flagstaff, 1; Holbrook, 8; Keams Cañon, 1; Moa Ave, Painted Desert, 4; Moki Pueblos, 3, including type of "*pallescens*"; Oraibi, 1; Tuba City, Painted Desert, 1; Walnut, 6; Winslow, 11; Zuni River, 2.

NEW MEXICO: Acoma, 1; Albiquin, 6; Albuquerque, 1; Carasal, Bernalillo County, 2 (Mus. Comp. Zool.); Chaco Canyon, 2 (Amer. Mus.); Chama River, 1; Española, 1; Fruitland, 2; Gallina, 1; Gallup, 13; Jamez, 1; Laguna, 1; La Plata, 1 (Amer. Mus.); Sandia Mountains, 3; Santa Fe, 1; Stinking Spring Lake, 4; Tierra Amarillo, 1; Wingate, 32; Zuni River, 1.

ONYCHOMYS LEUCOGASTER FULIGINOSUS Merriam.

1890. *Onychomys fuliginosus* MERRIAM, North Amer. Fauna, No. 3, p. 59. September 11.

Type-locality.—Black Tank lava beds, northeast of San Francisco Mountain, Arizona.

Geographic distribution.—Lava beds and pinyon and cedar belt, east and northeast of San Francisco Mountain, Arizona.

General characters.—Coloration very dark; characters otherwise as in *melanophrys*.

Color.—*Old adult in autumn* (17997, Black Tank, Arizona, September 27; type): Upperparts dark blackish brown; darkest on head and along middle of back to tail, where the color is almost deep neutral gray; sides lighter, more wood-brown; ear tufts not conspicuous, the color of head; outer sides of legs to foot color of back; tail blackish-brown above at base, paling to near end, which is white like the lower surface. Arms, hands, and feet whitish; underparts of body white. The color of upperparts extends downward on sides much farther than usual in the genus, leaving only the ventral surface pure white. *A younger adult* from the type-locality (17996, September 21) lacks most of the smoky coloration and is a rich dark wood-brown, mottled with blackish-brown, above; the legs are nearer white, as usual in the group, with only a faint indication of color along outer side to near heel. Three immature specimens also exhibit this variation in color and markings; two are like the type and one is like the last-described specimen.

Skull.—The skull does not differ in any essential respect from that of *melanophrys*.

Measurements.—Type: Total length, 160 millimeters; tail vertebræ, 47; hind foot, 21.5; ear from notch in dry skin, 15.0. Skull: Condylbasal length, 25.9; zygomatic breadth, 15.8; interorbital breadth, 5.2; breadth of braincase, 13.2; length of nasals, 11.6; length of mandible, 15.4; maxillary tooth row, 4.5. For detailed measurements of specimens, see page 477.

Type-specimen.—No. $\frac{17997}{24557}$, United States National Museum, Biological Survey collection. Skin and skull of old adult female (teeth much worn). Collected September 27, 1889, by Dr. C. Hart Merriam and Vernon Bailey. Original number, 547.

Remarks.—This is a local lava-bed form of *melanophrys*. Such local variations occur in other rodent genera, notably *Peromyscus* and *Neotoma*, in the "malpais" sections of Arizona and New Mexico. There is a question, perhaps, if such extreme local color variations should be recognized by name, but until more material from the vicinity of San Francisco Mountain is examined it seems best, in this case, to retain the form as a subspecies. Specimens of *melanophrys* from Walnut, Arizona, show a tendency toward *fuliginosus*

in coloration and intergradation presumably takes place at all places where the lava-bed form meets the desert race.

Specimens examined.—Total number, 5, from the following localities:

ARIZONA: Black Tank, Painted Desert, 3, including the type; San Francisco Mountain, cedar belt, east side, 2.

ONYCHOMYS LEUCOGASTER RUIDOSÆ Stone and Rehn.

1903. *Onychomys ruidosæ* STONE AND REHN, Proc. Acad. Nat. Sci. Philadelphia, 1903, p. 22. May 7.

1913. *Onychomys leucogaster ruidosæ* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 216. December 20.

Type-locality.—Hale's Ranch, Ruidoso, Lincoln County, New Mexico.

Geographic distribution.—Chiefly the mountainous region of southeastern Arizona and central and southwestern New Mexico. North to Camp Verde, Arizona, and to the Manzano Mountains and Las Vegas, New Mexico; east to the Capitan Mountains; south into northern Chihuahua and Sonora.

General characters.—A dark form of the *melanophrys* type; darker and richer colored than *melanophrys*, *arcticeps*, or *albescens*, its geographical neighbors; never, apparently, in its typical form, attaining the light buffy state of coloration.

Color.—*Adult in full fall pelage* (119149, Carrizozo, New Mexico, October 30): Above glossy dark wood-brown, with a wash of rich cinnamon color and finely lined with darker brown hair tips; darkest on lower back and rump, palest on shoulders and sides; posterior sides of body and hips almost pure cinnamon. Ear tufts pale cinnamon-brown, inconspicuous; ear brownish outside, rimmed with white; posterior side of inner ear with pure white hairs; tail grayish-brown above, whitish at tip and below. Lips, arms, hands, feet, and entire underparts whitish. *Juvenile* (119151, Carrizozo, New Mexico, October 31): Almost exactly like corresponding age in *O. l. longipes*, but tail lighter above, pale grayish-brown. *Young adult in autumn* (119152, Carrizozo, New Mexico, October 31): Paler and less richly colored than old animals. Above drab, very finely streaked with darker, and lightly washed with pale cinnamon.

Specimens collected during process of renewal into first full adult pelage are often curiously and irregularly mottled, with the head and dorsum dark brownish and the shoulders and sides patched with bright cinnamon.

Skull.—Less high and elongated than in *albescens* and *longipes*; much as in *arcticeps*, with flattened braincase. Differs from the skull of *arcticeps*, however, in its wider, less parallel sided, interpterygoid space and slightly smaller audital bullæ. (Plate 15.)

Measurements.—Averages and extremes of 21 adults from New Mexico and Arizona: Total length, 159 (150–167); tail vertebræ, 49 (42–55); hind foot, 22.2 (20.5–24.0); ear from notch in dry skin, 15.6 (13.7–16.9). Skull: Condylbasal length, 26.2 (24.9–27.5); zygomatic breadth, 14.8 (13.9–16.2); interorbital breadth, 4.8 (±.4–5.2); breadth of braincase, 12.8 (12.2–13.2); length of nasals, 11.2 (10.3–11.8); length of mandible, 15.3 (14.3–16.2); maxillary tooth row, 4.4 (4.3–4.6). For detailed measurements of specimens, see page 478.

Type-specimen.—No. 11091, collection of Academy of Natural Sciences, Philadelphia. Skin and skull of old adult female (teeth much worn). Collected September 19, 1898, by C. M. Barber. Original number, 73. Rhoads collection, No. 4091.

Remarks.—This is a dark form of the *melanophrys* type which seems never to attain the light buffy pelage of the more northern race. It is likewise darker and richer colored than *arcticeps*. Direct intergradation with *melanophrys*, *arcticeps*, and *albescens* is shown by numerous intermediate examples from the borders of the range. Specimens from Las Vegas, New Mexico, are approaching *arcticeps* in character. The lightest colored specimens I have referred to *ruidosæ* are from the Lower Sonoran parts of southern New Mexico, at Monument No. 15, Mexican Boundary Line, and Jarilla. These specimens show such a strong approach in color toward *albescens* of northern Chihuahua that their determination as *ruidosæ* seems perhaps unwarranted; but *albescens*, as known from three specimens only is so very local that until more complete collections from the general region are made it seems best to consider these specimens as intermediates, and probably nearest to *ruidosæ*.

Specimens examined.—Total number, 150, from the following localities:

NEW MEXICO: Ancho, 1; Bear Spring Mountains, 13; Burley, 4; Cactus Flat, 3; Capitan Mountains, 2; Carrizozo, 7; Datil Mountains, 2; Deer Creek, Grant County, 2; Deming, 8; Fairview, 2; Gallina Mountains, 4; Hale's Ranch, Ruidoso, 4 (Phila. Acad. Sci., type and two paratypes and one in Amer. Mus.); Hatchet Ranch, 1; Jarilla, 1; Lake Valley, 2; Las Vegas, 7; Magdalena, 1; Mangos Valley, 1; Manzano Mountains, east side, 11; Mesa Jumanes, 11; Mesilla, 1 (Phila. Acad. Sci.); Monument No. 15, Mexican Boundary Line, 5; Rio Alamosa, 1; San Augustine Plains, 7; San Pedro, 4; Socorro, 1.

ARIZONA: Camp Verde, 2; Dos Cabezas, 2; Fairbank, 4 (Amer. Mus. and Field Mus.); Lochiel, 1; San Bernardino Ranch, 1; San Pedro River, 23; Taylor, 5; Willcox, 1.

SONORA: Santa Cruz River, 4.

CHIHUAHUA: Colonia Diaz, 1.

ONYCHOMYS LEUCOGASTER CAPITULATUS Hollister.

1913. *Onychomys leucogaster capitulatus* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 215. December 20.

Type-locality.—Lower end of Prospect Valley, 4,500 feet, Hualpai Indian Reservation, Grand Canyon, Arizona.

Geographic distribution.—Known only from the type-locality and from Aubrey Valley, Arizona.

General characters.—Darker than *melanophrys*; lighter, more reddish-brown, than *fuliginosus*. Coloration much like that of *ruidosæ*, but slightly smaller in size and with considerably smaller and weaker skull.

Color.—The coloration of this form, in all pelages, closely resembles that of *O. l. ruidosæ*.

Skull.—Like skulls of *ruidosæ* and *melanophrys*, but smaller and generally weaker, with lighter rostrum, narrower interpterygoid space, and smaller audital bullæ. (Plate 15.)

Measurements.—Type and averages of 10 adults from vicinity of type-locality, the latter in parentheses: Total length, 142 (147); tail vertebræ, 43 (44); hind foot, 21.0 (21.9); ear from notch in dry skin, 14.6 (14.8). Skull: Condylbasal length, 25.1 (25.1); zygomatic breadth, 14.0 (14.0); interorbital breadth, 4.7 (4.6); breadth of braincase, 13.0 (12.6); length of nasals, 10.9 (10.9); length of mandible, 14.5 (14.5); maxillary tooth row, 4.3 (4.3). For detailed measurements of specimens, see page 478.

Type-specimen.—No. 202612, United States National Museum, Biological Survey collection. Skin and skull of adult male (teeth moderately worn) in fresh fall pelage. Collected September 26, 1913, by Edward A. Goldman. Original number, 22234.

Remarks.—This form is closely related to *O. l. ruidosæ*, but the slightly smaller size, smaller ear, and uniformly smaller and weaker skull, characters so constant in the series of 20 specimens as to appear truly reliable, make it necessary to recognize it by name. No *Onychomys* was known from the region before this series was taken by Mr. Goldman in 1913, and the type-locality is the most westerly point of the known range of the *leucogaster* group in the Southwest.

Specimens examined.—Total number, 20, from localities as follows:

ARIZONA: Aubrey Valley, 10 miles south of Pine Spring, 6; Grand Canyon, Hualpai Indian Reservation, 14.

ONYCHOMYS LEUCOGASTER ALBESCENS Merriam.

1904. *Onychomys leucogaster albescens* MERRIAM, Proc. Biol. Soc. Washington, vol. 17, p. 124. June 9.

Type-locality.—Samalayuca, Chihuahua, Mexico.

Geographic distribution.—Known only from the sand dunes at the type-locality in northern Chihuahua, and from Monument No. 1, Mexican boundary line, opposite El Paso, Texas.

General characters.—General coloration exceedingly pale, without distinct markings, and with white of underparts extending onto shoulders and upper sides.

Color.—*Adult in full winter coat* (50040, Samalayuca, Chihuahua, December 12; type): General color of upperparts pale vinaceous-buff, darkest on crown, lower back, and rump, where the color becomes almost light pinkish-cinnamon; nose to crown whitish; ear tufts pure white; ears scantily furred with whitish; underfur of back slate-gray. Lips, cheeks, region back of ears, sides, legs, and feet white, the hairs everywhere except on upper sides pure white to bases. Tail pale-grayish above, whitish below; not sharply bicolor. Two slightly younger specimens from the type-locality differ somewhat from the type, but both are very pale. One (50042, December 18) lacks the buffy general color and is decidedly grayish above.

Skull and teeth.—The skull of *albescens* resembles those of *longipes* and *breviauritus* in general shape more than other forms of the group. Compared with *ruidosæ* it is long and slender with higher, less flattened braincase. The teeth are small.

Measurements of type.—Total length, 160 millimeters; tail vertebrae, 60; hind foot, 23; ear from notch in dry skin, 15.6. Skull: Condylbasal length, 26.0; zygomatic breadth, 14.2; interorbital breadth, 14.8; breadth of braincase, 12.9; length of nasals, 11.6; length of mandible, 15.0; maxillary tooth row, 4.3.

Type-specimen.—No. 50040, United States National Museum, Biological Survey Collection. Skin and skull of young adult male (teeth moderately worn and basal suture open), in fresh full winter coat. Collected December 12, 1892, by C. P. Streater. Original number 2399.

Remarks.—This is a local form, restricted, so far as known, to the sand dunes in the vicinity of Samalayuca, Chihuahua, and northward to the Rio Grande, opposite El Paso, Texas. Specimens from the Lower Sonoran deserts of Otero County, New Mexico, are pale and are distinctly approaching this race in color, but are best placed with the wider ranging *ruidosæ*.

Specimens examined.—Total number 6, from:

CHIHUAHUA: Mexican boundary line, opposite El Paso, 3; Samalayuca, 3 (type and paratypes).

ONYCHOMYS LEUCOGASTER LONGIPES Merriam.

1888. *Cricetus (Onychomys) leucogaster* THOMAS, Proc. Zool. Soc. London, 1888, p. 445.

1889. *Onychomys longipes* MERRIAM, North Amer. Fauna, No. 2, p. 1. October 20.

1901. [*Onychomys leucogaster*] *longipes* ELLIOT, Field Col. Mus., pub. 45, zool. ser., vol. 2, p. 120.

1913. *Onychomys leucogaster longipes* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 216. December 20.

Type-locality.—Concho County, Texas.

Geographic distribution.—Central and southern Texas and Nuevo Leon and Tamaulipas, Mexico. North to Tom Green and Concho

Counties, Texas; west to the Pecos River; southeast to Rockport and Nueces Bay, Texas; south to Victoria, Tamaulipas. Lower Sonoran Zone.

General characters.—Size large; colors dull; ears larger than in any other subspecies of *leucogaster*. In general most like *breviauritus*, but much less brightly colored, lighter and grayer; with longer tail and feet and much larger ears.

Color.—*Adult in winter* (21180, Fort Clark, Texas, December 29): Upperparts drab, darkest on middle of back; finely lined with darker brownish, and with a wash of pale cinnamon over lower back and hips; an indistinct stripe of cinnamon along sides between color of upperparts and white of underparts, from fore legs to base of tail; a blackish spot each side of nose at base of whiskers; ear tufts scant, pale cinnamon color. Tail brown above with white tip; whitish below, not sharply bicolor. Underparts white, the hairs of throat and fore legs white to bases. There is little difference in the color of adults at any season. *Juvenile* (3863, Amer. Mus. Nat. Hist., Corpus Christi, Texas, April 24): Above brownish-gray, close to mouse-gray, finely lined with darker; sides paler.

Skull and teeth.—The skull of *longipes* resembles that of *breviauritus* and differs from the skulls of *arcticeps*, *melanophrys*, and other forms of *leucogaster* in being narrower and comparatively long, with longer, higher braincase. Teeth relatively small. (Plate 15.)

Measurements.—Averages and extremes of 12 adult specimens from Texas and Tamaulipas: Total length, 166 (152–190) millimeters; tail vertebræ, 55 (48–61); hind foot, 22.9 (22.0–25.0); ear from notch in dry skin, 16.1 (15.0–16.9). Skull: Condylbasal length, 27.1 (25.9–28.9); zygomatic breadth, 15.1 (14.3–15.5); interorbital breadth, 4.7 (4.5–5.2); breadth of braincase, 12.7 (11.9–13.3); length of nasals, 11.8 (10.9–12.7); length of mandible, 15.9 (15.1–17.1); maxillary tooth row, 4.4 (4.1–4.8). For detailed measurements of specimens see page 479.

Type-specimen.—No. 186478, United States National Museum. Skin and skull of young adult female (teeth little worn and basal suture not entirely closed). Collected March 11, 1887, by William Lloyd. Merriam collection, No. $\frac{3297}{3337}$.

Remarks.—This subspecies exhibits less variation in pelage from age and season than any other form of *Onychomys*. From lack of specimens between their ranges as mapped, intergradation with the Oklahoma form is not proved, but from the close resemblance between the two forms it seems most certain, and the Oklahoma form certainly intergrades with *arcticeps*. There are so few good specimens from the lower Pecos Valley that the actual relationship between *longipes* and *arcticeps* at this point can not be determined, but it seems most certain from the color of such skins as are available that

intergradation does take place at this point. Aside from the slight difference in shape, there seem to be no actual characters to distinguish the skulls of *longipes* from those of other forms of the *leucogaster* group.

Specimens examined.—Total number, 39, from the following localities:

TEXAS: Bee County, 1; Brownsville, 1 (Amer. Mus.); Comstock, 3; Concho County, 1 (type); Corpus Christi, 1; Eagle Pass, 1; Fort Clark, 8; Laredo, 2; Lomita Ranch, 2; Nueces Bay, 3; Raglan's Ranch, Rio Grande, 1; Rockport, 2 (Amer. Mus.); San Angelo, 1; San Diego, 1; Sauz Ranch, Cameron County, 1; Sheffield, 25 miles south on Pecos River, 1; Sycamore Creek, 1.

TAMAULIPAS: Camargo, 2; Reynosa, 1; Victoria, 2.

NUEVO LEON: Linares, 3.

ONYCHOMYS LEUCOGASTER BREVIAURITUS Hollister.

1913. *Onychomys leucogaster breviauritus* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 216. December 20.

Type-locality.—Fort Reno, Oklahoma.

Geographic distribution.—Eastern Nebraska, eastern and south-central Kansas, and middle Oklahoma. From Neligh, Nebraska, and Fort Riley and Ncosha Falls, Kansas, west and south to Kinsley, Kansas, and to Woodward and Fort Reno, Oklahoma. Entirely within the Carolinian and Austroriparian faunas of the Austral region.

General characters.—Most like *O. l. longipes*, but darker and richer colored, with shorter tail, smaller hind foot, and smaller ears.

Color.—*Adult in full winter pelage* (96057, Alva, Oklahoma, February 27): Head and back a rich blackish-brown, the ground color pinkish-cinnamon, the overlying hairs with long blackish tips which streak and darken the ground color; cheeks and sides with less of the dark streaking, the hips and lower rump almost pure pinkish-cinnamon. Center of nose gray; cinnamon spots at base of whiskers, between the gray of nose and white of lips. Ear tufts cinnamon-buff; tail grayish-brown above to near tip, sharply bicolor, the underside and tip white. Arms, hands, lower legs, and entire underparts white, with dark gray underfur everywhere except on chin. *Adult in late summer* (19145, Fort Reno, Oklahoma, October 8; breeding female, renewal retarded): Upperparts dull grayish-brown; sides brighter, more cinnamon; no conspicuous ear tufts; tail and feet scantily furred. *Juvenile* (96060, Alva, Oklahoma, September 5): Above hair-brown, finely lined; sides paler, more drab; no ear tufts; tail brownish above, whitish below. *Immature in winter coat* (23190, Fort Reno, Oklahoma, December 21): Like the juvenile but darker, more glossy and richly colored; the back blackish-brown, sides more pinkish-buff; no ear tufts; tail brownish above, with white tip; entire underparts white.

Skull.—Almost precisely like the skull of *longipes*. Compared with skulls of *arcticeps* it is narrower, longer, and more arched, with longer rostrum and longer, higher braincase. I can find no character to separate the skulls from those of *longipes*. There is, perhaps, less tendency toward the development of a spine on the posterior border of the palate, but in the *leucogaster* group this character is exceedingly variable and very unreliable.

Measurements.—Type and averages, the latter in parentheses, of seven adults from Kansas and Oklahoma: Total length, 164 (156); tail vertebræ, 42 (42); hind foot, 21.0 (22.0); ear from notch in dry skin, 13.2 (12.8). Skull: Condylbasal length, 27.4 (26.9); zygomatic breadth, 15.1 (15.3); interorbital breadth, 4.4 (4.7); breadth of braincase, 12.5 (12.9); length of nasals, 11.5 (11.6); length of mandible, 15.9 (15.7); maxillary tooth row, 4.7 (4.6). For detailed measurements of specimens see page 479.

Type-specimen.—No. $\frac{19144}{2872}$, United States National Museum. Skin and skull of adult female (teeth moderately worn). Collected at Fort Reno, Oklahoma, February 16, 1890, by Dr. J. C. Merrill. Original number, 18.

Remarks.—This subspecies intergrades with *O. l. arcticeps*. Specimens from Paladora Canyon, Texas, though placed with *arcticeps*, are undoubtedly intermediates. Skulls of specimens from Neligh, Nebraska, show an approach toward skulls of *arcticeps* in a general shortening and flattening, but the skins are typical of *breviauritus*. Intergradation doubtless takes place also with *longipes*, which the Oklahoma form most resembles in general characters, but specimens to connect the ranges of the two subspecies throughout southern Oklahoma and north-central Texas are wanting.

Specimens examined.—Total number 41, from localities as follows:
NEBRASKA: Neligh, 8.

KANSAS: Fort Riley, 1; Neosha Falls, 1 (Mus. Comp. Zool.); Kinsley, 1.

OKLAHOMA: Alva, 17; Beaver River, 5 (Amer. Mus. and Field Mus.); Camp Supply, 1¹; Fort Reno, 4; Neutral Strip, 1 (Amer. Mus.); White Horse Springs, 1 (Field Mus.); Woodward, 1.

ONYCHOMYS TORRIDUS (Coues).

(Synonymy under subspecies.)

Diagnosis.—Compared with *Onychomys leucogaster*, this species averages smaller and lighter built, with relatively longer tail (usually more than half the length of head and body). The skull averages considerably smaller and less stoutly built, but with the interorbital region comparatively wide. The teeth are lower crowned, the unworn cusps of *m*¹ longer than high, or with these dimensions

¹ Skeleton only.

nearly equal; anterior cusp of m^1 more broadened transversely, in unworn condition plainly divided at summit into two or three cusplets; m^1 narrow and elongated; m^3 smaller, much reduced, the greatest diameter transverse, the crown surface usually only one-sixth to one-fourth that of m^2 (rarely nearly one-third); owing to the length-

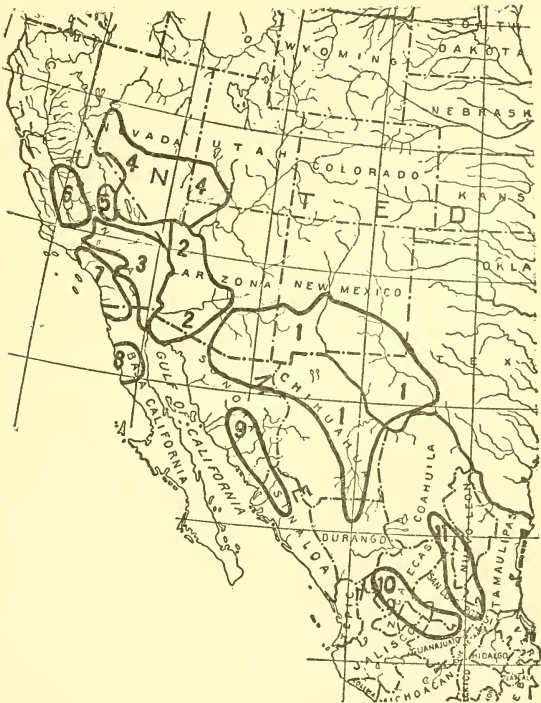


FIG. 3.—DISTRIBUTION OF THE SUBSPECIES OF ONYCHOMYS TORRIDUS.

- | | | |
|------------------------------|-----------------------------|----------------------------|
| 1. <i>O. t. torridus.</i> | 5. <i>O. t. clarus.</i> | 9. <i>O. t. yakiensis.</i> |
| 2. <i>O. t. perpallidus.</i> | 6. <i>O. t. tularensis.</i> | 10. <i>O. t. canus.</i> |
| 3. <i>O. t. pulcher.</i> | 7. <i>O. t. ramona.</i> | 11. <i>O. t. surrufus.</i> |
| 4. <i>O. t. longicaudus.</i> | 8. <i>O. t. macrotis.</i> | |

ening of m^1 and the reduction of m^3 , m^1 is almost invariably more than half the length of the tooth row.

Geographic distribution.—Southwestern United States and northern and central Mexico. From the deserts of Nevada and southeastern California and the San Joaquin Valley, south into Lower California and to Aguas Calientes and San Luis Potosi, Mexico. Eastward across southern Arizona and New Mexico to the Pecos Valley in Texas (see fig. 3).

Subspecies.—Eleven geographical races of *Onychomys torridus* are recognized. Four of these are confined to Mexico, and the others, with the exception of typical *torridus*, have comparatively limited distribution.

ONYCHOMYS TORRIDUS TORRIDUS (Coues).

1874. *Hesperomys (Onychomys) torridus* COUES, Proc. Acad. Nat. Sci. Philadelphia, 1874, p. 183. December 15.
 1885. *Onychomys leucogaster*, var. *torridus* HERRICK, Geol. and Nat. Hist. Surv. Minnesota, 13th Ann. Rep. (1884), p. 183.
 1885. *Hesperomys torridus* TRUE, Proc. U. S. Nat. Mus., vol. 7 (1884), p. 597.
 1888. *[Rictus] torridus* THOMAS, Proc. Zool. Soc. London, 1888, p. 133.
 1889. *Onychomys torridus* MERRIAM, North Amer. Fauna, No. 2, p. 3. October 30.
 1896. *Onychomys torridus arenicola* MEARNS, Proc. U. S. Nat. Mus., No. 1103, advance sheet, p. 3, May 25; Proc. U. S. Nat. Mus., vol. 19, p. 139. (Rio Grande, about six miles above El Paso, Texas; type in U. S. Nat. Mus.)
 1912. *Onychomys torridus torridus* MILLER, Bull. 79, U. S. Nat. Mus., p. 128. December 31.

Type-locality.—Camp Grant, Graham County, Arizona.

Geographic distribution.—From the Pecos Valley in Texas and southeastern New Mexico, west across southern New Mexico and Chihuahua into southeastern Arizona and northern Sonora. North in the Rio Grande Valley to Socorro, New Mexico; south to northern Durango.

General characters.—Size medium, but less than in any neighboring form; ear smaller than in any other subspecies of *torridus*. Color of adult in late autumn and winter very rich reddish brown; much paler in late winter and spring; and darker, less bright, in the new coat in late summer; young very dark. Skull with the anterior palatine foramina large, extending backward to plane of anterior edge of m^1 , or beyond to plane of second cusp of this tooth; posterior edge of palate normally concave, without projecting spine.

Color.—Adult in full winter pelage (17876, Dos Cabezas, Arizona, November 21): Upperparts dark pinkish-cinnamon, rich and glossy; palest on the nose and cheeks; darkest along back from between ears to rump, where it is considerably mixed with the dark blackish-brown tips of the long overlying hairs; purest and brightest on shoulders and sides where there is little or no admixture of blackish. Whiskers mixed black and white; underfur broadly dusky neutral-gray; lanuginous tufts in front of ears conspicuous, pure white; outer ear dark brownish, rimmed with whitish; inner side of ear scantily haired with whitish. Underparts pure white, sharply cut off from color of upperparts, and extending well up on lower sides of body and on lower cheeks; the underfur for one-half its length dark neutral-gray, black in some lights; arms and hands pure white; legs like hips above, white below; feet white. Tail sharply bicolor, grayish-brown above to near tip; white below and around tip. Adult in late winter and spring (21201, Mesquite Springs, Chihuahua, May 12): Much paler than in full winter coat, less reddish-cinnamon, more

vinaceous or pale pinkish-gray and buff; the overlying hair tips worn or faded and the brownish-black wash on back and rump less conspicuous as a consequence; lanuginous ear tufts less contrasted from surrounding color and therefore much less conspicuous. *Adult in new pelage, late summer and fall* (21215, San Pedro River, Arizona, October 25): Darkest annual stage of adult. Pelage short, glossy, and with little red. Upperparts of head and body uniform wood brown, finely lined with darker; cheeks, shoulders, and sides very slightly paler, with less blackish-brown suffusion from darker hair tips; underfur broadly dark neutral-gray, the grayish-brown tips comparatively short; ear tufts wanting or inconspicuous, not noticeably contrasting in color from head. Underparts grayish-white, the slaty underfur showing through the thinly haired chest, belly, and limbs. Tail comparatively thinly haired, dark brown above, tip and underside whitish. *Juvenile pelage* (66085, Dos Cabezos, Arizona, June 22): Above uniform mouse-gray, the hair tips only slightly lighter than the underfur; ear tufts grayish; ears blackish outside, rimmed with white; dark brown inside, thinly haired with whitish. Underparts grayish-white; tail not sharply bicolor as in adult, the upper side gray, the under side and tip grayish-white. This juvenile pelage moults and renews directly into the post-juvenile pelage, which is worn until the following summer or autumn. *Post-juvenile pelage* (132056, Colonia Diaz, Chihuahua, January 19): Above browner, less slaty-gray, than in the juvenile coat. General color of upperparts grayish-hair-brown, with a decided tendency toward drab, finely lined with darker. Underparts clear whitish. Tail sharply bicolor, the brown line along upper surface very narrow.

Skull.—The skull, in general shape, is not conspicuously different from that of other forms of the *torridus* group. It is of medium size with comparatively narrow zygomatic breadth. The anterior palatine foramina are large, widely spreading forward of center, and extend backward to or beyond plane of anterior edge of m^1 , usually fully to plane of second cusp of that tooth. The palate appears, therefore, very short, and this appearance is accentuated by the deeply concave posterior edge, normally without indication of spine. In occasional immature specimens from throughout the range of the form, and in many adults from the extreme western limits of its distribution in Arizona and Sonora, the posterior edge of the palate develops a well-formed spine, as in the neighboring races on the west and south. Skulls from these western localities show a still further approach toward *perpallidus* in the shortening of the anterior palatine foramina, though the skins from this region retain the high coloration of true *torridus*. (Plate 15.)

Measurements.—Averages and extremes of twenty-three specimens from Arizona, New Mexico, Sonora, and Chihuahua: Total

length, 146 (134–158) millimeters; tail vertebrae, 52 (47–60); hind foot, 21.2 (20.0–22.0); ear from notch in dry skin, 14.0 (12.0–15.8). Skull: Condylbasal length, 23.3 (22.7–24.7); zygomatic breadth, 12.7 (11.9–13.7); interorbital breadth, 4.5 (4.3–4.8) breadth of braincase, 11.5 (11.0–11.9); length of nasals, 9.7 (8.9–10.4); length of mandible, 13.4 (12.6–14.1); maxillary tooth row, 3.7 (3.5–3.9). For detailed measurements of specimens see page 480.

Type-specimen.—No. 9886, United States National Museum. Skin only; adult, not sexed; made up from alcohol and colors considerably modified. Collected June 10, 1867, by Dr. Edward Palmer. Catalogued January, 1872. On the label are recorded the following: "Alcoholic measurements: nose to eye, .50 [hundredths of inch]; nose to ear, .95; nose to occiput, 1.25; length, 3.75; tail, 2.00; fore foot, .40; hind foot, .80; ear, .70 long, .50 wide." Ear from notch in the dry skin measures 13.3 millimeters; the hind foot, 19.7.

Remarks.—A comparison of numerous examples in the same pelage proves that *Onychomys torridus torridus* is remarkably uniform in coloration over its entire range. Skins in the full winter coat from Texas can be exactly matched by comparable skins from Dos Cabezas, Arizona. As noted in the description of the skull, specimens of *torridus* from the extreme western limits of the range of the typical race show a decided approach toward *perpallidus* in cranial characters, though retaining the coloration of *torridus* in its extreme richness. No specimens are available from the area between the northwestern limits of the distribution of *torridus*, as mapped, and Phoenix, Arizona, where *perpallidus* occurs, but the ranges of the two subspecies doubtless meet in this territory, as indicated by the approach of characteristics in specimens of each.

The type-specimen of *Onychomys torridus arenicola* Mearns, collected by Dr. Edgar A. Mearns and F. X. Holzner on the Rio Grande about 6 miles above El Paso, Texas, February 29, 1892, is in the collection of the United States National Museum. It is in the pale spring stage of the winter pelage and exactly matches some early April skins of true *torridus*. All late autumn and early winter skins from the El Paso region and throughout western Texas are indistinguishable in color from comparable skins of *torridus* from southeastern Arizona, and there are no important discrepancies in measurements or in cranial characters.

Specimens examined.—Total number, 183, from localities as follows:

ARIZONA: Calabasas, 5; Camp Grant, 1 (type); Dos Cabezas, 7; Fairbank, 20 (Field Mus., Amer. Mus., and Mus. Comp. Zool.); Fort Lowell, 13 (Field Mus. and Amer. Mus.); La Osa, 3; Mammoth, 2; Oracle, 1; San Bernardino Ranch, 3 (Field Mus. and Amer. Mus.); San Pedro River, 1; Santa Cruz River, 4; Tucson, 2; United States

Government grass reserve, 30 miles south of Tucson, 1 (Univ. of Calif.).

NEW MEXICO: Alamogordo, 1 (Phila. Acad. Sci.); Apache, Grant County, 3; between Alamogordo and Dry Cañon, Sacramento Mountains, 7 (Phila. Acad. Sci.); Carizallilo Springs, 1; Dog Spring, 1; Dry Creek, 1; Eddy, 2; Glenwood, 4; Gold Camp, 1; Hillsboro, 1; Organ City, 1; Pleasanton, 4; Redrock, 2; San Andres Mountains, 1; Silver City, 2; Socorro, 3; Tularosa, 10; upper corner monument, Mexican boundary line, 9; Weed, 1.

TEXAS: Alpine, 5; El Paso, 1; Fort Lancaster, 6; Franklin Mountains, 1; Kent, 1; Marathon, 1; Marfa, 9; Maxon Springs, 1; Monahans, 4; Presidio County, 3; Rio Grande, 6 miles above El Paso, 1 (type of "*arenicola*"); Sierra Blanca, 11.

CHIHUAHUA: Casas Grandes, 5; Chihuahua, 2; Colonia Diaz, 1; Gallego, 1; Juarez, 1 (Amer. Mus.); Mesquite Springs, 1; Samalayuca, 1.

SONORA: Cerro Blanco, 1 (Field Mus.); Magdalena, 3.

DURANGO: Indé, 1; Rio Sestin, 2 (Amer. Mus.); Rosario, 1 (Amer. Mus.); Villa Ocampo, 1 (Amer. Mus.).

ONYCHOMYS TORRIDUS PERPALLIDUS Mearns.

1896. *Onychomys torridus perpallidus* MEARNS, Proc. U. S. Nat. Mus., No. 1103, advance sheet, p. 4, May 25; Proc. U. S. Nat. Mus., vol. 19, p. 140.

Type-locality.—East bank of Colorado River, at Monument No. 204, Mexican Boundary Line, Yuma County, Arizona.

Geographic distribution.—Colorado River valley in western Arizona; eastward along tributary streams to Big Sandy Creek, Signal, and Phoenix. Doubtless occurs also in northwestern Sonora.

General characters.—Slightly larger than the neighboring forms, *torridus*, *longicaudus*, and *pulcher*, with larger ears. Coloration much as in *longicaudus*, but averaging considerably duller, less brightly pinkish-buff; paler than in *torridus*, darker than in *pulcher*. Skull always with well-developed spine from posterior edge of palate; the anterior palatine foramina ending about even with plane of fronts of first molars.

Color.—*Adult in full winter pelage* (189282, Dolan's Spring, Arizona, February 7): Decidedly paler, less richly colored, than corresponding pelage of *torridus*. General color of upperparts light pinkish-cinnamon, pure on cheeks, shoulders, and sides, and very sparingly and minutely streaked with darker on back and rump, lanuginous tufts in front of ears mixed with color of head and much less conspicuous than in *torridus*; underfur a much paler slate, in most lights about as in slate-gray No. 5 of Ridgway. Tail, feet, and underparts as in *torridus*, but the underfur below very narrowly pale slate, very different from the broadly grayish-black underfur of *torridus*. *Adult in late winter and spring* (60174, type, Yuma

County, Arizona, March 27): Paler and more grayish than in late autumn and midwinter, lacking much of the bright pinkish tint. General color of upperparts vinaceous-buff, finely streaked by the darker hair tips; ear tufts not noticeable. *Adult in summer* (16855, Phoenix, Arizona, May 9): Like late winter and spring specimens but more cinnamon colored, less grayish, chiefly due to the wearing away of the dark hair tips of the old pelage and the gradual renewal of the new hairs. This stage more closely resembles the full winter coat than the last described spring stage in color, but is more cinnamon, less pinkish. *Juvenile* (141849, Gila City, Arizona, March 3): Very much paler than the young of *torridus*, drab instead of gray. Upperparts light drab, paler and clearer on sides; underparts white [not gray as in juvenile of *torridus*], the hairs of throat pure white to bases, of breast and belly with narrow gray undercolor. *Post-juvenile pelage* (189288, Yuma, Arizona, April 11): This pelage is retained by most individuals until late spring of the second year. It is much like the post-juvenile pelage of true *torridus*, but slightly paler, more grayish. Upper parts avellaneous, finely and fully streaked by the darker hair tips.

Skull.—The skull is like that of *torridus*, but with the posterior border of palate bow-shape, always with well-developed point extending backward into the interpterygoid space; anterior palatine foramina shorter, usually just reaching plane of fronts of first molars.

Measurements.—Type: Total length, 157 millimeters; tail vertebrae, 57; hind foot, 22.0; ear from notch in dry skin, 15.8. Average and extremes of four skulls of adults: Condylbasal length, 24.1 (23.5–25.3); zygomatic breadth, 13.0 (12.7–13.2); interorbital breadth, 4.6 (4.4–4.7); breadth of braincase, 11.4 (11.3–11.5); length of nasals, 9.9 (9.4–10.5); length of mandible, 13.8 (13.5–14.2); maxillary tooth row, 3.8 (3.7–4.0). For detailed measurements of specimens see page 481.

Type-specimen.—No. 60174, United States National Museum. Skin and skull of adult female, in late winter pelage. Collected March 27, 1894, by Dr. Edgar A. Mearns and F. X. Holzner. No. 3301, International Boundary Commission collection.

Remarks.—This well-marked form seems to be confined to the east side of the Colorado River, in western Arizona, and eastward along the Lower Sonoran valleys of tributary streams. As shown by the specimens at hand, its range reaches its most eastern limit in the valley of the upper Gila at Phoenix, Arizona. Specimens from Phoenix, in full fresh early winter coat, almost exactly match in color the paler spring stage of true *torridus*. The Colorado River seems a natural barrier between the ranges of *perpallidus* on the east, and *pulcher* and *longicaudus* on the west and north. Although specimens from points near the river in northwestern Arizona and

from Needles, California, may not be typical of their respective races, there is a decided break in size and in skull characters at this point, and every specimen so far examined can be placed unhesitatingly with its proper form. On the west side of the Colorado, at Needles, there is a decided reduction in size, accompanied by absence of the palatal spine, and the skins are colored much more like typical *pulcher* than true *perpallidus*. The specimens from east of the river (Fort Mojave, Beale's Spring, and Big Sandy Creek), are darker (slightly approaching typical *longicaudus* in color), but exhibit the cranial characters of *perpallidus*.

Specimens examined.—Total number, 21, from localities as follows:

ARIZONA: Beale's Spring, 3; Big Sandy Creek, 2; Colorado River at Monument 204, Mexican Boundary Line, 1 (type); Dolan's Spring, 1; Fort Mojave, 1; Gila City, 3; Harpers, 2; Parker, 1; Phoenix, 5; Signal, 1; Yuma, 1.

ONYCHOMYS TORRIDUS PULCHER Elliot.

1903. *Onychomys pulcher* ELLIOT, Field Col. Mus., pub. 87, zool. ser., vol. 3, No. 14, p. 243. December.

1913. *O[nychomys] t[orridus] pulcher* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 215. December 20.

Type-locality.—Morongo Pass, San Bernardino Mountains, California.

Geographic distribution.—Mohave and Colorado Deserts, California, and Lower California, Mexico. Known by specimens from Granite Springs and Needles on the north to Seven Wells, Lower California, on the south; and from the Colorado River bottoms westward to Antelope Valley and through San Gorgonia Pass to Cabezon station.

General characters.—Size smallest in the genus. Coloration very pale, with minimum amount of dark wash from the hair tips. Skull with anterior palatine foramina about even with fronts of m^1 and with tendency toward development of an imperfect spine at posterior edge of palate.

Color.—*Adult in full winter pelage* (151281, Morongo Pass, California, November 23): Resembling corresponding pelage of *O. t. perpallidus* but slightly paler, with less dark overwash from hair tips; nose and head paler, more grayish; upper side of tail lighter grayish-brown; and general coloration more pinkish-cinnamon; lanuginous tufts at bases of ears white, sharply marked from general color of head. *Adult in spring and early summer* (151640, Victorville, California, April 5): Brighter and purer pinkish-cinnamon than in early winter coat, with still less dark from hair tips, evidently due to wear and fading. Entire upperparts light ochraceous-pinkish-cinnamon, slightly darker on lower back and rump; nose and forehead paler, more grayish; underparts pure white, the gray hair bases very narrow.

Adult in summer molt (54070, Whitewater, California, June 8): Much darker than in any other stage of pelage, and most resembling younger animals in the post-juvenile coat. The general color of the upperparts is greatly darkened by the thinning of the longer overlying hairs and the consequent mixture of the slaty-gray underfur into the coloration. Ear tufts not conspicuous. *Juvenile* (136227, Oro Grande, California, March 16): Resembling the young of *perpallidus*, but still paler, more grayish-drab, the nose and ears with more whitish. Very much paler than the dark young of *O. t. ramona*. *Post-juvenile pelage* (54072, Whitewater, California, June 9; apparently in second year): Upperparts uniformly silky pale wood-brown, with a wash of cinnamon on nape and shoulders; ear tufts white, conspicuous.

Skull.—The skull of *Onychomys torridus pulcher* does not differ in any special characters from other races. The anterior palatine foramina end about even with plane of fronts of m^1 ; the posterior edge of the palate is rather variable, sometimes slightly concave, usually truncate, often with imperfectly developed spine.

Measurements.—Averages and extremes of nine adults: Total length, 136 (120–145); tail vertebrae, 48 (37–51); hind foot, 19.6 (18.0–20.0); ear from notch in dry skin, 14.5 (12.7–15.5). Skull: Condylobasal length, 22.7 (22.0–23.4); zygomatic breadth, 12.7 (12.6–13.2); interorbital breadth, 4.7 (4.4–5.1); breadth of braincase, 11.6 (11.2–11.9); length of nasals, 9.3 (8.8–9.9); length of mandible, 13.2 (12.6–13.7); maxillary tooth row, 3.6 (3.3–3.9). For detailed measurements of specimens, see page 481.

Type-specimen.—No. 12377, Field Museum Natural History, Chicago. Skin and skull of female adult (teeth much worn), in late winter pelage. Collected March 1, 1903, by Edmund Heller.

Remarks.—This is a well marked race which differs conspicuously in color from typical examples of all other forms excepting *clarus*, which it somewhat resembles. It is, however, less intensely bright colored than the Owens Lake form. Specimens from Needles, California, are slightly larger than typical examples of *pulcher*, thus approaching the dimensions of *perpallidus* and *longicaudus*, but they are indistinguishable in color from true *pulcher* and are still somewhat smaller than the average specimen of *perpallidus*. A single specimen from Granite Springs, on the north side of the Mohave Desert, is likewise approaching *longicaudus*, but clearly belongs best with *pulcher*. The material from along the Colorado River is rather limited but, as shown by all the specimens examined, the river appears to be a natural barrier between the subspecies *pulcher* and *perpallidus*. The animal is rare on the open desert, and is usually found in sandy places along the foothills or borders of streams and washes. Its distribution over the desert is therefore much broken, and large areas of its general range are unrepresented by specimens. The subspecies apparently

blends directly into *ramona* in the western end of San Gorgonio Pass, and probably intergrades with *tularensis* in the vicinity of Kern River Valley and Walker Pass. The single specimen from Onyx, on the south fork of the Kern River, is rather immature, and is indistinguishable from examples of *tularensis* from the lower levels in the San Joaquin Valley. Two young examples in the collection of the Museum of Vertebrate Zoology at the University of California, from Walker Pass, are likewise indistinguishable from specimens of the same age from the San Joaquin Valley, and are only provisionally on purely geographical grounds, and perhaps wrongly, placed with *pulcher*. Adults from this pass are much needed to determine the subspecies. The young of these forms, in post-juvenile pelage, are often very much alike.

Specimens examined.—Total number, 70, from the following localities:

CALIFORNIA: Agua Caliente, 1 (Amer. Mus.); Burns Cañon, San Bernardino Mountains, 2 (Field Mus.); Cabazon, 9; Cushenbury Springs, 2 (Univ. of Cal.); Daggett, 1 (Field Mus.); Fairmont, 3 (Univ. of Cal.); Granite Springs, 1; Lane's Mill, 20 miles north of Daggett, 1 (Field Mus.); Morongo Pass, 7¹; Needles, 3; Onyx, 1; Oro Grande, 2; Palm Springs, 2 (Mus. Comp. Zool.); Victorville, 18; Walker Pass, 2 (Univ. of Cal.); Warren's Well, San Bernardino Mountains, 1 (Field Mus.); Whitewater, 13.

LOWER CALIFORNIA: Seven Wells, 1.

ONYCHOMYS TORRIDUS LONGICAUDUS Merriam.

1889. *Onychomys longicaudus* MERRIAM, North Amer. Fauna, No. 2, p. 2. October 30.

1893. *O[nychomys] longicauda* RHOADS, Amer. Nat., vol. 27, p. 833. September.

1904. *O[nychomys] torridus longicaudus* MERRIAM, Proc. Biol. Soc. Washington, vol. 17, p. 123. June 9.

1913. *Onychomys torridus longicaudus* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 215. December 20.

Type-locality.—St. George, Utah.

Geographic distribution.—Southwestern Utah, northwestern Arizona north of the Colorado River, southern Nevada, and the adjacent desert mountain region of Inyo and Mono Counties, California. North in western Nevada to Carson Sink; west in California to Kearsarge Pass and to the Argus Mountains.

General characters.—Coloration like that of *pulcher*, but slightly darker. Larger than *perpallidus*, with shorter tail and hind foot, and smaller ear. Skull with anterior palatine foramina short, usually not reaching plane of front of first molars. Posterior edge of palate truncate, rarely slightly convex, never with spine.

¹ Including the type and four paratypes from the Field Museum of Natural History, Chicago.

Color.—*Adult in full winter pelage* (186476, St. George, Utah, January 4; type): Similar to corresponding pelage of *perpallidus*; slightly darker than in *pulcher*. *Adult in spring* (28359, Panaca, Nevada, May 20): Like winter pelage, but brighter, more ochraceous-pinkish-buff. *Juvenile* (26653, Vegas Valley, Nevada, March 15): Very pale; like young of *pulcher*, but even paler, more drab-gray. *Post-juvenile pelage* (28360, Oasis Valley, Nevada, June 2; in second year): Almost precisely like corresponding pelage of *pulcher*.

Skull.—Palate never ending posteriorly with projecting spine; usually truncate, rarely concave. Anterior palatine foramina short, not reaching (or rarely in some intermediate specimens just reaching) plane of front of first molars.

Measurements.—Averages and extremes of 23 adults from Utah, Nevada, and California: Total length, 141 (130–155) millimeters; tail vertebrae, 49.6 (40.0–58.0); hind foot, 19.9 (19.0–21.0); ear from notch in dry skin, 14.2 (13.2–15.6). Skull: Condylbasal length, 22.8 (21.8–23.8); zygomatic breadth, 12.9 (12.7–13.3); interorbital breadth, 4.9 (4.5–5.0); breadth of braincase, 11.6 (11.1–12.2); length of nasals, 9.2 (8.6–9.9); length of mandible, 13.3 (12.5–14.2); maxillary tooth row, 3.6 (3.4–3.8). For detailed measurements of specimens see page 481.

Type-specimen.—No. 186476, United States National Museum. Skin and skull of adult male in full winter pelage. Collected by Vernon Bailey, January 4, 1889. Original No., 476; Merriam collection, skin 5201, skull 5896.

Remarks.—This subspecies is sharply separated from *perpallidus* on the south by the Colorado River. At the type-locality it is comparatively dark, and is virtually indistinguishable in color in some pelages from *perpallidus*, but the cranial characters are diagnostic and reliable. Toward the west it gradually becomes more ochraceous in color until it meets and blends with the Owens Lake form on the western slopes of the Argus Mountains. It also blends imperceptibly into the paler form later described as *pulcher*, in the mountains bordering the main Mohave Desert on the north.

Specimens examined.—Total number, 65, from the following localities:

UTAH: St. George, 3 (including the type).

NEVADA¹: Ash Meadows, 2; Bunkerville, 2; Carson Sink, 2; Charleston Mountains, 2; Colorado River, southwest of Stone's Ferry, 2; Oasis Valley, 4; Pahrnagat Valley, 1; Pahroc Spring, 3; Pahrump Valley, 8; Panaca, 1; St. Thomas, 2; Stone's Ferry, 1; Table Mountain, 1; Vegas Valley, 6.

¹ For an account of most of the obscure localities in Utah, Nevada, and Inyo County, California, listed in this paper see a List of Localities Visited by the Death Valley Expedition, by T. S. Palmer, North American Fauna, No. 7, pp. 361–384.

CALIFORNIA: Amargosa, 1; Benton Station, 4 (Univ. of Cal.); Bishop, 2; Furnace Creek, Death Valley, 3; Independence, 2 (Univ. of Cal.); Kearsarge Pass, 2 (Univ. of Cal.); Maturango Spring, Argus Mountains, 1; Morans, upper Owens Valley, 1; Panamint Mountains, 4; Panamint Valley, 1; Resting Springs, 4.

ONYCHOMYS TORRIDUS CLARUS Hollister.

1913. *Onychomys torridus clarus* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 215. December 20.

Type-locality.—Keeler, east shore of Owens Lake, Inyo County, California.

Geographic distribution.—Vicinity of Owens Lake, Coso Mountains, and Salt Wells Valley, Inyo County, California.

General characters.—Like *Onychomys torridus longicaudus*, but clearer and brighter colored, with very little dark streaking from the hair tips. Resembling *O. t. pulcher*, but much more intensely pinkish-cinnamon. Skull as in *longicaudus*, but with anterior palatine foramina averaging longer, reaching backward fully to line of fronts of first molars.

Color.—*Adult in full winter coat* (25081, Keeler, California, November 30): Upperparts bright pinkish-cinnamon, palest on nose and head and most intense and glossy on lower back and rump, with very little or no darker admixture from the hair tips. Underfur dark neutral-gray; hairs with subapical band of buff, tipped with deep cinnamon. Ears very thinly haired, narrowly rimmed with brown; woolly tufts at bases creamy-white, comparatively inconspicuous. Nose, cheeks, lower sides, limbs, hands, feet, and underparts white, the underfur narrowly neutral-gray. Tail whitish, with narrow, indistinct stripe of grayish-brown along upper side for two-thirds its length. *Adult in late winter and spring* (28199, Hot Springs Valley, California, May 7): Paler, more pinkish-buff, the dark cinnamon hair tips worn or faded. *During the summer moult* (28127, Owens Lake, California, May 18) the adults are much darker, with very little bright cinnamon, and with considerable admixture of darker color from the gray underfur and the faded, now brownish, hair tips. *Juvenile* (28195, Olancho, California, June 30): Indistinguishable in color from the young of *pulcher*.

Skull.—The skull closely resembles that of *longicaudus*. The posterior end of the palate is always without projecting spine; the anterior palatine foramina average longer than in *longicaudus*, reaching quite to plane of fronts of first molars. (Plate 15.)

Measurements.—Type and average of six adults from the type region, the latter in parentheses: Total length, 143 (141) millimeters; tail vertebræ, 51 (51.4); hind foot, 20.5 (19.7); ear from notch in dry skin, 15.7 (14.8). Skull: Condylbasal length, 23.3 (23.0);

zygomatic breadth, 13.2 (12.8); interorbital breadth, 4.9 (4.8); breadth of braincase, 11.6 (11.7); length of nasals, 9.5 (9.3); length of mandible, 13.2 (13.3); maxillary tooth row, 3.7 (3.6). For detailed measurements of specimens, see page 482.

Type-specimen.—No. $\frac{25453}{2867}$, United States National Museum, Biological Survey collection. Adult male (teeth considerably worn) in full winter pelage. Collected December 30, 1890, by Vernon Bailey. Original number, 2314.

Remarks.—In the immediate vicinity of Owens Lake, the *Onychomys* of the *longicaudus* type develops its brightest coloration, with the minimum of admixture of any darker streaking from the hair tips. The animals from this region are so decidedly different in color from specimens of typical *longicaudus*, and occupy such a definite, though limited, range that the form represented requires recognition by name. It resembles *pulcher* in the purity of the color, but is decidedly richer and brighter colored. The intensity of the coloration in this region parallels that of several other species of rodents.

Specimens examined.—Total number, 21, from the following localities:

CALIFORNIA: Coso Mountains, 2 (Field Mus.); Hot Springs Valley, 2; Keeler, 8; Lone Pine, 3; Olancha, Owens Lake, 6.

ONYCHOMYS TORRIDUS TULARENSIS Merriam.

1904. *Onychomys torridus tularensis* MERRIAM, Proc. Biol. Soc. Washington, vol. 17, p. 123. June 9.

1905. *Onychomys longicaudus tularensis* ELLIOT, Field Col. Mus., zool. ser., vol. 6, p. 132.

Type-locality.—Bakersfield, Kern County, California.

Geographic distribution.—Upper San Joaquin Valley and neighboring foothills and valleys, California. North to Little Panoche Creek, San Benito County; south to Carriso Plain and Bakersfield.

General characters.—Color of upper parts grayish-drab; very different from adults of any other form found in the United States, and most resembling *O. t. canus* of Mexico. Posterior edge of palate not conspicuously concave, frequently convex, but never with distinct spine.

Color.—*Adult in full winter pelage* (151339, Little Panoche Creek, California, December 11): Upperparts light drab, slightly washed with a pinkish cast, and everywhere finely lined with the dark brown of the hair tips; upper face darker, ashy-gray. Between the color of the back and the white of the lower sides is a narrow, indefinite stripe of light pinkish-buff, clearest and most sharply marked posteriorly. The underfur is of a lighter gray than in the neighboring subspecies; the lanuginous tufts at ear bases are grayish-white and barely noticeable; arms, hands, lower sides of legs and of tail, lower

sides, and entire underparts white, the hairs of chin and throat white to bases; rest of underparts with narrow undercolor of gray. Tail sharply bicolor; grayish-brown above, whitish below, with whitish tip. *Adult in summer* (149793, Stanley, California, July 1): Upperparts grayish-cinnamon, with little luster and with considerable admixture of gray from the underfur; upper face dark ashy. *Juvenile* (129968, Santiago Springs, California, July 30): Lighter colored than young of *ramona*; darker, more ashy, than young of *longicaudus* or *pulcher*. Upperparts, including legs above to ankles, ecru-drab, finely streaked and darkened by the blackish hair tips; below whitish, the hairs barely darkened to a pale grayish-white at bases. *Post-juvenile pelage* (128409, Santiago Springs, California, August 14): General color above light drab, less ashy than in the juvenile, and without the pinkish cast of old adults; upper face not darker than back. This pelage is apparently worn until late in the second summer.

Skull.—Anterior palatine foramina about reaching plane of fronts of first molars. Posterior edge of palate never distinctly concave, but normally truncate, and frequently convex, but with no distinct spine projecting into interpterygoid space.

Measurements.—Averages and extremes of four adults: Total length, 144 (141–148) millimeters; tail vertebrae, 52.3 (51–54); hind foot, 20.8 (20.0–22.0); ear from notch in dry skin, 14.6 (14.0–15.1). Skull: Condylbasal length, 23.5 (23.2–24.0); zygomatic breadth, 12.9 (12.5–13.3); interorbital breadth, 4.7 (4.5–4.9); breadth of braincase, 11.6 (11.3–11.8); length of nasals, 9.2 (8.9–9.5); length of mandible, 13.4 (13.1–13.7); maxillary tooth row, 3.7 (3.5–3.8). For detailed measurements of specimens see page 482.

Type-specimen.—No. $\frac{29711}{41786}$, United States National Museum, Biological Survey collection. Skin and skull of female young adult (teeth slightly worn); moulting the post-juvenile pelage and renewing into first fall pelage of adult, probably second summer. Collected July 19, 1891, by Dr. A. K. Fisher. Orig. No. 792.

Remarks.—The adults of this form differ conspicuously in color from adults of all the neighboring subspecies of *torridus*. The San Joaquin grasshopper mouse is a decidedly grayish-drab colored race, becoming slightly more cinnamon or ochraceous in faded summer coat, before the moult. The differences in seasonal pelage are much less than in any other of the northern races, and are not so readily definable.

Specimens examined.—Total number, 20, from localities as follows:

CALIFORNIA: Alcalde, 1; Alila, 2; Bakersfield, 1 (type); Carriso Plains, 1; Coalinga, 1; Delano, 1; Famoso, 1; Huron, 2; Little Panoche Creek, 1; McKittrick, 1 (Univ. of Calif.); Santiago Springs, 2; Stanley, 2; Weldon, 4 (Univ. of Calif.).

ONYCHOMYS TORRIDUS RAMONA Rhoads.

1893. *Onychomys ramona* RHOADS, Amer. Nat., vol. 27, p. 833. September.

1904. *Onychomys torridus ramona* MERRIAM, Proc. Biol. Soc. Washington, vol. 17, p. 124. June 9.

Type-locality.—San Bernardino Valley, California.

Geographic distribution.—Extreme southwestern California and northwestern Lower California, Mexico. From San Fernando and San Bernardino south into Tecarte Valley.

General characters.—Size slightly greater than in *O. t. pulcher*; coloration very dark, the darkest of all the forms of the *torridus* group found in the United States; skull like that of *pulcher*.

Color.—*Adult in full winter pelage* (126063, Mouth of Tia Juana River, California, January 18): Nose, head, and broad area along upperparts to base of tail blackish-brown; sides of body and outer sides of hind limbs to ankles brighter, more reddish-brown, with less admixture from dark hair tips; ear tufts mixed brown and whitish, not especially conspicuous; underparts creamy-white, the hairs of chin and throat without grayish undercolor. Tail blackish-brown above, whitish at tip and below. *Adult in early summer* (127979, Reche Canyon, California, May 24): Lighter, more reddish, than in winter, without definite dark area on dorsum, the blackish-brown hair tips having faded and worn away. The most extreme example of this stage that I have seen is number 7376 of the Museum of Vertebrate Zoology, University of California, from Jacumba, March 19. It is the brightest specimen of *ramona* in all the collections, and most resembles specimens of true *torridus* in full winter pelage. *Juvenile pelage* (34090, San Diego, California, May 10): Darker than young of *pulcher*, more mouse-gray above. *Post-juvenile pelage* (31075, Reche Canyon, September 22; apparently in second year): Upperparts light drab, darker, more grayish, on head and lower back.

Skull.—The skull is apparently indistinguishable from that of *O. t. pulcher*. (Plate 15.)

Measurements.—Averages and extremes of 10 adult specimens: Total length, 141 (137–148) millimeters; tail vertebræ, 49.5 (36–56); hind foot, 20.3 (19.0–21.0); ear from notch in dry skin, 14.7 (14.2–15.4). Skull: Condylbasal length, 23.4 (22.6–23.8); zygomatic breadth, 13.2 (12.7–13.7); interorbital breadth, 4.8 (4.6–5.0); breadth of braincase, 11.8 (11.4–12.3); length of nasals, 9.7 (9.2–10.1); length of mandible, 13.6 (13.2–14.0); maxillary tooth row, 3.6 (3.4–3.7). For detailed measurements of specimens see page 482.

Type-specimen.—No. 7823, collection of Academy of Natural Sciences, Philadelphia. Skin and skull of female adult (teeth considerably worn), in early summer stage of pelage, with dark dorsal area nearly obsolete and general color considerably paled. Collected April 11, 1893, by R. B. Herron. Original number, 218 (Rhoads collection, No. 823).

Remarks.—This well-marked subspecies is the darkest of the races of *torridus* found in the United States. It intergrades directly with *pulcher* in the west end of San Gorgonio Pass. The specimens from Tia Juana River and Tecarte Valley show an approach in size to *O. t. macrotis* of Lower California peninsula.

Specimens examined.—Total number, 60, from localities as follows:

CALIFORNIA: Banner, 1 (Univ. of Calif.); Burbank, 1; Dulzura, 2 (Phila. Acad. Sci.); Ferndale, San Bernardino County, 2 (Mus. Comp. Zool.); Jacumba, 3; La Puerta Valley, 1 (Univ. of Calif.); mouth of Tia Juana River, 5; Pasadena, 1 (Univ. of Calif.); Reche Canyon, 4; Riverside, 9; San Bernardino Valley, 15 (including the type and paratypes, Phila. Acad. Sci.); San Diego, 1; San Fernando, 1; San Jacinto Lake, 1; Santee Mountains, 3; Tujunga Valley, 1 (Univ. of Calif.); Valle Vista, San Jacinto Valley, 4 (Univ. of Calif.); Warner Pass, 2 (Univ. of Calif.).

LOWER CALIFORNIA: Tecarte Valley, 3.

ONYCHOMYS TORRIDUS MACROTIS Elliot.

1903. *Onychomys macrotis* ELLIOT, Field Col. Mus., pub. 74, zool. ser., vol. 3, No. 10, p. 155. April.

Type-locality.—Head of San Antonio River, west slope of San Pedro Martir Mountains, Lower California, Mexico.

Geographic distribution.—From the San Pedro Martir and southern Hanson Laguna Mountains west to the Pacific coast, Lower California, Mexico.

General characters.—Like *Onychomys torridus ramona* but larger, with longer tail and hind foot, and especially larger ears.

Color.—Not distinguishable from that of *Onychomys torridus ramona*.

Skull.—The skull of *macrotis* is like that of *O. t. ramona*, but larger. (Plate 15.)

Measurements.—Type and an adult female from San Quintin, Lower California, the latter in parentheses: Total length, 155 (148) millimeters; tail vertebrae, 55 (54); hind foot, 21 (22); ear from notch in dry skin, 16.7 (16.8). Skull: Condylbasal length, 24.3 (24.7); zygomatic breadth, 13.3 (13.5); interorbital breadth, 4.9 (5.0); breadth of braincase, 11.7 (11.8); length of nasals, 10.3 (10.1); length of mandible, 14.1 (14.2); maxillary tooth row, 3.7 (3.7). Average external measurements of eight specimens from San Quintin, compared with averages of eight skins of *ramona*, the latter in parentheses: Tail vertebrae, 52.4 (47.0); hind foot, 21.1 (20.1); ear from notch in dry skin, 16.6 (14.5).

Type-specimen.—No. 10283, Field Museum of Natural History, Chicago. Skin and skull of female adult (teeth considerably worn). Collected March 11, 1902, by Edmund Heller.

Remarks.—The recorded measurements give little idea of the great size of the ear as compared with that of *ramona*. Except for increase

in general size and relative, as well as actual, increase in the size of the ear, *macrotis* is very like *ramona*, with which it most certainly intergrades.

Specimens examined.—Total number, 22, from localities as follows:

LOWER CALIFORNIA: El Alamo, 1 (Field Mus.); Head of San Antonio River, San Pedro Martir Mountains, 1 (Field Mus., the type); San Quintin, 18; Trinidad, 1 (Field Mus.); Trinidad Valley, 1.

ONYCHOMYS TORRIDUS YAKIENSIS Merriam.

1904. *Onychomys torridus yakiensis* MERRIAM, Proc. Biol. Soc. Washington, vol. 17, p. 124. June 9.

1904. *Onychomys yakiensis* MERRIAM, Proc. Biol. Soc. Washington, vol. 17, p. 124. June 9.

Type-locality.—Camoá, Rio Mayo, southern Sonora, Mexico.

Geographic distribution.—Southeastern Sonora and northern Sinaloa, Mexico. Known from the upper Rio Mayo on the north to the city of Sinaloa on the south.

General characters.—Like *O. t. torridus*, but larger and averaging darker in color, with larger ears and hind foot. Skull with posterior border of palate never concave, rarely truncate, usually with well-developed spine projecting into interpterygoid space.

Color.—*Adult in full early winter pelage* (96384, Alamos, Sonora, December 19): Like corresponding pelage of true *torridus*, but slightly darker and duller above, less rich pinkish-cinnamon; upper sides clear pinkish-cinnamon as in *torridus*; ears darker, thinly haired, with very narrow whitish rim, and no conspicuous white lanuginous tufts at bases as in *torridus*. Tail slightly grayish on terminal half below, brown above with whitish tip. *In late winter and spring* (96391, Camoá, Sonora, January 17) this pelage becomes darker, less bright, with large area of dull brown on upperparts and with the sides more grayish-pink, less cinnamon. *Adult in short new coat of late summer* (95855, Camoá, Sonora, October 28; type): Upperparts with broad strip of blackish-brown from between eyes to rump, blending into the dark pinkish-gray of sides and hips; cheeks and shoulders paler; no specially developed ear tufts. *Juvenile* (95853, Camoá, Sonora, October 28): Darker mouse-gray than young of *torridus*. This very dark stage soon changes into a lighter coat, apparently from fading of the hairs and without moult. In this stage (96383, Alamos, Sonora, December 19) the entire upperparts are a pale drab-gray, slightly darker on dorsum, against which the dark-gray ears are very conspicuous in color. *Post-juvenile pelage* (95856, Camoá, Sonora, October 28; apparently second autumn): Upperparts dark brownish-gray, washed with dark rusty; ears blackish, without lanuginous tufts at bases. This pelage moults and renews into the coat of the fully adult (96388, Alamos, Sonora, December 20), the hips and posterior sides first renewing the brownish pelage of full maturity; the white ear rim also becomes sharply marked.

Skull and teeth.—Skull larger than in *torridus*, with longer mandible. The posterior border of the palate is never concave as in *torridus*; it is rarely truncate, but usually with a very well-developed spine projecting into the interpterygoid space. The anterior palatine foramina are large, well bowed, and extend backward to line of the second cusps of first molars. The posterior palatine foramina are also especially large, open, and three times as long as wide. The teeth, as in all the middle Mexican forms, average larger than in the northern races. (Plate 15.)

Measurements.—Averages and extremes of seven adult specimens from Camoa and Alamos, Sonora: Total length, 149 (138–156) millimeters; tail vertebræ, 53.0 (47–57); hind foot, 22.4 (21.5–24.0); ear from notch in dry skin, 16.0 (15.2–17.8). Skull: Condylbasal length, 24.0 (22.4–25.4); zygomatic breadth, 13.2 (12.4–13.5); interorbital breadth, 4.5 (4.3–4.6); breadth of braincase, 11.8 (11.4–12.2); length of nasals, 9.9 (9.1–10.6); length of mandible, 14.3 (12.8–15.1); maxillary tooth row, 3.9 (3.8–4.0). For detailed measurements of specimens, see page 483.

Type-specimen.—No. 95855, United States Nat. Museum, Biological Survey collection. Skin and skull of female adult (teeth moderately worn), in short fall pelage. Collected October, 28, 1898, by E. A. Goldman. Original number, 13158.

Remarks.—Except for its large size and larger ears, *yakiensis* is externally much like true *torridus*. The skull differs greatly from typical *torridus* in the shape of the posterior border of the palate. In the presence of the palatal spine it shows approach toward the somewhat aberrant specimens of *torridus* from the western limits of the range of the latter, in the vicinities of Tucson and La Osa, Arizona, and at Magdalena, Sonora.

Specimens examined.—Total number, 19, from localities as follows: SONORA: Alamos, 7; Camoa, Rio Mayo, 11 (including the type). SINALOA: Sinaloa, 1.

ONYCHOMYS TORRIDUS CANUS Merriam.

1904. *Onychomys torridus canus* MERRIAM, Proc. Biol. Soc. Washington, vol. 17, p. 124. June 9.

Type-locality.—San Juan Capistrano, Zacatecas, Mexico.

Geographic distribution.—Zacatecas, Aguas Calientes, and southwestern San Luis Potosi, Mexico; south and east to Rio Verde, San Luis Potosi.

General characters.—Closely related to *O. t. yakiensis*, but differing greatly in color; less bright cinnamon or brownish, more pinkish-gray. Greatly resembles in color the San Joaquin Valley form, *O. t. tularensis*. Seasonal changes in pelage very slight.

Color.—Adult in full winter pelage (82102, Rio Verde, San Luis Potosi, January 13): Upperparts wood-brown, everywhere washed

with pale pinkish-cinnamon, giving a general color of "grayish-brown"; no distinct dorsal color area, the upper side uniform with back. Ears dark, thinly haired, the tufts at bases buffy and gray, inconspicuous; tail dark brown above, grayish-white below; feet very thinly haired with whitish. Underparts grayish-white, the underfur mixing with and darkening the general color from the white hair tips. *Adult in new short coat of late summer* (90840, Hda. San Juan Capistrano, Zacatecas, August 20): Darker, more blackish-brown on middle back and rump; the sides slightly paler pinkish-gray.

Skull.—As in *yakiensis*, but palate with less regularly well developed spine, sometimes concave as in true *torridus*. Posterior palatine foramina smaller.

Measurements.—Averages and extremes of six adults: Total length, 150 (146–153) millimeters; tail vertebræ, 52.8 (42–58); hind foot, 21.9 (21.0–23.0); ear from notch in dry skin, 16.0 (15.2–17.1). Skull: Condylbasal length, 24.0 (23.5–24.9); zygomatic breadth, 12.8 (12.4–13.2); interorbital breadth, 4.5 (4.4–4.8); breadth of braincase, 11.8 (11.6–12.0); length of nasals, 10.2 (9.8–10.7); length of mandible, 13.8 (13.5–14.1); maxillary tooth row, 3.7 (3.6–3.9). For detailed measurements of specimens, see page 483.

Type-specimen.—No. 90843, United States National Museum, Biological Survey collection. Skin and skull of female adult (teeth moderately worn). Collected August 23, 1897, by E. W. Nelson and E. A. Goldman. Original number, 11574.

Remarks.—In the comparative uniformity of color throughout the year, this subspecies differs greatly from the more northern forms of *Onychomys torridus*, in which the variations from age and season are so remarkable. The color resemblance of some adults to certain examples of *O. t. tularensis* is very striking. As shown by a small series of skins from northern Durango, which, though somewhat intermediate, have been placed with *O. t. torridus*, this form blends directly into the latter subspecies on the north. Typically, however, it most resembles *O. t. yakiensis*.

Specimens examined.—Total number, 14, from the following localities:

ZACATECAS: Hda. San Juan Capistrano, 5 (including the type).

AGUAS CALIENTES: Chicalote, 1.

SAN LUIS POTOSI: Jesus Maria, 2; Rio Verde, 6.

ONYCHOMYS TORRIDUS SURRUFUS new subspecies.

Type-locality.—Miquihuana, Tamaulipas, Mexico.

Geographic distribution.—East side of the Mexican table-land, in extreme southeastern Coahuila, southern Nuevo Leon, and southwestern Tamaulipas.

General characters.—Largest of the *torridus* group. Coloration in new coat more reddish than in *canus*, approaching that of *torridus*

proper. Skull as in *canus*, but slightly larger, with larger audital bullæ.

Color.—*Adult in left-over winter coat* (93829, Jaumave, Tamaulipas, June 3): Most like summer skins of *canus*, but with more pinkish suffusion over entire upperparts, and sides brighter pale pinkish-cinnamon. *Adults in process of moult* (93837, Miquihuana, Tamaulipas, June 8) are frequently very dark; the dark gray underfur is exposed in patches and the light hair tips are almost completely worn or faded away; rusty areas are irregular, from retarded moult or from renewal. *Adult in new coat* (93839, type Miquihuana, Tamaulipas, June 8; renewal not complete): Upperparts dark glossy pinkish-cinnamon, much resembling *O. t. torridus* in similar coat, but ear tufts color of head, not white, and tail above much darker brown.

Skull.—Like skull of *O. t. canus*, but averaging slightly larger, with larger audital bullæ. Anterior palatine foramina reaching plane of second cusp of first molars; posterior border of palate usually ending in large spine. (Plate 15.)

Measurements.—Type and averages of 11 adults from Jaumave and Miquihuana, Tamaulipas, the averages in parentheses: Total length, 163 (155) millimeters; tail vertebræ, 62 (59.4); hind foot, 22.5 (22.1); ear from notch in dry skin, 16.8 (16.7). Skull: Condylbasal length, 25.0 (24.4); zygomatic breadth, 13.6 (13.1); interorbital breadth, 4.6 (4.8); breadth of braincase, 11.8 (10.8); length of nasals, 10.3 (10.1); length of mandible, 14.6 (14.0); maxillary tooth row, 3.8 (3.9). For detailed measurements of specimens, see page 483.

Type-specimen.—No. 93839, United States National Museum, Biological Survey collection. Skin and skull of female adult (teeth much worn), renewing into fresh pelage. Collected June 8, 1898, by E. W. Nelson and E. A. Goldman. Original number, 12484.

Remarks.—This is the largest subspecies of *Onychomys torridus*. It slightly exceeds *O. t. canus* in size, with relatively longer tail. In faded summer coat it greatly resembles *canus*, but is distinguishable by the longer tail and the slight cranial characters. As shown by a single specimen in a more advanced state of renewal than is usual in early summer skins, the fresh coat is much as in true *torridus*, a rich, dark pinkish-cinnamon. This form seems to be confined to the eastern side of the Mexican table-land, and doubtless intergrades directly into true *torridus*. Like all the more southern forms it is distinguishable from *torridus* by its larger size and much larger ears.

Specimens examined.—Total number, 17, from localities as follows:
COAHUILA: La Ventura, 1.

TAMAULIPAS: Jaumave, 5; Miquihuana, 11.

Measurements of fully adult specimens of the *Onychomys leucogaster* group.

Locality.	Number.	Sex.	Total length.	Tail vertebrae.	Hind foot.	Ear from notch.	Skull: length.	Zygomatic breadth.	Interorbital breadth.	Breadth of brain case.	Length of nasals.	Length of mandible.	Maxillary tooth row.	Condition of molar teeth.
<i>O. l. leucogaster.</i>														
North Dakota:			<i>mm.</i>											
Hankinson.....	180025	Female..	108	38	22.0	14.4	27.9	10.3	4.5	13.3	12.3	17.3	4.4	Much worn.
Do.....	180027	Male.....	165	42	22.0	13.3	28.0	17.3	4.7	13.4	11.5	16.8	4.6	Do.
Devils Lake.....	35462	..do.....	160	47	22.0	14.2	26.2	15.1	4.7	13.2	10.5	15.9	4.5	Moderately worn.
<i>O. l. missouriensis.</i>														
Alberta: Calgary.....	69043	Female..	145	36	21.0	12.6	25.8	14.9	4.5	12.9	11.0	15.9	3.9	Much worn.
Montana:														
Robare.....	67511	Male....	141	35	20.0	14.4	25.4	15.1	4.6	13.3	10.4	14.9	4.3	Moderately worn.
Mountain Sheep Buttes.....	161394	Female..	150	36	20.0	15.4	26.2	14.9	4.6	13.1	10.9	15.7	4.3	Much worn.
Johnson Lake.....	169081	..do....	146	29	21.0	13.3	26.6	15.5	4.9	13.3	11.0	15.9	4.4	Do.
Bozeman.....	161395	..do....	146	29	21.0	14.7	26.2	15.7	4.8	13.3	11.0	15.7	4.6	Do.
Fort Custer.....	75735	..do....	151	40	21.0	14.2	26.3	15.1	4.6	13.0	11.0	15.4	4.6	Moderately worn.
Wyoming: Little Powder River.....	65868	..do....	160	43	20.0	14.5	25.7	14.9	4.8	13.5	11.0	15.5	4.6	Much worn.
North Dakota:														
Buford.....	168549	Male....	149	44	21.0	13.7	26.0	16.0	4.7	13.6	11.0	15.4	4.2	Do.
Do.....	168551	..do....	141	41	21.5	12.7	25.9	15.4	4.8	.....	10.7	15.7	4.6	Do.
Do.....	168548	Female..	155	45	21.5	14.6	26.6	15.7	4.8	12.9	10.9	15.7	4.4	Moderately worn.
Do.....	186242	..do....	161	45	.....	15.8	26.3	.....	4.8	13.2	10.9	15.8	4.4	Do.
<i>O. l. arcticus.</i>														
South Dakota:														
Smithville.....	65066	..do....	154	41	21.0	13.9	25.7	14.4	4.5	12.7	11.2	15.4	4.8	Much worn.
Buffalo Gap.....	189255	Male....	146	37	19.0	12.7	25.5	14.8	4.5	12.7	11.2	.....	4.8	Do.
Nebraska:														
Niobrara River.....	140	..do....	140	39	19.0	13.2	27.0	14.9	4.5	13.1	11.3	15.9	4.8	Moderately worn.
Cherry County.....	140	..do....	140	41	20.0	12.8	25.5	15.4	4.6	13.2	10.8	15.4	4.3	Do.
Do.....	154	..do....	140	40	21.0	12.4	26.4	16.2	4.5	13.4	11.5	15.8	4.7	Much worn.
Do.....	134	..do....	134	34	20.5	13.2	25.8	15.7	4.4	12.8	11.2	15.5	4.5	Do.
Do.....	144	..do....	144	39	20.0	12.7	26.6	15.7	4.4	12.4	12.1	15.6	4.4	Do.
Do.....	161	Female..	161	47	21.0	13.7	25.9	.....	4.4	.....	10.4	15.2	4.3	Do.
Do.....	139	..do....	139	39	20.0	12.7	26.0	15.4	4.5	13.1	11.3	15.8	4.4	Do.
Do.....	166	..do....	166	47	22.0	13.3	27.1	16.3	4.5	13.2	11.6	16.0	4.7	Do.
Do.....	116312	..do....	160	38	22.5	13.9	26.4	15.5	4.2	12.8	11.0	15.7	4.7	Do.
Kennedy.....	189260	Male....	151	36	22.0	12.8	25.7	15.9	4.5	13.4	10.4	15.2	4.5	Do.
Valentine.....														

Do.	1553	162	41	21.5	12.8	26.8	15.7	4.3	12.7	11.6	15.9	4.7	Do.
Do.	180258	150	39	20.0	14.4	26.1	15.4	4.6	13.2	11.5	16.2	4.7	Do.
Thomas County.	131	37	18.5	12.7	23.7	15.4	4.7	4.5	13.0	10.9	15.3	4.6	Moderately worn.
Do.	136	38	19.5	12.7	23.9	15.4	4.7	4.3	13.1	12.2	15.4	4.9	Much worn.
Birdwood Creek.	138	39	19.0	15.0	25.9	15.4	4.5	4.5	13.1	10.9	14.6	4.5	Do.
Myrtle.	139	39	19.0	15.0	25.9	15.4	4.5	4.5	13.1	10.9	14.6	4.5	Do.
Kansas	144	37	20.0	12.3	26.0	14.8	4.6	4.6	12.6	10.9	14.8	4.6	Moderately worn.
Trego County.	189287	.....	.....	.....	13.6	26.9	15.1	4.6	13.5	11.7	15.7	4.5	Do.
Pendennis.	87663	.....	.....	.....	13.4	26.7	14.8	4.5	12.8	11.0	15.4	4.8	Much worn.
Do.	87665	.....	.....	.....	14.8	27.7	16.6	4.6	13.4	11.8	16.8	4.4	Do.
Do.	87666	.....	.....	.....	13.8	27.1	16.2	4.8	13.7	11.9	16.3	4.4	Do.
Do.	87664	.....	.....	.....	12.5	26.8	15.5	4.5	12.7	11.3	16.2	4.5	Do.
Wyoming:													
Saratoga.	171476	141	35	20.0	14.4	24.8	14.8	4.8	13.0	10.3	15.0	4.4	Do.
Do.	176465	146	40	20.0	15.4	24.8	14.9	4.5	13.2	10.9	15.0	4.3	Do.
Mountainview.	179116	139	37	20.0	15.6	25.3	15.3	4.8	12.9	10.8	15.1	4.4	Do.
Kemmerer.	140	39	19.0	15.0	25.9	15.6	4.7	4.5	13.5	10.5	15.5	4.2	Moderately worn.
Kinney Ranch.	88298	138	33	20.0	15.0	25.9	15.4	5.1	12.7	10.5	15.4	4.2	Much worn.
Fort Bridger.	44899	146	40	20.0	15.0	24.6	14.8	4.5	12.8	10.3	14.2	4.4	Do.
Do.	44897	144	38	20.0	15.4	24.9	15.2	4.7	13.2	10.2	15.4	4.2	Do.
Bridger Pass.	44892	144	38	20.0	15.4	24.9	15.2	4.7	13.2	10.2	15.4	4.2	Do.
Do.	44894	145	42	21.0	14.5	25.1	14.8	4.7	13.2	10.5	14.8	4.3	Moderately worn.
Colorado:													
Lay.	138244	146	38	21.0	14.8	25.8	14.7	5.1	12.7	10.8	15.4	4.2	Much worn.
Do.	138241	143	35	20.5	15.2	25.3	15.2	4.7	12.9	10.9	15.3	4.1	Do.
Canadian Creek.	138242	144	38	20.0	14.2	24.9	15.0	4.8	13.2	10.8	15.2	4.5	Do.
Do.	170	48	23.0	14.2	26.7	15.8	4.8	4.8	13.2	11.3	15.9	4.7	Do.
Sterling.	69361	165	49	23.0	14.4	27.0	15.7	4.8	13.6	10.6	16.0	4.7	Do.
Loveland.	69367	155	45	22.0	13.7	26.7	14.8	4.4	12.6	10.6	15.4	4.8	Do.
Greeley.	69368	133	41	21.5	13.6	25.8	15.4	4.4	12.7	10.1	15.6	4.4	Do.
Limon.	69856	170	53	22.0	13.0	27.3	16.1	4.9	12.7	10.6	14.9	4.5	Moderately worn.
Do.	33137	170	53	22.0	13.0	27.3	16.1	4.8	13.1	11.4	16.4	4.3	Do.
Salida.	159884	149	47	22.0	14.0	23.9	13.0	4.8	12.7	11.2	13.1	4.3	Do.
New Mexico:													
Santa Rosa.	127300	145	38	21.0	13.8	25.7	14.6	4.6	12.4	11.4	14.8	4.7	Do.
Do.	109227	170	56	21.0	16.0	26.2	13.7	4.4	12.8	11.7	15.6	4.4	Much worn.
Do.	197267	152	42	22.0	14.8	23.6	13.9	4.8	12.5	11.4	15.6	4.5	Moderately worn.
Roswell.	119247	161	51	22.0	14.9	26.1	14.5	4.6	13.0	11.6	13.1	4.3	Much worn.
Do.	119249	155	50	22.0	14.2	26.5	13.2	4.8	13.2	10.9	15.4	4.4	Do.
Texas:													
Texline.	128226	166	46	22.0	13.8	27.0	14.8	5.0	13.0	11.3	14.7	4.4	Do.
Lipscomb.	127846	158	42	22.0	13.0	27.5	15.8	4.7	12.9	11.5	16.2	4.7	Moderately worn.
Hereford.	109692	150	40	19.0	13.3	25.9	.....	4.6	12.9	11.8	15.2	4.4	Do.
O. l. brevicaudus.													
Idaho:													
Blackfoot.	130858	139	38	19.5	15.4	.....	14.6	5.0	13.0	10.1	14.6	4.0	Much worn.
Minidoka.	169572	138	36	19.0	15.7	24.5	.....	5.1	12.8	9.4	14.0	4.1	Do.
Do.	169575	136	33	17.0	15.5	24.9	14.2	4.7	12.7	10.0	14.4	3.9	Do.
Do.	169574	135	31	17.0	15.7	24.8	14.6	4.9	13.1	10.3	13.9	3.9	Do.
Utah: Nephi.	75689	155	42	20.0	15.7	26.0	.....	5.0	12.4	9.8	14.9	3.9	Do.

!Type.

Measurements of fully adult specimens of the *Onychomys leucogaster* group—Continued.

Locality.	Number.	Sex.	Total length.	Tail vertebrae.	Hind foot.	Ear from notch.	Skull: Condylobasal	Zygomatic breadth.	Interorbital breadth.	Breadth of brain case.	Length of nasals.	Length of mandible.	Maxillary tooth row.	Condition of molar teeth.
<i>O. l. breviceaudus</i> —Continued.														
Nevada:														
Carson Sink.....	156861	Male.....	mm. 148	45	21.0	15.7	24.8	14.7	4.8	12.6	10.3	14.5	mm. 4.1	Moderately worn.
Halleck.....	54594	do.....	136	38	19.0	15.4	24.1	14.5	5.0	12.6	9.8	13.9	4.2	Much worn.
Do.....	31333	Female.....	130	40	20.0	15.2	23.8	13.4	4.7	12.5	10.0	14.2	4.2	Moderately worn.
Elko.....	94666	do.....	149	39	19.0	16.2	25.1	13.7	4.7	12.3	9.5	14.4	4.1	Do.
Osobb Valley.....	93451	do.....	144	39	20.0	16.1	25.1	14.6	5.0	13.3	10.5	14.6	4.0	Much worn.
Do.....	93452	do.....	145	38	20.0	15.8	25.4	14.8	5.0	12.4	10.2	14.8	4.2	Do.
Austin.....	93454	Male.....	141	40	20.0	16.2	25.2	14.1	4.8	12.7	10.2	14.3	4.2	Moderately worn.
Do.....	93455	do.....	146	42	20.0	16.3	25.7	14.5	5.1	13.1	10.2	15.0	4.1	Much worn.
Reese River.....	24892	do.....	138	40	20.0	14.4	24.3	14.4	5.1	13.1	9.9	14.2	4.2	Moderately worn.
Montro Valley.....	31177	do.....	131	38	18.0	14.5	24.0	13.8	5.0	12.3	9.7	13.7	3.9	Much worn.
Silver Creek.....	32311	do.....	146	41	19.0	15.8	25.3	14.6	5.0	12.9	10.0	15.0	4.0	Moderately worn.
Gatconda.....	94667	Female.....	153	42	19.0	16.7	24.0	14.0	4.8	12.6	10.0	14.2	3.8	Much worn.
Mountain City.....	94662	Male.....	141	38	19.0	15.2	24.0	14.7	5.1	12.9	10.1	14.7	3.9	Do.
California, Mono Lake.....	109543	Female.....	138	43	20.0	15.9	24.5	14.0	4.9	12.7	10.2	13.8	4.2	Moderately worn.
<i>O. l. fuscogristis</i> .														
Washington:														
Coulee City.....	89716	Male.....	141	39	20.0	15.1	24.6	12.6	4.6	12.4	9.8	14.4	4.0	Moderately worn.
Baird.....	149059	do.....	143	35	18.5	15.0	25.2	14.5	4.8	12.9	10.3	14.5	4.1	Do.
Do.....	149060	Female.....	138	39	18.0	15.8	24.8	14.2	4.9	12.5	10.0	14.2	4.0	Do.
Pasco.....	34433	do.....	144	40	19.0	14.5	24.6	14.0	4.9	12.9	9.9	14.2	4.2	Much worn.
Oregon:														
Breck Creek.....	78640	Male.....	140	34	19.0	14.8	24.4	14.4	5.0	12.9	10.2	14.7	4.0	Do.
Plush.....	78875	Female.....	149	41	19.0	14.5	25.1	14.0	4.8	12.4	10.3	14.9	4.2	Moderately worn.
California, Madeline Plains.....	88959	do.....	147	40	21.0	15.3	25.2	15.0	4.6	12.9	10.1	14.9	4.4	Do.
<i>O. l. melanophrys</i> .														
Utah:														
Kanab.....	161200	Male.....	156	46	22.5	15.0	25.7	15.3	4.8	12.5	11.3	15.9	4.7	Much worn.
Do.....	161201	do.....	160	51	22.0	14.8	26.0	15.0	4.9	12.7	11.2	15.5	4.7	Moderately worn.
Do.....	186477	do.....	154	41	21.0	14.4	25.8	15.6	5.0	12.8	11.0	15.0	4.7	Do.
Do.....	189276	do.....	150	42	21.0	14.7	25.9	15.3	5.3	13.0	10.5	15.1	4.6	Do.
Hanksville.....	157965	Female.....	145	39	21.5	13.9	24.8	14.8	4.8	12.8	10.3	14.8	4.5	Much worn.

Bluff City.....	57201	Male	.....	14.9	26.2	14.8	4.9	12.3	11.1	14.8	4.8	Moderately worn.		
Do.....	57202	do.....	.....	15.3	26.1	14.1	5.2	12.8	11.0	15.2	4.6	Do.		
Colorado:														
Fruita.....	148222	do.....	40	22.0	14.1	15.2	5.2	13.1	16.4	15.3	4.4	Do.		
Do.....	148225	Female.....	149	22.0	14.2	14.8	5.2	12.4	11.0	15.2	4.5	Do.		
Coventry.....	151410	Male.....	153	22.0	15.4	16.1	5.3	13.1	11.4	15.9	4.6	Do.		
Conejos River.....	133711	Female.....	156	22.0	15.4	15.0	5.2	13.0	11.3	15.8	4.4	Much worn.		
Mesadno Ranch.....	150983	do.....	163	49	23.0	14.8	4.9	12.4	10.6	15.7	4.7	Moderately worn.		
Arizona:														
Moa Ave.....	118675	do.....	150	21.5	14.2	25.6	5.0	12.4	11.0	15.0	4.8	Do.		
Moki Pueblos.....	2 186479	Male.....	46	22.0	15.2	27.2	15.3	4.6	11.8	16.0	4.5	Do.		
Walnut.....	535683	do.....	46	22.0	16.1	25.9	15.0	4.9	11.3	15.1	4.5	Much worn.		
Do.....	535558	Female.....	160	47	22.0	15.1	14.7	14.7	11.7	14.6	4.5	Moderately worn.		
Do.....	535559	do.....	158	49	22.5	15.9	15.2	5.0	13.2	11.4	4.4	Do.		
Do.....	535560	do.....	160	46	23.0	14.8	24.6	4.6	13.1	11.3	15.6	4.4	Much worn.	
Do.....	535561	do.....	152	45	22.0	15.4	25.4	4.9	13.2	11.7	15.2	4.5	Do.	
Winslow.....	535553	Male.....	156	48	22.0	15.0	14.4	4.8	12.7	11.6	15.2	4.4	Moderately worn.	
Do.....	535555	do.....	167	50	24.0	16.3	27.0	16.1	5.2	13.7	16.0	4.5	Do.	
Do.....	161197	Female.....	171	54	21.0	16.3	24.8	14.7	4.9	13.5	11.6	16.4	4.3	Much worn.
Do.....	167415	do.....	168	51	21.5	25.9	15.0	4.8	12.8	11.7	15.4	4.3	Do.	
Holbrook.....	532113	do.....	165	50	24.0	15.9	27.4	15.2	5.0	12.9	12.1	15.7	4.5	Moderately worn.
New Mexico:														
Apache County.....	189274	do.....	160	53	24.0	15.8	25.9	14.5	4.6	12.4	11.4	14.3	4.4	Much worn.
Gallup.....	137497	Male.....	160	21.5	16.0	26.9	15.9	5.1	12.9	12.2	15.6	4.8	Moderately worn.	
Do.....	137499	do.....	165	44	22.5	16.3	26.5	13.8	5.0	12.7	11.5	15.8	4.7	Much worn.
Do.....	137574	do.....	169	47	22.5	16.8	26.8	13.8	5.1	13.1	11.7	13.6	4.8	Do.
Do.....	138443	do.....	159	46	21.0	15.3	26.0	14.8	4.8	12.7	11.5	14.8	4.6	Moderately worn.
Do.....	137576	Female.....	179	47	22.5	17.1	28.7	16.7	5.1	13.2	12.2	16.8	4.6	Much worn.
Wingate.....	137411	Male.....	168	44	23.5	16.5	27.5	16.1	5.1	12.8	11.8	13.9	4.6	Do.
Do.....	137425	do.....	167	53	22.0	16.1	26.8	16.2	5.3	12.7	10.9	15.5	4.6	Do.
Do.....	137402	Female.....	178	51	23.0	16.1	27.6	15.9	5.0	12.9	11.8	16.5	4.8	Do.
Do.....	137400	do.....	178	52	22.0	16.8	26.9	15.7	4.8	12.6	12.0	15.7	4.7	Do.
Do.....	137403	do.....	179	46	22.5	16.2	28.2	15.5	5.1	13.1	12.3	16.1	4.5	Do.
Do.....	137404	do.....	168	45	22.0	15.7	26.8	16.2	4.9	13.4	11.3	15.2	4.7	Do.
Do.....	137409	do.....	172	46	23.0	16.8	27.3	15.9	5.0	13.2	11.3	16.0	4.9	Do.
Do.....	137412	do.....	166	45	22.0	17.2	27.1	15.9	4.9	13.0	11.6	15.9	4.9	Moderately worn.
Do.....	137413	do.....	169	44	23.0	16.9	27.3	16.0	4.9	12.9	11.5	15.9	4.7	Much worn.
Do.....	137419	do.....	165	48	22.0	16.6	27.1	15.3	5.1	13.1	11.5	15.2	4.7	Moderately worn.
Do.....	137420	do.....	176	49	22.0	15.4	26.8	16.8	5.0	13.3	12.2	16.5	4.7	Do.
Do.....	137424	do.....	175	46	23.0	18.4	28.0	16.7	5.0	13.4	12.6	15.9	4.6	Do.
Do.....	137426	do.....	167	46	23.5	16.3	27.9	16.0	5.0	13.0	11.8	16.3	4.7	Do.
Santa Fe.....	127427	do.....	166	46	21.0	15.4	24.4	15.6	4.7	13.1	11.3	15.6	4.4	Much worn.
Albuquerque.....	134640	Male.....	166	51	23.5	16.3	27.6	15.9	5.1	13.4	11.8	16.5	4.5	Moderately worn.
Acorn.....	148909	do.....	150	43	24.0	15.4	24.9	16.1	5.1	13.9	10.9	16.0	4.4	Much worn.
Laguna.....	148908	do.....	160	44	21.0	15.8	27.0	15.4	5.1	13.2	11.3	15.8	4.7	Moderately worn.
Arizona:														
Black Tank.....	132887	Female.....	160	47	21.5	15.0	25.9	15.8	5.2	13.2	11.6	15.4	4.5	Much worn.
Do.....	142525	do.....	160	53	22.5	14.8	25.9	14.6	4.9	12.5	11.5	14.7	4.7	Moderately worn.

² Type of "pallascens."

¹ Type.

O. t. fuliginosus.

Measurements of fully adult specimens of the *Onychomys leucogaster* group—Continued.

Locality.	Number.	Sex.	Total length.	Tail vertebrae.	Hind foot.	Ear from notch.	Skull: Condylabasal	Zygomatic breadth.	Interorbital breadth.	Breadth of brain case.	Length of nasals.	Length of mandible.	Maxillary tooth row.	Condition of molar teeth.
<i>O. l. ruidosus.</i>														
New Mexico:			<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	
Las Vegas.....	64599	Female	163	46	22.0	16.2	26.2	14.0	4.4	12.2	11.7	15.4	4.4	Moderately worn.
Capitan.....	12787	do	159	51	22.0	15.9	25.7	15.6	4.7	13.2	11.1	15.8	4.3	Do.
Carrizozo.....	119149	do	150	47	21.0	16.0	25.9	15.1	4.8	12.7	11.3	14.8	4.3	Do.
Manzano Mountains.....	131084	Male	158	50	22.0	14.2	26.4	14.6	4.7	12.7	10.5	14.9	4.4	Do.
Do.....	151	do	151	53	21.0	14.4	24.9	14.0	4.7	12.2	10.8	14.3	4.4	Do.
Do.....	131688	Female	153	50	20.5	13.7	25.8	13.9	4.8	12.7	10.8	14.7	4.5	Do.
Bear Spring Mountains.....	131686	do	160	42	23.0	15.8	25.9	14.7	4.8	13.2	11.3	15.7	4.5	Do.
Do.....	138809	do	167	46	24.0	16.9	27.2	16.2	5.2	13.3	11.4	15.8	4.6	Do.
San Augustine Plain.....	167133	Male	164	47	24.0	14.8	27.5	15.8	5.0	13.0	11.4	16.2	4.6	Do.
Deming.....	155	do	155	50	22.5	15.4	25.5	15.4	4.7	12.8	11.2	14.4	4.4	Do.
Do.....	157846	Female	167	52	23.0	15.7	26.8	15.4	5.0	12.8	11.8	16.1	4.6	Do.
Do.....	14808	do	152	48	21.0	15.4	25.5	14.6	4.8	12.5	11.1	15.4	4.4	Do.
Do.....	14809	do	163	51	22.0	15.7	26.3	14.6	4.8	12.7	10.3	14.8	4.4	Do.
Do.....	25496	do	163	51	22.0	15.7	26.3	14.6	4.8	12.7	10.3	14.8	4.4	Do.
Monument 15.....	161	Male	161	55	23.0	16.7	26.3	15.0	4.6	12.9	11.2	15.2	4.4	Much worn.
Do.....	31223	do	150	47	21.0	15.8	26.2	14.6	4.7	12.7	11.5	14.8	4.6	Do.
Do.....	31224	do	157	50	22.0	15.8	25.6	14.6	4.7	12.7	11.2	14.8	4.4	Do.
Do.....	31225	do	157	50	22.0	15.8	25.6	14.6	4.7	12.7	11.2	14.8	4.4	Do.
Arizona:														
Camp Verde.....	34558	Male	167	52	22.0	14.5	27.1	15.3	5.0	12.9	11.4	15.9	4.3	Moderately worn.
Do.....	34559	do	153	45	22.0	16.1	26.3	14.5	5.0	12.8	11.4	15.4	4.5	Much worn.
San Pedro River.....	31211	Female	163	48	22.0	16.2	26.0	14.6	4.9	12.6	11.1	15.2	4.5	Moderately worn.
Do.....	31212	do	161	48	22.0	15.5	26.4	14.8	4.8	12.6	11.6	15.2	4.4	Much worn.
Do.....	31213	do	157	47	21.0	15.8	25.6	14.6	4.7	12.7	11.5	14.8	4.6	Do.
Do.....	31216	do	157	50	22.0	15.8	25.6	14.6	4.7	12.7	11.2	14.8	4.4	Do.
Arizona:														
Camp Verde.....	34558	Male	167	52	22.0	14.5	27.1	15.3	5.0	12.9	11.4	15.9	4.3	Moderately worn.
Do.....	34559	do	153	45	22.0	16.1	26.3	14.5	5.0	12.8	11.4	15.4	4.5	Much worn.
San Pedro River.....	31211	Female	163	48	22.0	16.2	26.0	14.6	4.9	12.6	11.1	15.2	4.5	Moderately worn.
Do.....	31212	do	161	48	22.0	15.5	26.4	14.8	4.8	12.6	11.6	15.2	4.4	Much worn.
Do.....	31213	do	157	47	21.0	15.8	25.6	14.6	4.7	12.7	11.5	14.8	4.6	Do.
Do.....	31216	do	157	50	22.0	15.8	25.6	14.6	4.7	12.7	11.2	14.8	4.4	Do.
Arizona:														
Grand Canyon.....	202612	Male	142	43	21.0	14.6	25.1	14.0	4.7	13.0	10.9	14.5	4.3	Moderately worn.
Do.....	202615	do	146	42	22.0	14.6	25.5	14.0	4.8	12.5	10.7	14.6	4.3	Do.
Do.....	202618	do	140	43	22.0	14.5	24.8	13.8	4.8	13.0	10.5	14.2	4.3	Do.
Do.....	202613	Female	153	46	21.5	14.8	25.3	13.9	4.6	12.8	10.4	14.7	4.2	Much worn.
Do.....	202620	do	144	46	22.0	15.4	25.3	14.1	4.6	12.9	10.9	14.2	4.2	Moderately worn.
Do.....	202620	do	155	48	21.5	15.3	25.2	13.7	4.6	12.9	11.3	14.9	4.3	Much worn.
Do.....	202622	do	143	44	22.0	15.3	24.2	13.7	4.6	12.9	11.0	14.9	4.3	Moderately worn.
Do.....	202624	do	148	43	22.0	14.8	24.3	14.0	4.9	12.8	10.7	14.6	4.2	Do.
Aubrey Valley.....	202626	Male	149	43	22.5	14.4	25.2	14.2	4.8	12.8	11.3	14.6	4.3	Do.
Do.....	202629	Female	149	43	22.5	14.4	25.2	14.2	4.8	12.8	11.3	14.6	4.3	Do.
Do.....	202630	do	152	45	22.0	14.7	25.7	14.1	4.8	12.4	11.4	14.9	4.4	Do.

	150040	Female	160	60	15.6	26.0	14.2	4.8	12.9	11.6	15.0	4.3	Moderately worn.
Chihuahua: Samalayuca.....													
Texas:													
Cimcho County.....		Female	190	48	15.0	27.0	15.2	4.6	12.5	11.8	16.2	4.2	Moderately worn.
Comstock.....	186478	Male	152	52	15.9	25.9	14.3	4.6	11.9	10.9	15.1	4.1	Do.
Do.....	3334	Female	157	50	22.0	15.9	26.2	4.6	12.2	11.9	15.3	4.3	Much worn.
Do.....	3335	do	165	55	23.0	15.9	26.5	4.8	13.2	11.6	15.7	4.5	Do.
Eagle Pass.....	3337	Male	164	55	23.0	16.8	27.5	4.5	12.9	11.8	15.9	4.4	Moderately worn.
Do.....	3338	do	155	56	23.0	16.8	26.8	4.6	12.3	11.7	15.7	4.5	Do.
Fort Clark.....	3339	do	167	55	23.0	16.3	27.1	4.7	13.1	11.2	15.8	4.3	Much worn.
Laredo.....	3340	do	165	60	22.0	15.5	26.5	4.9	13.0	11.8	16.2	4.6	Moderately worn.
Do.....	3341	Female	169	55	23.0	16.5	28.9	4.8	12.4	12.7	16.1	4.8	Much worn.
Lomita Ranch.....	3342	do	180	55	23.0	15.7	26.9	4.6	12.8	11.3	16.1	4.4	Do.
San Angelo.....	3343	Male	180	55	23.0	16.2	28.2	4.9	13.3	12.5	17.1	4.6	Moderately worn.
Tamaulipas: Reynosa.....	108357	Female	182	61	23.0	16.2	28.2	4.9	13.3	12.5	17.1	4.6	Do.
Do.....	58679	do	.....	.....	16.9	27.2	15.5	5.2	13.2	12.2	16.0	4.6	Do.
Kansas: Kinsley.....	134525	Male	152	43	23.0	12.8	28.2	4.6	13.1	11.8	16.1	4.6	Moderately worn.
Oklahoma:													
Alva.....	96057	do	.....	.....	12.6	.....	15.2	4.8	.....	11.5	14.8	4.7	Moderately worn.
Do.....	8522	do	.....	.....	12.2	27.5	15.4	5.0	13.1	11.8	16.2	4.5	Much worn.
Do.....	8523	do	.....	.....	12.7	26.0	15.2	4.8	13.0	11.2	15.7	4.6	Moderately worn.
Do.....	8521	Female	151	38	23.0	13.1	26.4	4.7	12.9	11.6	15.5	4.6	Do.
Do.....	6720	do	155	44	22.0	12.8	26.0	4.6	12.5	11.5	15.7	4.7	Do.
Fort Reno.....	13314	do	164	42	21.0	13.2	27.4	4.3	12.5	11.5	15.9	4.7	Do.

¹Type.

²Type; collector's field measurements probably too large, especially the measurement of hind foot.

³Museum Comparative Zoology at Harvard.

⁴Field Museum, Chicago.

Measurements of fully adult specimens of the *Onychomys torridus* group.

Locality.	Number.	Sex.	Total length.	Tail vertebrae.	Hind foot.	Ear from notch.	Skull: Condylbasal length.	Zygomatic breadth.	Interorbital breadth.	Breadth of brain case.	Length of nasals.	Length of mandible.	Maxillary tooth row.	Condition of molar teeth.
<i>O. t. torridus.</i>														
Arizona:														
Dos Calceos.....	11415	Male.....	146	50	21.5	14.5	23.7	12.7	4.5	11.8	10.3	13.5	3.8	Much worn.
Do.....	11416	Female.....	151	54	21.0	14.5	23.6	12.9	4.7	11.8	10.3	13.7	3.7	Moderately worn.
San Pedro River.....	11417	Do.....	151	57	21.0	14.4	23.7	13.3	4.6	11.6	10.2	14.1	3.7	Much worn.
Santa Cruz River.....	11418	Do.....	146	55	21.0	14.0	23.8	13.3	4.5	11.6	9.3	13.8	3.8	Do.
Calabasas.....	11770	Do.....	153	56	20.0	15.8	24.0	13.7	4.5	11.7	10.3	13.9	3.9	Moderately worn.
New Mexico:														
Tulosa.....	119158	Do.....	150	52	21.0	14.6	23.6	12.7	4.5	11.9	9.8	13.7	3.7	Much worn.
Do.....	119159	Do.....	148	54	22.0	13.5	23.9	12.9	4.8	11.6	9.9	13.7	3.8	Moderately worn.
Carrizalillo Springs.....	119757	Do.....	147	57	22.0	13.2	23.2	12.6	4.8	11.3	10.3	13.3	3.6	Much worn.
Corner monument.....	119758	Male.....	139	49	21.0	12.5	22.6	12.4	4.5	11.6	9.3	13.2	3.5	Do.
Do.....	119759	Do.....	134	47	20.0	13.0	22.4	12.7	4.6	11.6	9.2	13.3	3.6	Do.
Do.....	119760	Do.....	139	47	21.0	13.0	22.4	12.7	4.6	11.2	9.3	13.1	3.9	Do.
Do.....	119761	Do.....	139	50	21.0	12.0	22.5	13.0	4.5	11.2	9.4	13.1	3.9	Moderately worn.
Do.....	119762	Female.....	139	50	21.0	13.2	22.9	13.1	4.5	11.9	9.8	13.7	3.7	Much worn.
Do.....	119763	Do.....	137	57	22.0	13.7	23.1	12.7	4.5	11.9	9.8	13.3	3.8	Moderately worn.
Do.....	119764	Do.....	132	55	20.5	14.3	23.3	12.7	4.3	11.6	9.8	13.6	3.8	Much worn.
Do.....	119765	Do.....	138	56	22.0	14.5	22.4	12.0	4.4	11.6	9.1	13.2	3.5	Do.
Do.....	158257	Do.....	151	54	21.5	15.2	23.4	12.0	4.4	11.4	9.6	12.8	3.5	Do.
Pleasanton.....	160715	Male.....	158	60	21.5	14.8	24.4	13.4	4.8	11.9	9.5	14.0	3.9	Do.
Socorro.....	160713	Female.....	151	51	21.0	15.2	23.5	12.0	4.5	11.6	9.7	13.4	3.8	Do.
Do.....	148310	Male.....	143	51	22.0	14.8	23.3	12.6	4.5	11.7	10.0	13.4	3.9	Do.
Glenwood.....	148310	Male.....	143	51	22.0	14.8	23.3	12.6	4.5	11.6	10.4	13.9	3.8	Moderately worn.
Sonora: Magdalena.....	147771	Female.....	150	55	21.0	13.7	24.0	13.2	4.3	11.6	10.4	13.9	3.8	Moderately worn.
Chihuahua:														
Gallego.....	57625	Do.....	148	50	21.0	14.9	22.8	12.2	4.5	11.0	8.9	13.0	3.5	Do.
Casas Grandes.....	97419	Male.....	149	55	22.0	12.4	22.6	12.8	4.5	11.7	9.2	13.2	3.6	Do.
Do.....	97423	Do.....	149	53	21.5	12.7	22.9	12.5	4.5	11.0	9.2	13.3	3.7	Much worn.
Do.....	97421	Female.....	138	51	21.5	13.0	22.3	12.3	4.5	11.0	9.4	12.6	3.6	Moderately worn.
Durango: Inde.....	95279	Male.....	145	52	21.0	15.2	23.3	.....	4.2	11.4	9.5	13.5	3.9	Much worn.
Texas:														
Fort Lancaster.....	108361	Female.....	163	57	20.0	15.2	23.9	12.9	4.6	11.6	10.3	13.7	4.2	Do.
Do.....	108363	Do.....	136	48	20.0	14.8	23.1	12.3	4.6	11.8	10.1	13.3	3.8	Moderately worn.
Marathon.....	108575	Do.....	160	57	21.0	14.8	23.4	12.5	4.4	11.9	10.2	13.7	4.0	Much worn.
Marfa.....	147772	Male.....	140	53	20.0	13.6	22.7	12.0	4.5	11.6	9.7	12.8	3.7	Moderately worn.
Do.....	147773	Do.....	137	54	21.0	14.4	22.6	12.6	4.7	12.0	9.9	13.1	3.9	Do.
Do.....	147774	Do.....	140	51	20.5	15.3	22.2	12.4	4.1	11.1	9.8	12.8	3.6	Do.

Sierra Blanca	156	60	21.5	15.2	23.4	12.3	4.5	11.1	10.3	13.2	3.7	Do.	
Do.	141	55	21.0	14.0	23.4	12.8	4.5	11.5	10.4	13.5	4.0	Do.	
Do.	143	51	20.5	14.4	22.8	12.3	4.6	11.3	9.5	12.8	3.7	Do.	
Do.	142	54	20.0	13.9	22.8	12.3	4.5	11.7	10.0	13.6	3.4	Do.	
Do.	149	57	20.5	13.3	22.9	12.6	4.6	11.7	9.7	13.3	3.8	Do.	
Do.	157	55	20.0	12.8	23.9	12.3	4.5	11.1	10.4	13.0	3.7	Much worn.	
Do.	154	57	21.5	13.9	23.7	12.6	4.5	11.4	10.0	13.6	3.7	Moderately worn.	
Do.	146	53	21.0	14.5	24.0	11.6	4.7	11.5	10.1	13.9	4.0	Much worn.	
Do.	137	53	21.0	14.0	23.5	13.1	4.5	11.8	9.8	14.0	3.8	Do.	
<i>O. t. perpallidus.</i>													
Arizona:													
Yuma County	157	57	22.0	15.8	23.7	13.1	4.4	11.5	9.4	13.9	3.8	Moderately worn.	
Do.	18258		15.9	23.8	12.7	4.5	11.3	9.5	13.5	3.5	4.0	Do.	
Phoenix	161	58	21.0	16.3	23.3	13.2	4.7	11.5	10.5	14.2	3.7	Much worn.	
Beales Spring	146	57	20.0	14.9	23.5	13.0	4.7	11.3	10.2	13.6	3.7	Do.	
<i>O. t. putcher.</i>													
California:													
Victorville	136	49	19.0	14.3	22.0	12.6	4.7	11.5	8.8	12.6	3.6	Much worn.	
Do.	120	44	18.0	12.7	22.2	12.6	4.6	11.4	8.9	12.8	3.6	Moderately worn.	
Morongo Pass	15252		18.0	14.5	22.4	12.6	4.7	11.5	9.3	12.7	3.5	Do.	
Do.	15251		20.0	15.4	23.5	13.2	5.1	11.8	9.5	13.7	3.6	Much worn.	
Needles	13706	144	20.0	15.5	22.6	12.7	4.8	11.7	9.0	13.3	3.6	Moderately worn.	
Do.	13705	137	20.0	15.1	23.4	13.1	4.8	11.9	8.3	13.4	3.9	Much worn.	
Whitewater	54070	134	47	20.0	14.5	23.3	12.9	4.8	11.4	8.6	3.4	Moderately worn.	
Do.	54064	142	46	20.0	14.5	23.3	12.7	4.4	9.2	13.3	3.4	Much worn.	
Cabazon	54065	139	49	20.0	14.6	23.3	12.7	4.4	11.7	9.2	3.3	Much worn.	
Do.	54066	145	50	19.0	14.2	23.2	12.7	4.8	9.7	13.4	3.0	Moderately worn.	
<i>O. t. longicaudus.</i>													
Utah:													
St. George	186476	55	20.0	14.1	23.2	12.8	4.8	11.8	9.9	13.6	3.8	Moderately worn.	
Do.	189281	46	20.0	14.2	23.3	12.9	4.9	11.5	9.4	13.6	3.7	Do.	
Do.	189280	40	19.0	14.1	22.5	12.7	4.8	11.6	9.7	13.3	3.8	Do.	
<i>Nevada:</i>													
Pahruc Spring	23183	36	20.0	14.5	22.6	12.8	5.0	11.7	8.9	12.8	3.6	Much worn.	
St. Thomas	189285	144	20.0	14.5	22.9	12.7	4.6	11.7	9.3	12.5	3.7	Moderately worn.	
Do.	23189	53	20.0	13.7	22.9	13.3	5.0	11.7	9.5	13.3	3.5	Much worn.	
Colorado River	23184	146	55	20.0	14.8	23.4	12.8	4.9	11.4	9.4	3.2	Moderately worn.	
Charleston Mountains	23188	149	54	21.0	13.3	23.8	13.3	5.0	12.2	9.7	14.2	3.7	Much worn.
Do.	23187	139	47	19.5	13.2	22.7	12.7	4.9	11.9	9.2	3.5	Moderately worn.	
Pahruc Valley	23182	138	51	20.0	13.8	22.4	12.8	5.0	11.6	9.0	3.6	Do.	
Do.	23181	145	49	20.0	15.6	23.5	13.1	5.0	11.4	9.0	3.7	Much worn.	
Do.	23184	131	49	19.5	14.4	21.9	12.7	4.9	11.1	8.9	3.5	Moderately worn.	
Do.	23183	145	54	20.0	14.5	22.8	12.7	4.8	11.5	9.0	3.6	Do.	
Do.	23182	138	45	20.0	15.4	22.5	12.7	4.9	11.2	8.8	3.0	Much worn.	
Do.	23185	138	52	21.0	14.2	23.4	12.7	4.9	11.6	9.1	3.3	Do.	
Oasis Valley	158260	140	48	20.0	14.3	23.4	13.3	4.9	11.8	9.8	3.7	Do.	
Carson Sink	158261	130	40	19.5	14.8	21.8	12.7	4.5	11.3	8.8	3.5	Moderately worn.	

* Type.

1 Type of *Onychomys torridus arenicola* Mearns.

Measurements of fully adult specimens of the *Onychomys torridus* group—Continued.

Locality.	Number.	Sex.	Total length.	Tail vertebrae.	Hind foot.	Ear from notch.	Skull: Condylabasal	Zygomatic breadth.	Interorbital breadth.	Breadth of braincase.	Length of nasals.	Length of mandible.	Maxillary tooth row.	Condition of molar teeth.
<i>O. t. longicaudus</i> —Continued.														
California:			<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	
Amarcosa.....	33111	Female	155	58	20.0	14.2	23.3	13.2	4.8	11.5	9.6	13.9	3.8	Much worn.
Resting Springs.....	33112	Male	133	57	19.0	14.2	23.2	12.5	4.9	11.4	9.4	13.2	3.7	Moderately worn.
Do.....	33113	do.	139	53	19.5	14.7	22.8	13.0	4.9	11.5	9.3	13.3	3.7	Do.
Panamint Mountains.....	33114	do.	141	53	20.0	13.7	22.8	12.9	4.9	11.4	9.4	12.8	3.5	Much worn.
Do.....	33115	Female	147	51	19.0	13.8	22.8	13.2	4.9	11.6	8.9	13.0	3.5	Do.
Maturango Springs.....	33116	Male	135	49	20.0	13.3	22.3	12.8	4.8	11.5	8.6	13.2	3.6	Moderately worn.
<i>O. t. clarus</i> .														
California:														
Lone Pine.....	33117	Female	144	53	20.0	14.4	22.2	13.3	4.8	12.1	9.4	13.3	3.6	Much worn.
Do.....	33118	Male	144	53	20.0	14.2	23.2	12.8	4.9	11.7	9.4	13.0	3.7	Moderately worn.
Keeler.....	33119	do.	143	51	20.5	15.7	23.3	13.2	4.9	11.6	9.5	13.2	3.7	Much worn.
Olancha.....	33120	Female	140	53	20.0	14.8	23.2	12.8	4.7	11.9	9.6	13.3	3.7	Do.
Hot Springs Valley.....	33121	Male	133	49	18.0	14.3	22.1	12.2	4.8	11.5	8.7	12.9	3.5	Do.
Do.....	33122	Female	146	51	20.0	15.5	23.3	12.2	4.8	11.6	8.9	13.4	3.4	Do.
<i>O. t. tularensis</i> .														
California:														
Bakersfield.....	33123	Female	148	52	20.0	15.1	23.2	12.7	4.8	11.5	9.0	13.7	3.5	Moderately worn.
Alcalde.....	33124	do.	141	54	22.0	14.6	23.3	12.5	4.6	11.3	8.9	13.1	3.7	Do.
Huron.....	33125	do.	142	51	20.5	14.0	24.0	13.3	4.9	11.7	9.5	13.6	3.8	Do.
Little Panoche Creek.....	151339	Female	142	51	20.5	14.0	23.3	12.9	4.5	11.8	9.3	13.2	3.6	Do.
<i>O. t. ramona</i> .														
California:														
San Fernando.....	33126	Female	140	36	19.0	14.4	22.6	12.8	4.6	11.5	9.5	13.3	3.4	Much worn.
Reche Canyon.....	127978	Male	143	50	21.0	14.2	23.3	12.7	4.9	12.3	9.4	13.4	3.6	Do.
Do.....	127979	Female	148	56	20.0	14.6	23.6	13.7	4.8	11.7	9.8	14.0	3.6	Do.
Riverside.....	94007	do.	137	40	20.0	14.3	23.8	13.3	4.9	11.4	9.5	13.9	3.4	Do.
Jacumba.....	126069	do.	140	54	20.0	14.5	23.3	13.0	5.0	12.1	9.2	13.2	3.6	Do.
Tia Juana River.....	126061	Male	137	49	21.0	15.1	23.5	13.1	4.7	11.6	9.7	13.8	3.5	Do.
Do.....	126062	do.	138	50	20.0	14.8	23.4	13.2	4.6	11.6	9.7	13.7	3.5	Do.
Do.....	126065	Female	140	52	21.0	15.4	23.5	13.2	4.9	11.7	9.7	13.2	3.6	Moderately worn.

Lower California: Tecarte Valley.....	141 145	Male..... Female..	55 54	20.0 21.0	14.2 15.4	23.8 23.4	13.2 13.4	4.8 4.8	11.9 11.8	10.1 10.1	13.8 13.5	3.7 3.7	Much worn. Do.
<i>O. t. macrotis.</i>													
Lower California: San Antonio River.....	2 10283 138946	Female..... do.....	55 54	21.0 22.0	16.7 16.8	24.3 24.7	13.3 13.5	4.9 5.0	11.7 11.8	10.3 10.1	14.1 14.2	3.7 3.7	Much worn. Do.
<i>O. t. yakitensis.</i>													
Sonora: Camoa.....	96587	Male.....	56	24.0	15.8	24.2	13.4	4.5	11.7	10.1	14.2	4.0	Moderately worn.
Do.....	1 96585	Female..	53	22.0	17.8	25.4	13.5	4.6	12.0	10.6	13.1	3.9	Do.
Do.....	96580	do.....	144	22.5	15.5	23.7	13.4	4.4	12.2	10.0	13.8	3.8	Do.
Do.....	96390	do.....	138	22.5	15.6	22.4	12.4	4.3	11.4	9.1	12.8	3.9	Do.
Do.....	96391	do.....	152	21.5	15.2	23.9	13.3	4.4	12.1	9.8	14.1	3.8	Do.
Alamos.....	96386	Male.....	149	22.5	16.3	23.9	13.2	4.3	11.9	10.1	13.9	4.0	Do.
Do.....	96384	Female..	55	21.5	15.8	24.2	13.2	4.5	11.6	9.9	14.4	3.8	Do.
<i>O. t. canus.</i>													
Zacatecas: San Juan Capistrano.....	90840	Female..	51	22.0	15.3	23.7	12.7	4.4	11.7	9.8	13.8	3.7	Much worn.
Do.....	90841	do.....	151	21.0	16.3	23.5	12.6	4.7	11.6	10.3	13.7	3.8	Moderately worn.
Do.....	90842	do.....	148	20.0	15.7	23.6	12.4	4.4	11.7	10.1	13.5	3.6	Much worn.
Do.....	1 90843	do.....	152	22.0	15.2	23.8	13.1	4.6	11.7	10.1	13.9	3.9	Moderately worn.
San Luis Potosi: Jesus Maria.....	50705	Male.....	42	21.0	17.1	24.9	13.2	4.8	11.8	10.3	13.9	3.8	Much worn.
Rio Verde.....	82102	Female..	58	22.5	16.4	24.4	12.7	4.4	12.0	10.7	14.1	3.6	Moderately worn.
<i>O. t. surrufus.</i>													
Tamaulipas: Jauimave.....	93828	Male.....	55	22.0	.....	24.2	13.3	4.8	12.0	10.5	13.8	3.8	Moderately worn.
Do.....	93831	do.....	154	23.0	16.8	24.9	13.2	4.7	11.8	10.1	13.8	3.8	Do.
Do.....	93832	do.....	150	22.0	16.7	23.7	13.3	4.7	11.9	10.3	13.7	3.8	Do.
Miquihuana.....	93833	do.....	156	22.0	16.8	24.3	12.9	4.9	12.1	10.4	13.9	4.1	Do.
Do.....	93835	do.....	148	22.0	16.0	24.3	13.2	4.5	12.2	9.9	13.9	3.8	Much worn.
Do.....	93836	do.....	153	22.0	16.8	24.0	12.8	4.4	11.5	9.6	13.8	3.8	Do.
Do.....	93837	do.....	153	22.0	16.7	24.0	13.1	4.6	11.9	10.2	14.1	3.8	Do.
Do.....	93838	do.....	56	22.5	16.8	24.3	12.7	4.5	11.7	9.8	14.2	3.9	Moderately worn.
Do.....	1 93839	do.....	62	22.5	16.8	25.0	13.6	4.8	11.8	10.3	14.6	3.8	Much worn.
Do.....	93840	Female..	163	22.0	16.8	24.6	12.8	4.5	11.9	10.1	13.7	3.8	Do.
Do.....	93843	do.....	158	21.5	17.2	24.7	13.2	4.4	11.8	9.8	14.2	4.0	Do.

3 Type; Field Museum of Natural History, Chicago.

1 Type.

Average measurements of adult specimens of the subspecies of *Onychomys leucogaster*.

Number of specimens averaged.	Subspecies.	Localities.	Total length.	Tail vertebrae.	Hind foot.	Ear from notch.	Skull: Condylar basal length.	Zygomatic breadth.	Inter-orbital breadth.	Breadth of brain-case.	Length of nasals.	Length of mandible.	Maxillary tooth row.
3	<i>O. l. leucogaster</i>	North Dakota.....	164	42	22.0	14.0	27.4	16.2	4.6	13.3	11.4	16.7	4.5
11	<i>O. l. missouriensis</i>	Alberta, Montana, Wyoming, and North Dakota.....	150	39	20.8	14.2	26.1	15.3	4.7	13.2	10.9	15.6	4.4
35	<i>O. l. arcticeps</i>	South Dakota, Nebraska, Kansas, Colorado, New Mexico, and Texas.....	151	42	20.9	13.4	26.4	15.4	4.6	13.0	11.2	15.6	4.6
17	<i>O. l. brevicaudus</i>	Idaho, Utah, and Nevada.....	141	39	19.1	15.6	24.8	14.3	4.9	12.8	10.0	14.4	4.0
7	<i>O. l. fuscosignatus</i>	Washington, Oregon, and California.....	143	38	19.2	15.0	24.9	14.1	4.8	12.7	10.1	14.5	4.1
12	<i>O. l. melanophrys</i>	Utah and Colorado.....	154	44	21.9	14.7	25.9	15.1	5.0	12.7	10.9	15.4	4.6
13	do.....	Arizona.....	100	48	22.3	15.5	26.4	15.0	4.9	12.9	11.5	15.4	4.5
2	<i>O. l. fuliginosus</i>	do.....	100	50	22.0	14.9	25.9	15.2	5.1	12.9	11.6	15.1	4.6
21	<i>O. l. rufidors</i>	New Mexico and Arizona.....	139	49	22.2	15.6	26.2	14.8	4.8	12.8	11.2	15.3	4.4
10	<i>O. l. capitatus</i>	Arizona.....	147	44	21.9	14.8	25.1	14.0	4.6	12.6	10.9	14.5	4.3
1	<i>O. l. albescens</i>	Chihuahua.....	160	60	23.0	15.6	26.0	14.2	4.8	12.9	11.6	15.0	4.3
12	<i>O. l. longipes</i>	Texas and Tamaulipas.....	166	55	22.9	16.1	27.1	15.1	4.7	12.7	11.8	15.9	4.4
7	<i>O. l. brendarrivus</i>	Kansas and Oklahoma.....	156	42	22.0	12.8	26.9	15.3	4.7	12.9	11.6	15.7	4.6

Average measurements of adult specimens of the subspecies of *Onychomys torridus*.

Number of specimens averaged.	Subspecies.	Localities.	Total length.	Tail vertebrae.	Hind foot.	Ear from notch.	Skull: Condylobasal length.	Zygomatic breadth.	Interorbital breadth.	Breadth of braincase.	Length of nasals.	Length of mandible.	Maxillary tooth row.
23	<i>O. t. torridus</i>	Arizona, New Mexico, Sonora and Chihuahua.	146	52.1	21.2	14.0	23.3	12.7	4.5	11.5	9.7	13.4	3.7
17	.....do.....	Texas and southeastern New Mexico.	147	53.6	20.7	14.3	23.4	12.5	4.5	11.6	10.0	13.4	3.8
4	<i>O. t. perpallidus</i>	Arizona.....	155	57.3	21.0	15.7	24.1	13.0	4.6	11.4	9.9	13.8	3.8
9	<i>O. t. pulcher</i>	California.....	136	48.0	19.6	14.5	22.7	12.7	4.7	11.6	9.3	13.2	3.6
23	<i>O. t. longicaudus</i>	Utah, Nevada, and California.	141	49.6	19.9	14.2	22.8	12.9	4.9	11.6	9.2	13.3	3.6
6	<i>O. t. clarus</i>	California.....	141	51.4	19.7	14.8	23.0	12.8	4.8	11.7	9.3	13.3	3.6
4	<i>O. t. tularensis</i>.....	.....do.....	144	52.3	20.8	14.6	23.5	12.9	4.7	11.6	9.2	13.4	3.7
10	<i>O. t. ramona</i>	California and northwestern Lower California.	141	49.5	20.3	14.7	23.4	13.2	4.8	11.8	9.7	13.6	3.6
2	<i>O. t. macrotis</i>	Lower California.....	152	55.5	21.5	16.8	24.5	13.4	5.0	11.8	10.2	14.2	3.7
7	<i>O. t. yakitensis</i>	Sonora.....	149	53.0	22.4	16.0	24.0	13.2	4.5	11.8	9.9	14.3	3.9
7	<i>O. t. canus</i>	Zacatecas and San Luis Potosi.	150	52.8	21.9	16.0	24.0	12.8	4.5	11.8	10.2	13.8	3.7
11	<i>O. t. surrufus</i>	Tamaulipas.....	155	59.4	22.1	16.7	24.4	13.1	4.6	10.8	10.1	14.0	3.9

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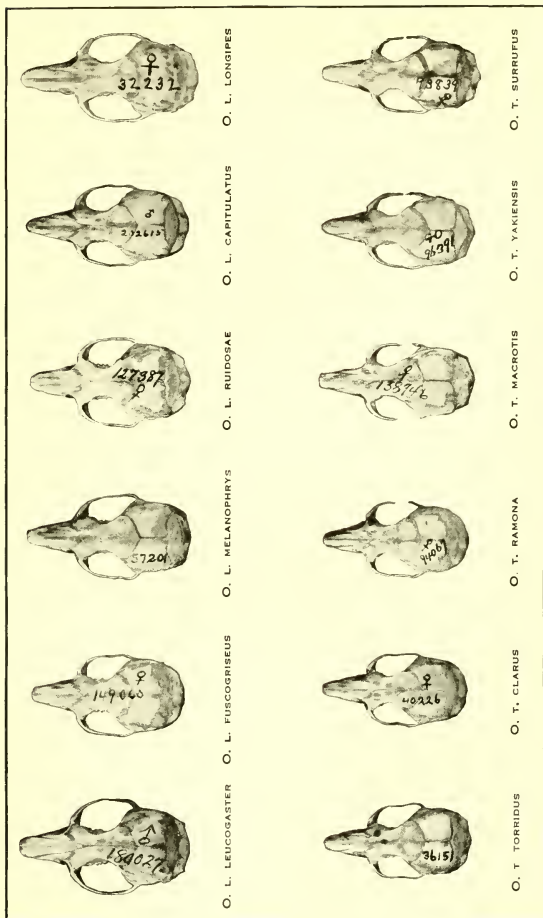
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EXPLANATION OF PLATE 15.

Skulls of *Onychomys*, dorsal views, about natural size.

- Fig. 1. *Onychomys leucogaster leucogaster*, U.S.N.M. (Biological Survey Coll.), Cat. No. 180027, male adult, Hankinson, North Dakota, July 25, 1912, V. Bailey.
2. *Onychomys leucogaster fuscogriseus*, U.S.N.M. (Biological Survey Coll.), Cat. No. 149060, female adult, Baird, Washington, June 6, 1907, S. E. Piper.
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9. *Onychomys torridus ramona*, U.S.N.M. (Biological Survey Coll.), Cat. No. 94067, female adult, Riverside, California, July 23, 1897, Dane Coolidge.
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12. *Onychomys torridus surrufus*, U.S.N.M. (Biological Survey Coll.), Cat. No. 93839, female adult, Miquihauna, Tamaulipas, Mexico, June 8, 1898, E. W. Nelson and E. A. Goldman. Type.



SKULLS OF ONYCHOMYS.

FOR EXPLANATION OF PLATE SEE PAGE 489.