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Dipodomys gravipes.

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Dipodomys gravipes Huey, 1925

San Quintín Kangaroo Rat

Dipodomys gravipes Huey, 1925:83. Type locality 2 mi W Santo Domingo Misión, Baja California, Mexico, 30°45′N, 115° 58′W, or, precisely, on the cactus-covered slopes south of the huge red cliff that marks the entrance of the Santo Domingo River canyon from the coastal plain.

CONTEXT AND CONTENT. Order Rodentia, Family Heteromyidae, Subfamily Dipodomyinae. *Dipodomys gravipes* is monotypic.

DIAGNOSIS. *Dipodomys gravipes* is a large-sized, heavy-bodied, small-eared kangaroo rat, with thick tail of medium length, belonging to the *heermanni* group; tip of tail dark; five toes on the extremely large-boned hindfoot; and pelage medium-coarse dorsally but seems, by the "feel" and springiness of the hair to the touch, to be much coarser on the underparts (Huey, 1925). The tail is 1.36 times (range of means 1.30 to 1.39) the length of head and body (Best, 1983*a*). The cranium (Fig. 1) has a prominent, sharp postero-external angle in the maxillary root of the zygomatic arch, and the width across the maxillary roots of the zygomatic arches is more than 54.8% of the greatest length of skull (Hall, 1981).

In most dimensions, *D. gravipes* is larger than the two other species of kangaroo rats with which it is sympatric (*D. merriami* and *D. agilis*). Five toes on the hindfoot further distinguish *D. gravipes* from *D. merriami*, which has four. Compared to *D. agilis*, *D. gravipes* has shorter ears, longer hindfeet, larger body size (Best, 1978, 1983*b*), and the tail is thicker, paler, and less sharply bicolored.

GENERAL CHARACTERS. Lower surface of body, entire forelegs and feet, upper surface of hindfeet, and hip stripes are white; upperparts, including hip spot, are pinkish buff, and have interspersed black hairs or hairs with black tips; the purest pinkish buff is on the cheeks and sides, and the darkest area is on the rump; a small white spot is over the eye; area around the ear is white, with the white extending downward rather than posteriorly or between the ears; white lateral tail stripes are narrow, extending almost to the tip, where they disappear in the long dark hairs of the tuft; hairs in the dorsal stripe of the tail are more uniformly dark than in the ventral stripe; soles of hindfeet, from base of toes to ankle, are nearly black (Huey, 1925). The subadult pelage generally is grayer and more finely textured than the adult pelage, as in all species of the genus.

There is moderate secondary sexual size dimorphism in *D. gravipes*; total length, body length, hindfoot length, greatest cranial length, nasal length and width, and basioccipital length are significantly greater in males (Best, 1983*a*). Ranges of external measurements (mm) of 56 adult males and 54 adult females are, respectively: total length, 299 to 312, 296 to 310; body length, 129 to 132, 126 to 130; tail length, 168 to 180, 170 to 180; hindfoot length, 44 to 45, 44 to 45; ear length, 11 to 16, 11 to 16 (Best, 1983*a*). Mean adult weights (g) of six males and three females from 8.5 mi N San Quintín are 81.3 and 78.9, respectively, and for 16 males and 12 females from 6 mi E El Rosario, 90.6 and 85.1, respectively.

Best (1983*a*) found significant interlocality character variation in 14 of 19 characters when three geographic samples of *D. gravipes* were compared; 12 characters were significant for males and 11 for females. Neither sex had significant differences among the three samples for basal length, intermaxillary width, alveolar length, basioccipital length, and nasal width. For basal length, greatest cranial length, and width of maxillary arch only males differed between samples, and for interorbital width and lacrimal length only females had differences between samples. Females from the vicinity of El Rosario were the largest in all characters, whereas males from the same area were largest in 18 of 19 characters. The El Rosario sample was significantly different from both of the other samples in six characters for males and six characters for females. The general increase in size of *D. gravipes* from north to south in Baja California is evident in *D. agilis* as well (Best, 1978, 1982).

DISTRIBUTION. The known geographic distribution of *D. gravipes* extends southward from near San Telmo (Huey, 1951) to near El Rosario (Best, 1978) in Baja California, Mexico; an area

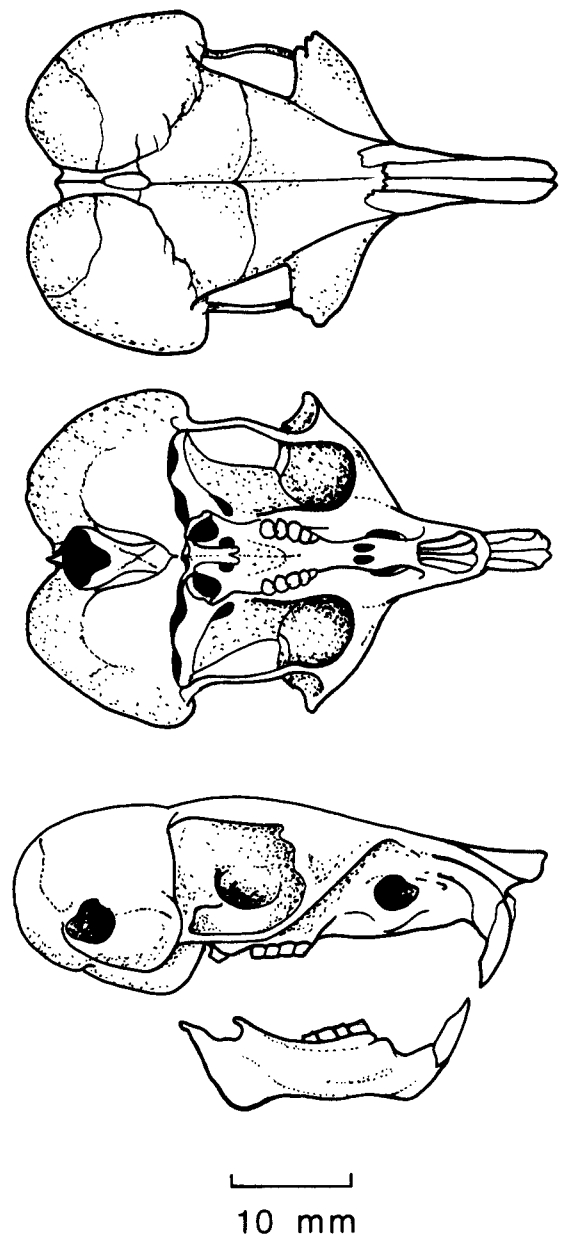

FIG. 1. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of *Dipodomys gravipes* (modified from Best, 1978).

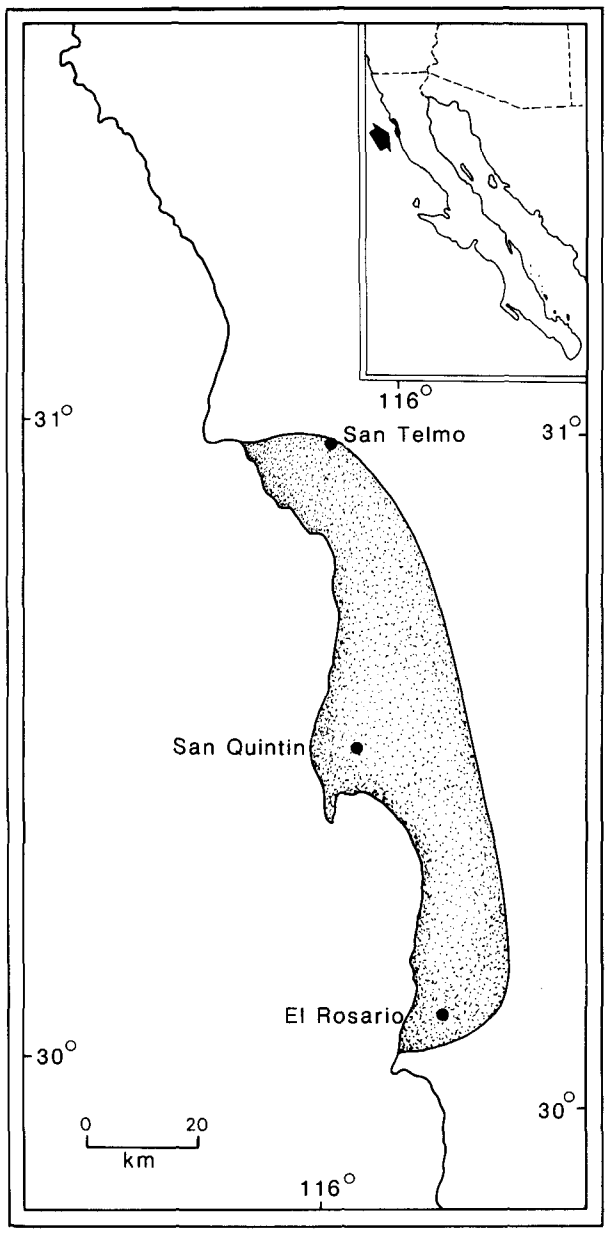

FIG. 2. Geographic distribution of *Dipodomys gravipes* in Baja California, Mexico. The inset shows the location of the range in relationship to southwestern North America.

extending about 20 km eastward from the Pacific Ocean (Fig. 2). The southern populations of *D. gravipes* near El Rosario may be geographically isolated from the northern populations (Best, 1983*a*). The elevational distribution is from sea level to about 30 m. No fossils of *D. gravipes* are known.

FORM AND FUNCTION. Except for the external and cranial features already described and in the cited references, little has been reported on form or physiology of *D. gravipes*. The baculum was described by Lackey (1967) and later illustrated and analyzed statistically by Best (1981) and Best and Schnell (1974). Representative bacula are depicted in Fig. 3. Bacular measurements (mm) for a sample of 21 specimens of *D. gravipes* are: length, 12.8; width of base, 1.6; height of base, 2.1 (Best, 1981). The interparietal bone showed considerable variation among the three specimens studied by Beer (1965); one was similar to that found in most other species of kangaroo rats (type B), one was found in 8 of 21 other species examined (type F), and one was considered "aberrant."

ONTOGENY AND REPRODUCTION. Nothing has been published regarding the ontogeny or reproduction of *D. gravipes*.

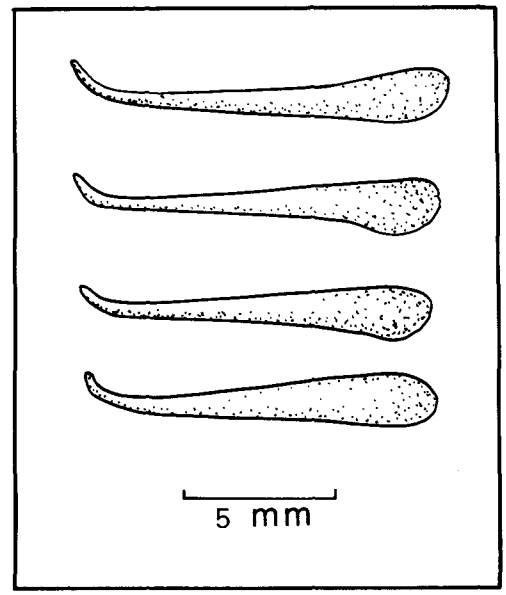

FIG. 3. Lateral views of representative bacula of *Dipodomys gravipes* from 6 mi E El Rosario, Baja California.

However, among 138 specimens examined by Best (1983*a*), 28 were classified as subadults according to the age determination criteria of Best and Schnell (1974). The months of capture of the subadults were: March, 5 specimens; April, 2; June, 7; July, 3; August, 1; November 1; December, 9. This implies that young are

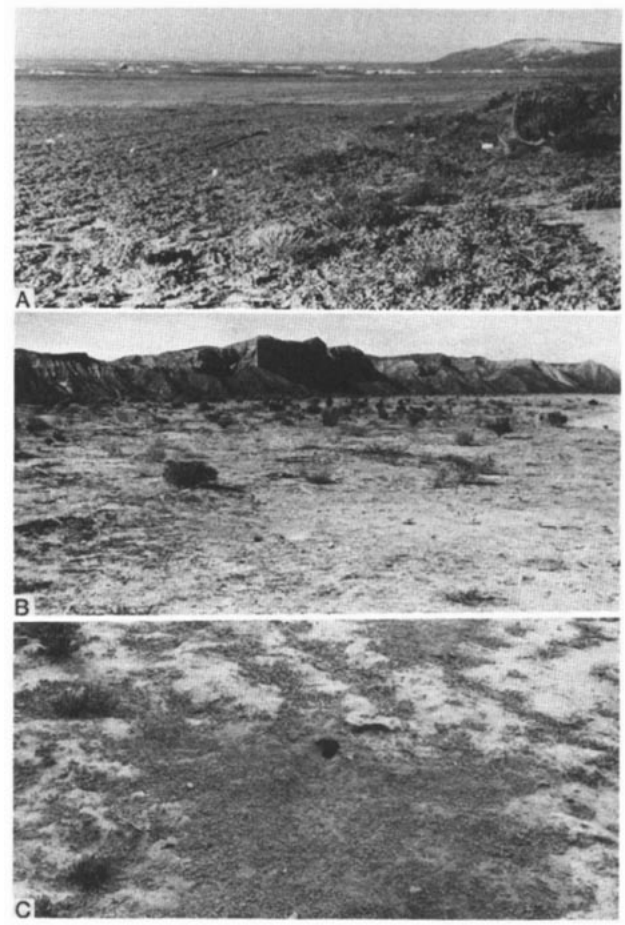

FIG. 4. Habitat of *Dipodomys gravipes* 8.5 mi N San Quintín (A), 6 mi E El Rosario (B), and a typical burrow entrance (C) in 1972. In June 1980 all of these areas were cropland.

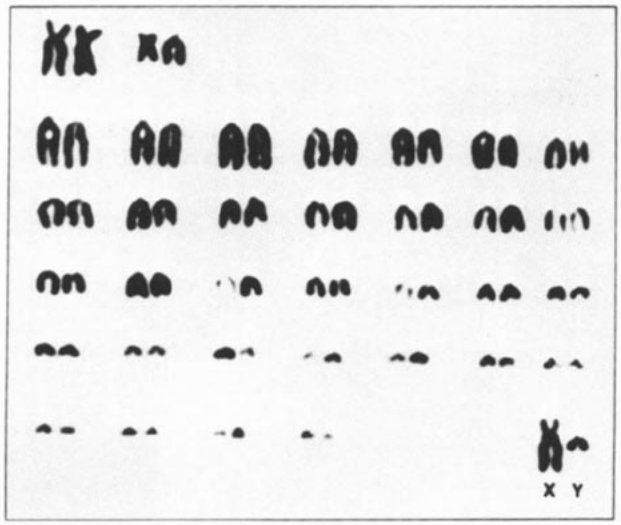

FIG. 5. Representative karyotype of a male *Dipodomys gravipes* (from Hsu and Benirschke, 1975).

born during several months of the year, but the peaks appear to be in winter and spring.

ECOLOGY AND BEHAVIOR. Huey (1925) described the type locality of *D. gravipes* as "cactus-covered slopes" at "the entrance of the Santo Domingo River canyon from the coastal plain." Other than data on burrow characteristics (Best, 1976), the remainder of the published observations on the ecology of this species was presented by Best (1983*a*), and is summarized here. Populations of *D. gravipes* found to the north of El Socorro occur on the San Quintín Plain and on contiguous areas with short vegetation and little topographic relief (Fig. 4A). The southern populations inhabit the floodplain of the Arroyo del Rosario, a relatively flat area bordered by mesas and hills (Fig. 4B). Throughout the range of *D. gravipes*, habitats having greater elevation and denser vegetation are occupied by *D. agilis*, although *D. agilis* occasionally was found on lower areas. A similar ecologic relationship was reported for *D. agilis* and *D. stephensi* in southern California (Lackey, 1967).

Goldman and Moore (1946) listed *D. gravipes* as a characteristic mammal of their California Biotic Province. The northern part of the range of *D. gravipes*, together with most of the Arroyo del Rosario, is included within the San Diegan Faunal District and the Upper Sonoran Life Zone of Nelson (1922: Plate 32), and the southern localities are within the Lower Sonoran Life Zone. In the biogeographic districts described by Brown and Lowe (1980), the northern localities of *D. gravipes* fall within the boundaries of the Californian Coastalscrub of the Scrub Formation, whereas the southern localities are in the Vizcaíno Subdivision of the Desertscrub Formation. The southern population in the region of El Rosario, therefore, seems to be isolated to some degree from the northern populations in terms of geography and habitat. Best (1983*a*) postulated that both factors may have contributed significantly to the development of morphologic differences observed between northern and southern populations.

Best (1976) presented data for six burrows 8.5 mi N San Quintín (Fig. 4C) and for four burrows 6 mi E El Rosario excavated during the summer of 1972. Mean values of measurements (cm) were: height of opening, 8.4 (San Quintín), 6.0 (El Rosario); width of opening, 7.6, 6.9; number of openings per burrow system, 4.7, 1.8; greatest depth of the system, 39.8, 49.5; average depth of the system, 29.2, 32.8; number of nests, 3.3, 1.5; average depth of nests, 31.6, 25.8; average diameter of main burrow, 8.7, 8.0; average diameter of side burrows, 8.2, 8.9; average length of side burrows, 40.2, 41.7; number of side burrows, 24.7, 16.8; greatest length of system, 584.8, 353.8; greatest width of system, 318.5; 280.0; number of food caches, 10.7, 9.0; average depth of food caches, 29.2, 37.4. There were no burrows located under vegetation and the only burrow having a mound was located 6 mi E El Rosario.

Dipodomys gravipes largely has been eliminated from most of its native range during the past decade by extensive cultivation (Best, 1983*a*). The species apparently possesses a high affinity for flat land and a lack of tolerance to cultivation.

Stout and Duszynski (1983) examined one *D. gravipes* and found it to be infected with the protozoan parasite, *Eimeria scholtysecki*. No ectoparasites have been reported.

Dipodomys gravipes is nocturnal and occupies flatland habitat as already noted. Stock (1974) mentioned that males of *D. gravipes* were attacked by estrous females of *D. agilis* when placed together.

GENETICS. The karyotype (Fig. 5) consists of a diploid number of 70 chromosomes and a fundamental number of 71. According to Stock (1974) there are 1.5 pairs of submetacentric and 32.5 pairs of telocentric chromosomes in the autosomal complement. The X-chromosome is submetacentric and the Y-chromosome is telocentric. Hatch et al. (1976) examined the distribution of DNA buoyant density fractions for *D. gravipes*. No other genetic data are available.

REMARKS. Huey (1925) placed *D. gravipes* in the *heermanni* group and later (Huey, 1951) emphasized the close resemblance between this species and *D. stephensi*; placement in the *heermanni* group was supported by Lidicker (1960). Lackey (1967) examined the relationships of *D. gravipes* and *D. stephensi* by use of bacular characters and suggested a close relationship between the two species. Best (1978, 1981) compared external, cranial, and bacular variation in *D. gravipes* with that of *D. agilis* in Baja California. Most characters exhibited overlap between the taxa, but multivariate analyses clearly separated the two species.

By use of bacular characters, Best and Schnell (1974) compared *D. gravipes* with 19 other species of kangaroo rats and found this species to cluster with *D. ordii*, *D. ingens*, *D. stephensi*, *D. heermanni*, *D. elator*, and *D. ornatus*. Stock's (1974) karyotypic study suggested that *D. stephensi* and *D. gravipes* are closely related and that the ancestral form of the *heermanni* group of kangaroo rats may have resembled these species karyotypically and morphologically.

Schnell et al. (1978) examined 41 morphologic measurements, including 4 standard external characters, 16 characters from the skull and mandible, and 21 from the postcranial skeleton. They compared *D. gravipes* to 23 other species of kangaroo rats by various multivariate statistical procedures. *D. gravipes* was most similar to *D. elator*, *D. nelsoni*, *D. elephantinus*, and *D. venustus* in their distance phenogram and to *D. ingens*, *D. ordii*, *D. compactus*, and *D. stephensi* in their correlation phenogram.

Dipodomys is derived from the Greek words *dipodos* (two-footed) and *mys* (mouse), which refer to its enlarged hindfeet and bipedal mode of locomotion. The specific name *gravipes* is from the Latin words *gravis* (heavy) and *pes* (foot) referring to the heavy-boned hindfeet.

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