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DOI: 10.31390/opmns.004

Available at: https://repository.lsu.edu/opmns/vol1/iss4/1
GEOGRAPHIC RACES OF THE KANGAROO RAT, DIPodomys microps

By E. Raymond Hall and Frederick H. Dale

Dipodomys microps is a medium-sized, five-toed kangaroo rat of a color slightly darker than average for the genus. The species was named in 1904 by C. Hart Merriam, who at the same time named the race levipes. Subsequently, six other races were named, five by Goldman and one by Willet. Three new names are proposed in the present paper making a total of eleven named forms, all of which are here recognized as valid subspecies.

D. microps is typically a Great Basin species. Its range is sharply limited on the west by the Cascade-Sierra Nevada Mountain Chain, and on the east by the Wasatch Range and by mountains and elevated plateaus which extend on southward to the Colorado River. From about 43° north latitude in eastern Oregon and extreme western Idaho, and from a little south of the northern boundary of Nevada and Utah, it occurs southward to between 36° and 37° north. The Upper Sonoran Life-zone is the home of microps. In this zone it is to be looked for from the sagebrush belt down through the shadscale into the greasewood belt, rather than in the more elevated, timbered belt where pinyons and junipers grow. In these shrub-supporting areas, microps, although widely distributed, does not live as far out on alkaline lands

3 Read at the 21st annual meeting of the American Society of Mammalogists held at the Louisiana State University and Agricultural and Mechanical College, University, Louisiana, April 3-7, 1939. This paper is a contribution from the University of California Museum of Vertebrate Zoology.
toward, for example, a true salt flat devoid of vegetation, as does *Dipodomys merriami*. Despite the zonal preference just noted, *microps* does occur in the Lower Sonoran Life-zone, as in Death Valley, California, and near Las Vegas, Nevada. At the other extreme we have found it just entering the pinyon-juniper belt. This was at Breeen Creek in the Kawich Mountains of Nye County, Nevada. The elevation there is 7000 feet. Our only record of a higher occurrence is 7700 feet in Mauzurka Canyon on the western side of the White Mountains in Inyo County, California. The opposite extreme is 91 feet below sea level at Salt Creek in Death Valley. Ninety per cent or more of the specimens available to us come from elevations of between 3500 and 6500 feet.

The southwestern part of the range of *microps* is shared with *Dipodomys deserti*, a much larger, lighter-colored animal with only four toes on the hind foot. In this area and also entirely across the southern part of the range of *microps* one finds *Dipodomys merriami*, an animal smaller than *microps* and with only four toes on the hind foot. Along the western margin of its range, *microps* is sometimes taken in the same place as *Dipodomys leucogenys*, also a five-toed species of similar color. Most of the populations of *leucogenys* occur at elevations higher than those of *microps*. *D. leucogenys* is larger, and in our experience can always be distinguished from *microps* of the same region by its larger hind foot, which is more than 44 millimeters long. We have repeatedly taken together, on the same ground, *D. microps*, *D. merriami*, *D. deserti*, and *D. ordii*. The last-mentioned species occurs over all but the southwestern part of the range of *microps*. There *microps* is able to tolerate slightly lower zonal territory and pushes a few miles farther south than does *ordii*.

Compared with *ordii*, *microps* generally has the color darker, the dark ventral stripe on the tail extended all the way to the tip rather than terminated short of the tip, black stripes on tail wider than white stripes, lining of cheek pouches dusky rather than white, hind foot longer, interparietal and zygomatic arm of maxilla narrower, and upper incisors subequal, rather than equally grooved. Nevertheless, no one of these characters can be relied upon to distinguish between the two species at all localities. The similarity of the two animals probably explains why *microps* was unrecognized until as late as 1904. The difficulty of correctly identifying specimens is illustrated by the fact that several specimens, taken in recent years, were misidentified by mammalogists having special knowledge of the genus. In 1937, however, Mr. Lee W. Arnold, when with a field party from the Museum of Vertebrate Zoology, found that he could readily distinguish the two species by the shape of the incisors in the lower jaw. In *microps* these teeth are flat on the anterior face and chisel-like, whereas in *ordii* they are rounded and awl-like (see fig. 1.).

**Fig. 1.** Lower jaws, showing difference in shape of lower incisor teeth in two species of *Dipodomys*. A. *Dipodomys microps* bonnevillei, 9, adult, no. 45286, Mus. Vert. Zool., Kelton, Box Elder County, Utah. B. *Dipodomys ordii celeripes*, 9, adult, no. 68062, Mus. Vert. Zool., Tecopa, Elko County, Nevada. Note the flat-faced, chisel-like incisors of *microps* as contrasted with the rounded, awl-like incisors in *ordii*. X 2.

When drafting statements about geographic variation, we took exceptional pains to compare only animals of like age, sex, and seasonal condition of pelage. We find evidence of only one molt a year, occurring in July, although in the extreme southern part of the range it may begin as early as the first week in June. We have no specimens taken earlier than May or later than October. Fresh, unworn pelage is superior to worn pelage for study of geographic variation in coat-color and color-pattern. Females are on the average smaller than males, but in any given population the average secondary sexual difference (males average about 69 grams and females 64 grams in *centralis*) is less than the difference ascribable to individual variation within one age-group of either sex. The measurements in table 1 indicate the degree of variation, both secondary sexual and individual.

Variation correlated with age is less, in the later stages of growth, than in many other genera of rodents. Even so, the shape of the skull changes somewhat after the adult pelage is acquired; for example, the oldest animals are wider across the maxillary processes of the zygomatic arches than are younger animals. Recognition of these changes led us to select for measurement and comparison, from animals in adult pelage, only those which had reached, or passed, an advanced stage of growth, as determined by the following mentioned criteria: Bone firm and of
fine texture; cheek teeth worn generally to the enamel of the lingual side (young appear to have enamel-breaks at the sides, and the crown surfaces are angular rather than oval). It is to these animals and not to any of a lesser stage of development that we have applied the term adult. Sexual maturity is reached at an earlier stage of development, as is shown by pregnant females that retain part of the immature pelage.

Fig. 2. A. Dorsal view and B. ventral view, of the skull of Dipodomys microps alfredi, adult, no. 3602, Colo. Mus. Nat. Hist., from Gunnison Island, Box Elder County, Utah, to show points between which cranial measurements were taken. X 1/2.
Basal length, a-a'.
Maxillary breadth, d-d'.
Length of nasal, b-b'.
Interorbital breadth, c-c'.
Greatest breadth, c-c'.

The differences mentioned in the paragraph of comparisons for each subspecies, were determined by contrasting topotypes except where the races aquilonius, occidentalis and bonnevillei were involved, for which there were so few adult topotypes as to make the computed mean unreliable. For aquilonius the larger series of specimens from Hausen was used, the series from Sulphur for occidentalis, and the series from 13 miles north of Montello for bonnevillei when estimating the average size of the animal, or when comparing the shape of its skull with that of some other subspecies. For preblei so few adults were available that those from Narrows, Buena Vista, and Summer Lake were employed as

Fig. 3. Map to show the geographic distribution of subspecies of Dipodomys microps.
one series. In the mentioned comparisons, larger, smaller, longer, shorter, and similar terms refer to the average or mean. Two races are said to differ uniformly in a given measurement or other feature, when there is no overlap of individuals between the two series compared, but specimens from near the margin of the range of a subspecies often show resemblance to the next adjacent subspecies. Type specimens are skulls with skins.

Localities of occurrence in each state are listed by counties from north to south and in similar order within a county. Unless otherwise indicated, specimens are in the Museum of Vertebrate Zoology. A total of 1149 specimens has been available for study. A few more than 500 of these are in the Museum of Vertebrate Zoology. For the opportunity to examine the remainder we are indebted to: Ray Alcorn, Fallon, Nevada; Alfred M. Bailey, Colorado Museum of Natural History; Stephen D. Durrant, University of Utah; Lynn C. Hayward, Brigham Young University; Hartley H. T. Jackson, United States Bureau of Biological Survey; Stanley G. Jewett, Portland, Oregon; and Adrian J. van Rossem, Donald R. Dickey collections. Assistance with the preparation of materials used in this study is acknowledged to the Works Progress Administration (Official Project No. 465-03-3-192).

**Dipodomys microps centralis** new subspecies

*Type.*—Male, adult, no. 70817, Mus. Vert. Zool.; 4 mi. SE Romano, Diamond Valley, Eureka County, Nevada; June 3, 1936; collected by William B. Richardson; original no. 1621.

*Range.*—Central Nevada from the Humboldt River valley south to Pahute Meso; east from northeastern Pershing County, Reese River Valley, Great Smoky and Ralston valleys to Steptoe and Spring valleys.

*Diagnosis.*—Size: Medium (see measurements). Color: Dark; upper parts nearest (16°) Cinnamon-Buff (capitalized color terms after Ridgway, Color Standards and Color Nomenclature, 1912), mixed with blackish; underparts, inside of hind legs and hind feet (soles excepted), fore feet and legs, upper lips, hip stripes, lateral stripes of tail and its superior base white; supracubital spots and postauricular patches with a few black hairs; vibrissae, anteriors facial markings, soles of hind feet, dorsal and ventral stripes of tail, and sometimes inside of cheek pouches, blackish. Skull: Medium sized, and of a shape "average" for the species (see measurements).

*Comparisons.*—Comparisons with the ten other races are made in the accounts of those forms.

*Remarks.*—In the southern part of its range centralis approaches occidentalis in color but otherwise agrees with type-species. Specimens of centralis have long been referred to the race lepido. The two are similar, and differ, mosatic as we can see, only in the features mentioned under comparisons in the account of lepido. However, the ranges of these two races are separated by that of occidentalis, a light-colored animal. *D. m. centralis* occupies a central position geographically in the species, and its position as regards structure is similar. For example, it is neither the lightest nor darkest, and in size is larger than some races and smaller than others.

*Specimens examined.*—Number total 303, all from Nevada, as follows: Humboldt County: 18 mi. NE Iron Point, 4500 ft., 5; 16 mi. NE Iron Point, 4500 ft., 4; 5 mi. NE Golconda, 4; 2 mi. NE Golconda, 2; 25 mi. NW Battle Mountain, 2; Pershing County: 15 mi. SW Winnemucca, 1; Lyon County: 1 mi. NE Battle Mountain, 2; 1-2 1/2 mi. NW Cortez, Cortez Mts., 4; Reese River Valley, 7 mi. N Austin, 2; Eureka County: 1/2 mi. S Beowawe, 3; Winnemucca, 1; 4 mi. S Romano, Diamond Valley, 2; 4 mi. SE Romano, Diamond Valley, 6; Nye County: 4 mi. N Millert, 5500 ft., 1; 2 mi. N Millert P. O., 5500 ft., 6; Ophir Creek, 6500 ft., 1; 4 mi. S Millert, 5500 ft., 2; 4 mi. NE Millert, 5500 ft., 3; 5 mi. S Millert, 5500-5700 ft., 3; South Twin River, 6500 ft., 28; 5 mi. SE Millert P. O., 5500 ft., 1; 11-1/2 mi. NE San Antonio, 5700 ft., 3; 4 to 5 1/2 mi. NE San Antonio, 5650-5700 ft., 4; San Antonio, 5400 ft., 1; Ralston Valley, 15-1/2 mi. NE Tonopah, 5800 ft., 18; Hot Creek Valley, 6-1/2 mi. N Hot Creek, 5900 ft., 2; Hot Creek Valley, 7 mi. NE Hot Creek, 5900 ft., 3; 4 mi. E Hot Creek, 6000 ft., 2; Hot Creek Valley, 3-1/2 mi. E Hot Creek, 5650 ft., 9; S end Hot Creek Valley, 2 1/2 mi. E-X Twin Spring, 5400 ft., 5; Ralston Valley, 34 mi. E and 1 mi. N Tonopah, 5650 ft., 15; N end Jelliff Valley, 7 mi. Old Mill, 6200 ft., 14; Railroad Valley, 7 mi. Old Mill, 6200 ft., 4; Railroad Valley, 3-1/2 mi. S Lock's Range, 5000 ft., 1; Railroad Valley, 9 mi. S Lock's Range, 5000 ft., 4; Railroad Valley, 12-1/2 mi. S Lock's Ranch, 5000 ft., 1; Railroad Valley, 14 mi. S Lock's Ranch, 5000 ft., 1; Railroad Valley, 2 mi. N Nyea, 5100 ft., 1; Railroad Valley, 3 mi. N Nyea, 5100 ft., 9; Railroad Valley, 3 mi. E Kalula, 5100 ft., 6; S end Railroad Valley, 5000 ft., 1; White River Valley, 15 mi. WSW Sunnyside, 5500 ft., 2; Railroad Valley, 9-1/2 mi. N New Reavelo, 5100 ft., 1; 3 mi. SW Cactus Spring, Cactus Range, 1; Breem Creek, 7000 ft., Kawich Range, 1; E end Arche Creek, 6500 ft., Kawich Mts., 2; 2 mi. SW Silverow, 6400 ft., Kawich Mts., 3; 3-1/2 mi. S Silverow, 6200 ft., Kawich Mts., 2; 5-1/2 mi. SW Silverow, 6000 ft., Kawich Mts., 1; Cactus Flat, 6500 ft., Kawich Mts., 1; SW Silverow, 1; Cactus Flat, 5750 ft., 6-1/2 mi. SW Silverow, 2; Gold Flat, 5200 ft., 5; W Kawich P. O., 1; Gold Flat, 5100 ft., 6 mi. SW Kawich P. O., 2; 4 1/2 mi. NW Indian Spring, 5700 ft., Kawich Valley, 3; Kawich Valley, 5200 ft., 5; SE Kawich P. O., 4; 2 1/2 mi. NW Indian Spring, 5700 ft., Kawitch 6000 ft., 2; 1-2 1/2 mi. NW Indian Spring, 5700 ft., Kawich 6000 ft., 2; 1-2 1/2 mi. NW Indian Spring, 5700 ft., N Nevada, 5100 ft., 2; 1-2 1/2 mi. NW Indian Spring, 5700 ft., Belden Range, 1; 8 mi. NE Wheelbarrow Peak, 1; 9 mi. E Wheelbarrow Peak, 2; White Pine County: Cherry Creek, 6600 ft., 2; 3 mi. SE Greens Ranch, Steptoe Valley, 5900 ft., 2; 7 mi. SW Querida, Spring Valley, 6100 ft., 9 mi. E, 12 N, 5-1/2 mi. NW Shoshone P. O., 6100 ft., 2; Spring Valley, 4 mi. S Shoshone, 5900 ft., 1. Lincoln County: Duck Valley, 3 mi. S Greysier, 6500 ft., 1; Coal Valley, 10 mi. N Seaman Pass, 4670 ft., 1; Penoyer Valley, 17 mi. N Groom Baldy, 10; Penoyer Valley, 14 mi. NIXW Groom Baldy, 2; 5 mi. W Groom Baldy, 5500 ft., 22.

**Dipodomys microps idahoensis** new subspecies

*Type.*—Male, adult, no. 67568, Mus. Vert. Zool.; 5 mi. SE Murphy, Owyhee County, Idaho; May 26, 1935; collected by Howard Twining; original no. 39.

*Range.*—Known only from northern Owyhee County, Idaho.

*Diagnosis.*—Size: Medium (see measurements); body short, tail long. Color: About as in centralis but less blackish with dark ventral tail stripe brownish rather than blackish. Skull: Medium sized; actually, and especially relatively,
broad in interorbital region and across maxillary processes; maxillary breadth averaging 85 (84-87) per cent of breadth across bullae.

Comparisons.—Compared with centralis, idaboensis differs as follows: Body shorter, and total length less; skull broader, relatively as well as actually, especially in the maxillary region. Compared with homestelli from eastern Elko County, idaboensis differs in: Body shorter; tail actually and relatively longer; color darker; skull broader interorbitally and across maxillary processes, especially relative to length of skull and to width across bullae. From prebelle, idaboensis differs in: Body slightly shorter; color darker; skull larger in all measurements taken, and relatively as well as actually broader. From aquilinus, idaboensis differs as follows: Body shorter; color lighter; skull larger in every measurement taken except breadth of nasals distally; relatively broader in maxillary region (maxillary breadth 85.4 per cent as opposed to only 80 per cent of greatest breadth across bullae).

Remarks.—The range of this relatively dark-colored, short-bodied, broad-skulled form probably is more extensive than our records of occurrence show. Actual intergrades are lacking, but the intermediate nature of prebelle, in length of body and breadth of skull, as between idaboensis and aquilinus, indicates for idaboensis only subspecific rank.

Specimens examined.—Total number, 6, all from Idaho. Owyhee County: 5 mi. SE Murphy, 4; 10 mi. E Murphy, Quintana Ranch, Sink Creek, 2 (coll. S. G. Jewett).

Dipodomys microps prebelle (Goldman)


Type.—Female, adult, no. 79340, U. S. Nat. Mus., Biol. Surv. coll.; Narrows, Malheur Lake, Harney County, Oregon; July 23, 1896; collected by E. A. Preble; original no. 1201 (after Goldman, orig. descr.; type not seen by us).

Range.—Southeastern Oregon and northern Humboldt County, Nevada; south from Narrows, Oregon, to 17 miles south of Quinn River Crossing, Nevada; east from Summer Lake, Oregon, to Owyhee River, Oregon.

Diagnosis.—Size: Medium, except that body is short (see measurements). Color: About as in centralis but less blackish and more cinnamon on sides with dark tail stripes brownish rather than blackish. Skull: Small, but relatively broad interorbitally.

Comparisons.—From centralis, prebelle differs as follows: Body shorter; color darker; skull smaller in all measurements taken except interorbital breadth and breadth of nasals. For comparison with idaboensis, see account of that form. From aquilinus, prebelle differs as follows: Color lighter; body and hind foot shorter; nasals relatively longer; maxillary breadth actually greater and especially greater relative to greatest breadth of skull and to basal length. From occidentalis, prebelle differs as follows: Color darker; skull relatively narrower across bullae but relatively as well as actually broader interorbitally; relative to greatest breadth, maxillary breadth greater.

Remarks.—There are still too few adult specimens of prebelle to give an accurate measure of its characters. Evidences of intergradation with more southern races

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are furnished by specimens from Lake Alvard. In these, the breadth across the maxillary processes of the symmetrical arches amounts to only 80.6 per cent of the greatest breadth across the auditory bullae. In this character the specimens are more nearly aquilinus and occidentalis. Specimens from Quinn River Crossing, although referable to prebelle, resemble aquilinus and centralis in longer hind foot, greater basal length of skull and greater breadth across tympanic bullae.

The single specimen from 36 miles northeast of Paradise Valley, Nevada, is too young to display fully the characters relied upon in differentiating prebelle. Adult specimens from these might prove to be referable to some other subspecies.

Specimen examined.—Total number, 45, as follows:


Nevada. Humboldt County: Virgin Valley, 1; Big Creek Ranch, base of Pine Forest Mts., 1; 1-1/2 mi. N Quinn River Crossing, 4100 ft., 6; Quinn River Crossing, 7; 2 mi. SW Quinn River Crossing, 4000 ft., 1; 2-1/2 mi. SW Quinn River Crossing, 4100 ft., 1; Jackson Creek Ranch, 17-1/2 mi. S and 5 mi. W Quinn River Crossing, 4; 56 mi. NE Paradise Valley, 5500 ft., 1.

Dipodomys microps aquilinus Willett


Type.—Female, adult, no. 3935, Los Angeles Mus.; 3 mi. E Eagleville, Modoc County, California; June 4, 1934; collected by G. Willett (after Willett, orig. descr.; type not seen by us).

Range.—Wasco County, Nevada, and extreme eastern California from Surprise Valley south to the north end of Pyramid Lake, Nevada.

Diagnosis.—Size: Medium (see measurements). Color: Dark; upper parts heavily mixed with blackish, which is present in maximum degree for the species throughout the dark-colored areas. Skull: Medium sized; relatively narrow across the maxillary processes and broad interorbitally.

Comparisons.—From centralis, aquilinus differs in darker color and narrower skull. For comparisons with idaboensis and prebelle see accounts of those forms. From occidentalis, aquilinus differs in: Color darker; body averages longer; weight greater; skull broader interorbitally.

Remarks.—D. m. aquilinus is a long-bodied form but its range is separated from those of the other long-bodied forms by the ranges of the shorter-bodied occidentalis and prebelle. The dark color of aquilinus is especially distinctive in comparison with the adjoining light-colored race, occidentalis. D. m. aquilinus is darker also than prebelle. Cotypes of aquilinus are paler than other specimens, possibly as a result of preservation for a time in a salt-alum-picrol solution.
Dipodomys microps occidentalis new subspecies

Type.—Female, adult, no. 64119, Mus. Vert. Zool.; 3 m. S Schurz, 4100 ft., Muley twist, Nevada; July 8, 1954; collected by E. Raymond Hall; original no. 4183.

Range.—Western and southern Nevada, and extreme California in Mono and Inyo counties; south from western Humboldt County, Nevada, to Death Valley, California, and Las Vegas, Nevada; east from the Black Rock Desert, Sierra Nevada, White Mountains and Death Valley, to Smiths Creek Valley, Lander County, Mud Lake, Nye County, thence east (south of Palute Mesa) to a point 21 miles west of Panaca, in Desert County.

Diagnosis.—Size: Small (see measurements); body short. Color: Pale, less bright than lewipes and microps; upper parts and acroploric facial markings more restricted than in centrals; darkest areas brownish as opposed to blackish. Skull: Small.

Comparisons.—Compared with centrals, occidentalis differs as follows: External measurements less; color lighter; skull smaller, and relatively narrower across ballea and maxillary processes. For comparisons with predi, aquilonius, lewipes and microps see accounts of those forms. From bonnievillei, occidentalis differs as follows: Body shorter; all cranial measurements less except breadth of nasals in females and interorbital breadth in both sexes, which last averages relatively greater. From color, occidentalis differs in: External measurements smaller; weight of a fourth (24 per cent) less in males and a fifth (18 per cent) less in females; color lighter; skull smaller in all measurements taken, with uniformly shorter nasals; nasals relatively as well as actually shorter.

Remarks.—In the northern part of its range specimens of occidentalis average larger and darker than in the vicinity of the type locality. Intergradation with centrals is shown by the animals from Smiths Creek Valley, which in the sum total of their characters are only a little nearer centrals than occidentalis. This was surprising to us because on geographic grounds we had expected they would agree with centrals.

The name Occidental Greenwater may be regarded as intergrades with lewipes because of the long nasals and great total length. In certain proportions, namely, long tail and interorbital breadth, these specimens are even larger than lewipes and are suggestive of centrals. These and most of the other specimens referred to occidentalis from southern Nevada, south of the range of centrals, though light in color, have long bodies suggestive of centrals, bonnievillei and centrals.

Specimens examined.—Total number, 425, as follows:
Dipodomys microps alfredi Goldman


**Type.**—Female, adult, no. 262846, U. S. Nat. Mus., Biol. Surv. coll.; Gunnison Island, 4360 ft., Great Salt Lake, Box Elder County, Utah; June 1, 1937; collected by Alfred M. Bailey and Robert J. Niswarc; original no in Colorado Mus. Nat. Hist., 2994 (after Goldman, orig. descr.; type not seen by us).

**Range.**—Confined to Gunnison Island, Great Salt Lake, Utah.

**Diagnosis.**—Size: Large (see measurements); hind foot large. Color: Pale; upper parts less blackish than in *centrois* and dark brownish as opposed to blackish. Skull: Large; straight or dorsally convex in nasofrontal region; upper incisors extremely broad; broad across maxillary processes.

**Comparisons.**—Compared with *centrois, bonnevillei* and *leucotis, alfredi* is larger in all external and cranial measurements taken, and the breadth across the maxillary processes is greater, relative to the breadth across the bulleae. The color is darker than in *bonnevillei* and lighter than in *centrois* and *leucotis*. Also, the nasals, relative to the basal length, are shorter than in *leucotis*. From *celius*, *alfredi* differs as follows: External measurements larger, especially hind foot; color lighter; length of nasals and breadth across bulleae actually less; also less relative to length of skull; other cranial measurements, especially basal length, greater; breadth across maxillary processes 87 per cent rather than 83 per cent of greatest breadth across bulleae.

**Remarks.**—Individuals of this insular race are the largest in the species. The orbit is relatively short. This is correlated with the marked extension anteriorly of the auditory bullae.

**Specimens examined.**—Total number, 11, all from the type locality, and preserved in the Colorado Museum of Natural History.

Dipodomys microps leucotis Goldman


**Type.**—Male, adult, no. 250036, U. S. Nat. Mus., Biol. Surv. coll.; 6 mi. W Colorado River Bridge, House Rock Valley, about 3700 ft., N side of Marble Canyon of Colorado River, Coconino County, Arizona; June 6, 1931; collected by E. A. Goldman; original no. 25570 (after Goldman, orig. descr.; type not seen by us).

**Range.**—Known only from the type locality.

**Diagnosis.**—Size: Large (see measurements). Color: Upper parts with more reddish or cinnamon and less blackish than in *centrois*. Skull: Medium sized.

**Comparisons.**—From *centrois, leucotis* differs in the more reddish or cinnamon color of the upper parts and relatively narrower skull, especially as measured across the auditory bullae. In comparison with *bonnevillei* the same narrowness of skull is evident, and *leucotis* is darker colored. From *celius, leucotis* differs in that every external and cranial measurement taken averages slightly less, and that the skull is relatively narrower across the bulleae.

**Remarks.**—This southeasternmost population of the species resembles *celius*. 
in color but approaches Pinkish Cinnamon rather than Cinnamon.  

**Specimens examined.**—Total number, 24, all from the type locality.

**Dipodomys microps celsius Goldman**


**Type.—** Male, adult, no. 245039, U. S. Nat. Mus., Biol. Surv. coll.; 6 mi. N Wolf Hole, 3500 ft., Mohave County, Arizona; October 16, 1922; collected by E. A. Goldman; original no. 23384 (after Goldman, orig. descr.; type not seen by us).

**Range.**—Southwestern Utah from along the Virgin River and northwestern Arizona north of the Colorado River; east to Kanab Creek.

**Diagnosis.**—Size: Large (see measurements). Color: Dark; in upper parts blackish about as in *centralis* with admixture of more reddish or cinnamon. Skull: Large.

**Comparisons.**—From *centralis*, *celsius* differs in: External measurements greater; weight one fifth more; color of upper parts with more reddish or cinnamon; larger in all cranial measurements taken, but skull narrower relative to basal length. For comparison with *occidentalis*, *bonnevillei*, *alfredi*, and *levipes* see accounts of those forms.

**Remarks.**—This large, strongly reddish race probably has a relatively small range; rats of this species have been sought in vain nearby in Nevada along the Meadow Valley Wash and the Virgin River.

**Specimens examined.**—Total number, 30; as follows:

- **Utah.** Washington County: Gould's Ranch, Hurricane, 1; St. George, 2850 to 3500 ft., 6.
- **Arizona.** Mohave County: 10 mi. N Wolf Hole, 3800 ft., 18; Kanab Wash, S Boundary Kaibab Indian Reservation, 2; near S Boundary Kaibab Indian Reservation, 3.

**Dipodomys microps levipes (Merriam)**


**Type.—** Male, adult, no. 25898/52701, U. S. Nat. Mus., Biol. Surv. coll., Lone Pine, Owens Valley, Inyo County, California; December 22, 1890; collected by E. W. Nelson, original no. 138 (after Merriam, orig. descr.; type not seen by us).

**Range.**—Owens Valley, California, from 5 miles north of Benton Station south to vicinity of Olancha; occurs also at Victorville, California.

**Diagnosis.**—Size: Small (see measurements). Color: Pale, extreme for the species in this respect; dark markings brown rather than blackish; dark arietiform facial markings brown rather than blackish. Skull: Small, relatively narrow with relatively long nasals.

**Comparisons.**—Selected differences, in comparison with *centralis*, are: Size less; color paler, with area of light markings increased at expense of dark markings; dark markings brownish rather than blackish; skull actually smaller throughout and relatively narrower across bullae; relatively broader interorbitally and across maxillary processes. Differences from *levipes*, additional to those indicated in the diagnoses, include: Size less throughout; area of dark arietiform facial markings less; lateral white tail-stripes actually broader, and area of other white markings increased at expense of dark markings; upper incisors more recurved and with relatively smaller occlusal areas. From *occidentalis*, *microps* differs in: Size slightly less; color slightly paler; skull smaller, relatively as well as actually narrower; nasals relatively longer; maxillary breadth 86 per cent as opposed to 81 per cent of breadth across bullae.

**Remarks.**—D. *m. microps* is a strongly marked race. Its differential characters are maintained over a long distance, from Olancha, Inyo County, northward up Owens Valley, about 100 miles to a point 5 miles north of Benton Station. It is true that the skulls of the animals from near Benton Station average slightly larger than those of topotypes, but the light color and small size otherwise are essentially as in the more southern populations of *microps*.
We doubt that intergradation occurs between *mierops* and *occidentalis* at the head of Owens Valley; territory there may not support rats of the species *mierops*, but only *Dipodomys lewisiensis*. At the southeastern part of the range, intergradation with *lewisi* is indicated by specimens from the vicinity of Ojuela, and from Darwin. Those from Darwin are referred to *lewisi* and the others to *mierops*. Six of the specimens from Victorville are in juvenile pelage. The reference of this population to the subspecies *mierops* is made on the basis of small size and light color of the one adult, which has a broken skull.

**Specimen examined.**—Total number, 63, all from California, as follows:

- **Mono County:** Pellisier Ranch, 3600 ft., 3 mi. N. Benton Station, 15; (D. R. Dickey coll.); McKeever’s Ranch, 2 mi. S. Benton Station, 5200 and 5300 ft., 3.
- **Inyo County:** Hill east mouth of Silver Canyon, 4800-4860 ft., 3; Silver Canyon, 5100 ft., 1; Messina Canyon, 7700 ft., 1; Inyo Mesa, 1; 2 1/2 mi. NE Lone Pine, 3; 0.5 mi. NW Lone Pine, 15; 3 1/2 mi. NE Ojuela, 3600 ft., 1; 1 1/2 mi. W. Ojuela, 3650 ft., 1; Ojuela, 3600 ft., 8; (D. R. Dickey coll.); 1/2 mi. SW Ojuela, 3650 ft., 2; 1 1/2 mi. SW Ojuela, 3900 ft., 1; San Bernadino County: Victorville, 7.

After this paper was in press, two additional subspecific names were proposed for kangaroo rats of the species *Dipodomys mierops*. We have not examined any specimens referable to these two new races, from islands in Great Salt Lake, but to provide here a complete record to date (September 15, 1939) of the races named, list these two newly proposed races below:

**Dipodomys mierops rufus** Goldman (Jour. Mammalogy, vol. 29, p. 353, August 14, 1939). *Type locality:*—Dolphin Island, 4250 ft., Great Salt Lake, Utah. Known from only one specimen.


*Transmitted April 28, 1939.*

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**Average and Extreme Measurements, in Millimeters, of Adults of Eleven Subspecies of *Dipodomys* Mierops**

<table>
<thead>
<tr>
<th>Species</th>
<th>Body Length</th>
<th>Tail Length</th>
<th>Hind Foot</th>
<th>Ears</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>D. m. mierops</em></td>
<td>120-130</td>
<td>30-40</td>
<td>20-25</td>
<td>15-20</td>
<td>6-12</td>
</tr>
<tr>
<td><em>D. m. rufus</em></td>
<td>110-120</td>
<td>30-40</td>
<td>20-25</td>
<td>15-20</td>
<td>6-12</td>
</tr>
<tr>
<td><em>D. m. subtilissimus</em></td>
<td>110-120</td>
<td>30-40</td>
<td>20-25</td>
<td>15-20</td>
<td>6-12</td>
</tr>
</tbody>
</table>

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**E. Raymond Hall and Frederick H. Dale**