Mammals of Mexico

Edited by

Gerardo Ceballos

The most comprehensive reference on Mexico's diverse mammalian fauna

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Introductory photographic plates:
Black-tailed prairie dog (*Cynomys ludovicianus*) in the grasslands of the Janos Biosphere Reserve, Chihuahua. Photo: Gerardo Ceballos.
Free tailed-bats (*Tadarida brasiliensis*) form colonies of millions of individuals, northern Mexico. Photo: Gerardo Ceballos.
Jaguar (*Panthera onca*) in a semi-evergreen forest in Calakmul Biosphere Reserve, Campeche. Photo: Gerardo Ceballos.
Page ii Ring-tailed cat (*Bassarisus astutus*) in an oak forest, Picachos, Nuevo Leon. Photo: Marcelo Sada.
Page vi North American porcupine (*Erethizon dorsatum*) in the Janos Biosphere Reserve, Chihuahua. Photo: Rurik List.
Page ix Elk (*Cervus canadensis*) were reintroduced to the Serranias del Burro region of Coahuila in the 1960s. Photo: Gerardo Ceballos.
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Page xii Blue whale (*Balaenoptera musculus*) near Aqua Verde, Sea of Cortez, Baja. Photo: Michael Fishbach.

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Family Heteromyidae

Gerardo Ceballos and Troy L. Best

The New World family Heteromyidae is widely distributed from southern Canada to northern South America. Heteromyidae and Geomyidae (pocket gophers) are the only two families of mammals with external, fur-lined cheek pouches. The cylindrical body, muscular jaws, head, neck, and chest, short tail, and long claws on the forefeet easily distinguish geomyids from the more slender, long-tailed, and more agile heteromyids. Heteromyidae includes 60 species and 6 genera of kangaroo mice (*Microdipodops*), kangaroo rats (*Dipodomys*), spiny pocket mice (*Liomys* and *Heteromys*), and pocket mice (*Chaetodipus* and *Perognathus*; Wilson and Reeder, 2005) that generally inhabit arid deserts, but a few species occur in coniferous forests, deciduous forests, and a variety of tropical habitats. In Mexico, the family is represented by 40 species in 5 genera: *Chaetodipus*, *Dipodomys*, *Heteromys*, *Liomys*, and *Perognathus*. Of these, 13 species are endemic to the country. A few species have broad geographic distributions (e.g., *Dipodomys merriami* and *D. ordii*), most occur over relatively small areas (e.g., *Chaetodipus nelsoni* and *Perognathus merriami*), and some have small ranges (e.g., *Dipodomys insularis* and *Chaetodipus goldmani*). One species, *Dipodomys gravipes*, which occupied a small geographic range in Baja California, probably is extinct because of habitat destruction and introduction of exotic species.

Subfamily Dipodomyinae

The subfamily Dipodomyinae contains two genera (*Dipodomys* and *Microdipodomys*). Ten species of the genus *Dipodomys* are known from Mexico.

Dipodomys compactus True, 1889

Gulf Coast kangaroo rat

Vinicio J. Sosa and Claudia Álvarez A.

SUBSPECIES IN MEXICO

Dipodomys compactus compactus True, 1889

DESCRIPTION: *Dipodomys compactus* is medium in size; its tail and hind feet are shorter than those of other species of the genus. The hind feet have five toes and are much larger than the forefeet. The tail is long and ends in a brush. Because the auditory bullae are narrower, the skull is narrower than that of other species of the genus. *D. compactus* has the greatest number of chromosomes in the genus (diploid number 2n = 74; Stock, 1974). Unlike most members of the genus, its pelage is paler on the sides of the head and hind legs, apparently as an adaptation to aridity of the region where it lives (True, 1888) or to the color of the soil. The Mexican subspecies displays two variants in dorsal coloration; orange on Island Padre, Texas, and gray on barrier islands of Laguna Madre, Tamaulipas. Lower parts of the body, forelimbs, and the hind limbs are white. Sides and most of the distal part of the tail are white; upper parts are yellowish-brown. Soles of the hind feet and fronts of the ears are brownish. Ears are covered with short white or gray hairs. Whiskers are white and brownish, and nails are white (Baumgardner, 1991; Hall, 1951b; Selander et al., 1962).

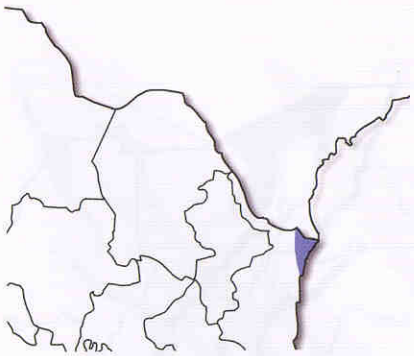
EXTERNAL MEASURES AND WEIGHT
TL = 101 to 109 mm; TV = 109 to 113 mm; HF = 34 to 37 mm; EAR = 12 to 16 mm. Weight: 44 to 60 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3, total = 20.

NATURAL HISTORY AND ECOLOGY: Little is known about the biology of this species. It is a nocturnal animal adapted to a diet comprised mostly of seeds. On barrier islands of the Laguna Madre, it coexists with land crabs that apparently outnumber them, and with other mammals such as the spotted ground squirrel (*Spermophilus spilosoma*), silky pocket mouse (*Perognathus flavus*), hispid cotton rat (*Sigmodon hispidus*), southern plains woodrat (*Neotoma micropus*), and Texas pocket gopher (*Geomys personatus*; Hall, 1951b; Selander et al., 1962). This species can be infested by nematodes that can penetrate the skull (Hall, 1951b). Little is known about its reproductive biology, but it probably reproduces in summer, as reproductively active males and females were reported in July and August (Baumgardner, 1991; Selander et al., 1962).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: This species inhabits coastal-dune vegetation. On barrier islands of Laguna Madre, *D. compactus mexicana* generally is associated with flat dunes with *Croton punctatus* and *Fimbristylis castanea*. On the western edge of the dunes, a mixture of morning glories (*Ipomoea pescaprae*), *Croton*, *Lycium carolinianum*, and velvet mesquite (*Prosopis juliflora*) is common. On stabilized dunes on the western side of the islands, common plants include cacti (*Opuntia lindheimeri*), *Gaillardia pulchella*, *Iva*, *Flaveria oppositifolia*, *Enstoma exaltatum*, and *Croton capitatus* (Selander et al., 1962). Elevational range is sea level to a few meters.

CONSERVATION STATUS: *D. compactus* is not formally listed under any category of conservation concern, although it is considered vulnerable because of its restricted distribution (Ceballos et al., 1998). Barrier islands of Laguna Madre are under increasing pressure from developments for tourism and grazing by livestock. It is likely that the status of this locally common kangaroo rat is threatened. In the future, it would be desirable to establish a protected area to ensure its conservation. A protected area in its range also would protect other potentially endangered species with marginal distributions in Mexico (Ceballos, 1999; Ceballos et al., 1998) such as eastern moles (*Scalopus aquaticus*) and Texas pocket gophers (*Geomys personatus*).



DISTRIBUTION: Most of the range is in southeastern Texas. *D. compactus* has a marginal distribution in Mexico, where it occurs only in northeastern Tamaulipas and on barrier islands of the Laguna Madre (Baumgardner and Schmidly, 1981). It has been recorded in the state of TA.

Dipodomys deserti Stephens, 1887

Desert kangaroo rat

Eric Mellink and Jaime Luévano

SUBSPECIES IN MEXICO
Dipodomys deserti deserti Stephens, 1887
Dipodomys deserti sonoriensis Goldman, 1923

DESCRIPTION: *Dipodomys deserti* is large. It is creamy white without marks in the face. Usually, the tail does not have the dark ventral stripe that characterizes other kangaroo rats and the long tail ends in a white tip. Hind feet have four toes (Hoffmeister, 1986).

EXTERNAL MEASURES AND WEIGHT
TL = 305 to 377 mm; TV = 180 to 215 mm; HF = 50 to 58 mm; EAR = 15 to 18 mm. Weight: 83 to 138 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: This species requires dry, sandy soils, which must be at least 30 cm to 50 cm deep (Hall, 1946; Hoffmeister, 1986). Openings of burrows are often at bases of creosote bushes (*Larrea tridentata*) and other species of shrubs (Jameson and Peeters, 1988). It is intolerant of members of its own species, although it may share burrows with round-tailed ground squirrels (*Spermophilus tereticaudus*) and desert cottontails (*Sylvilagus audubonii*; Hoffmeister, 1986). It is likely to live three to five years in the wild. *D. deserti* is nocturnal and crepuscular (Jameson and Peeters, 1988), but remains in its burrow when the moon is bright because it can be caught more easily by predators (Whitaker, 1980). Predators include coyotes (*Canis latrans*), foxes, American badgers (*Taxidea taxus*), snakes, and owls (Brylski, 1990d). When disturbed desert kangaroo rats rapidly strike the ground with the hind feet, producing a low-frequency drumming sound. When an unknown object is encountered, these kangaroo rats may kick sand at the object to determine if it is alive or if it is a threat (Hoffmeister, 1986). Like other species in the genus, this kangaroo rat dust-bathes in the sand to keep its pelage clean and free from grease (Hoffmeister, 1986). Its diet consists mostly of seeds, although it consumes green vegetation in winter and spring (Jameson and Peeters, 1988). It gathers seeds and carries them in large quantities to burrows, where the seeds are stored. In Arizona, two desert kangaroo rats gathered more than 10 kg of seeds in 2 nights (Lockard and Lockard, 1971). This species can reproduce all year, but usually reproduction takes place during February and June. Gestation is 29 to 32 days, the size of the litter is 1 to 6, and 1 to 2 litters are produced annually. After parturition, the mother will kick sand onto neonates, perhaps to dry them. To nurse the offspring, the female stands on her hind feet. At 2 weeks of age, the young open their eyes and begin eating solid food; they are weaned at about 3 weeks of age. Young reach the size of adults at 3 months of age (Hoffmeister, 1986).

DISTRIBUTION: The geographic range of *D. deserti* is the southwestern United States and northwestern Mexico. It inhabits areas of the Sonoran desert that are characterized by deep sandy soils from south of Hermosillo, Sonora, to near San Felipe, Baja California. It has been recorded in BC and SO.

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: The desert kangaroo rat occurs in microphyllous scrublands, with short and scattered shrubs. In Mexico, it occurs from sea level to 300 m. In the United States, it has been recorded at elevations to 1,710 masl (Hall, 1981).

CONSERVATION STATUS: Current status of populations is unknown. The size of populations probably has not changed substantially since the arrival of Europeans because the deep sandy soils where this species occurs are not desirable as agricultural croplands.

Dipodomys gravipes Huey, 1925

San Quintín kangaroo rat

Eric Mellink and Jaime Luévano

SUBSPECIES IN MEXICO
D. gravipes is a monotypic species.

DESCRIPTION: The San Quintín kangaroo rat is relatively large and has a stocky body and small ears. Males are larger than females. Individuals near El Rosario, in the southern part of the range, are slightly larger than those to the north. The underside of body, forefeet and paws, upper surface of the hind feet, and sides of hind legs are white. The rest of the body is cream-reddish in color. *Dipodomys gravipes* has white spots above the eyes and around the ears. The tail is thick and moderately long, with a black tip. The hind feet are large with five toes (Best and Lackey, 1985). Based on characteristics of the baculum (the bone in the penis) there is a close relationship with *D. stephensi* (Lidicker, 1960) and both species could be similar to the ancestral form of the *heermanni* group of kangaroo rats; the diploid number is 2n = 70 (Best and Lackey, 1985; Stock, 1974).

EXTERNAL MEASURES AND WEIGHT
TL = 312 mm; TV = 168 to 180 mm; HF = 43 to 44 mm; EAR = 11 to 16 mm.
Weight: 69 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: Little is known about the biology of this kangaroo rat (Best and Lackey, 1985). *D. gravipes* inhabits flat areas, with lowland vegetation in sandy soils. It constructs burrows that are up to 50 cm deep, with an average of 4.7 openings, which include a main tunnel and several secondary passages. On average, there are 3.3 nests in each burrow, with up to 10 food chambers. No openings to burrows are under shrubs. Although its diet has not been studied, it is likely that it is primarily made up of seeds, but green plants are consumed when available. It may be parasitized by the protozoan *Eimeria scholtysecki* (Stout and Duszynski, 1983).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: The San Quintín kangaroo rat occurs in communities of coastal xeric shrubs in alluvial soils, from sea level to about 30 m (Best and Lackey, 1985).

CONSERVATION STATUS: In 1925, when this species was described, large colonies were present. Since then, the whole area has been transformed into agricultural fields, which resulted in virtual extinction of this species (Best, 1983; E. Mellink, pers.

DISTRIBUTION: *D. gravipes* is endemic to Mexico and is known from about 1,000 km^2 along the coastal plain between San Telmo and El Rosario in the San Quintín Valley of western Baja California (Best and Lackey, 1985; Hall, 1981). It has been recorded in BC.

Dipodomys gravipes. Scrubland. San Quintin Valley, Baja California. Photo: Troy L. Best.

comm.). Ceballos and Navarro (1991) considered *D. gravipes* to be in danger of extinction and noted that the population probably did not exceed 30 individuals. The last two known colonies have disappeared (Mellink, 1992a), and intensive searches have not been successful (E. Mellink, pers. obs.). It is likely that the species is extinct. Officially, it is considered to be extinct (SEMARNAT, 2010).

DISTRIBUTION: *D. insularis* is endemic to Mexico. It occurs only on San José Island in the Gulf of California, which is north of La Paz, Baja California Sur (Hall, 1981). It has been recorded in BCS.

Dipodomys insularis Merriam, 1907

San José Island kangaroo rat

Eric Mellink and Jesús Ramírez Ruíz

SUBSPECIES IN MEXICO

D. insularis is a monotypic species.

The taxonomic status of *D. insularis* is not clear, as some authors consider it a subspecies of *D. merriami* (Best and Janecek, 1992; Williams et al., 1993a; Wilson and Reeder, 2005), while others consider it a distinct species (Best, 1993; Best and Thomas, 1991a; Merriam, 1907).

DESCRIPTION: *Dipodomys insularis* is among the smallest of kangaroo rats. *D. insularis* is distinguished from *D. merriami* by its larger ears, more robust body, and the dorsal line on the tail that is wide and dark. Dorsal color is yellow with black hairs interspersed, which gives *D. insularis* a more grayish look than *D. merriami*. Markings around the eyes are paler than the rest of the body and the ears are also pale. The skull is more triangular, the parietal plate is narrower, and the mastoid bullae are smaller than in *D. merriami* (Best and Thomas, 1991a; Hall, 1981; Merriam, 1907).

EXTERNAL MEASURES AND WEIGHT

TL = 243 to 258 mm; TV = 146 to 150 mm; HF = 38 to 40 mm; EAR = 13 to 13.5 mm. Weight: 36 to 47 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: This species occurs along bottoms of canyons and near beaches in open habitats. Associated species of mammals are the mule deer (*Odocoileus hemionus*), San José cottontail (*Sylvilagus mansuetus*), spiny pocket mouse (*Chaetodipus spinatus*), desert woodrat (*Neotoma lepida*), and ringtail (*Bassariscus astutus*; Best and Thomas, 1991a; Nelson, 1992). There are no data on diet or reproductive biology, but a juvenile was caught in May indicating that could have been born in February or March (Best and Thomas, 1991a).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: San José Island is of volcanic origin and has vegetation similar to that on the mainland, which is crassicaule scrubland, with most vegetation in arroyos between hills (Best and Thomas, 1991a). *D. insularis* occurs from sea level to a few meters in elevation (Best and Thomas, 1991a).

CONSERVATION STATUS: The San José Island kangaroo rat is an endangered species (SEMARNAT, 2010) and is vulnerable to introduction of exotic species such as feral cats.

Merriam's kangaroo rat

Reyna A. Castillo

SUBSPECIES IN MEXICO

Dipodomys merriami ambiguus Merriam, 1890
Dipodomys merriami annulus Huey, 1951
Dipodomys merriami arenivagus Elliot, 1904
Dipodomys merriami atronasus Merriam, 1894
Dipodomys merriami brunensis Huey, 1951
Dipodomys merriami llanoensis Huey, 1951
Dipodomys merriami mayensis Goldman, 1928
Dipodomys merriami margaritae Merriam, 1907
Dipodomys merriami melanurus Merriam, 1893
Dipodomys merriami merriami Mearns, 1890
Dipodomys merriami mitchelli Mearns, 1897
Dipodomys merriami olivaceus Swarth, 1929
Dipodomys merriami platycephalus Merriam, 1907
Dipodomys merriami quintinensis Huey, 1951
Dipodomys merriami semipallidus Huey, 1927
Dipodomys merriami trinidadensis Huey, 1951

DESCRIPTION: *Dipodomys merriami* is among the smallest of kangaroo rats. It has four toes on the hind feet. The tail is thin and moderately long, and ends in a tuft of hair. Dorsal color varies greatly according to subspecies, but the underside, back of the legs, supraorbital region, behind the eyes, and bands on the sides of the tail and legs are white (Lidicker, 1960). Sexual dimorphism is present and males are larger than females in several morphological characteristics (Best, 1993; Lidicker, 1960). In addition, there is geographic variation in sexual dimorphism (Best, 1993).

Dipodomys merriami. Grassland. Janos Biosphere Reserve, Chihuahua. Photo: Gerardo Ceballos.

EXTERNAL MEASURES AND WEIGHT

TL = 234 to 259 mm; TV = 135 to 161 mm; HF = 36 to 41 mm; EAR = 12 to 16 mm. Weight: 38 to 47 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: Merriam's kangaroo rat inhabits areas with large expanses of bare soil among shrubby vegetation. This habitat seems to be a limiting factor in its geographic distribution (Lidicker, 1960). It excavates burrows, generally among roots of bushes. *D. merriami* fills the opening of the burrow with soil during the day, which helps maintain a favorable microclimate. This species is not a good digger, however, and burrows are shallow and simple (Reynolds, 1958). Merriam's kangaroo rats feed mostly on seeds; those of mesquites (*Prosopis*) and cacti are especially important in their diet. Given that *D. merriami* rarely drinks water, water is derived from metabolism of carbohydrates from seeds (metabolic water). Most reproductive activity occurs from February to July, but may extend throughout the year, with the exception of October and November (Bradley and Mauer, 1971). The mating system may be polygynandrous (Randall, 1993). Mating occurs primarily between close neighbors. A female selects a male from those males that compete for her when she is in estrus (Randall, 1989, 1991b). Females in estrus select males with a familiar smell. Females recognize the scent of their neighbors and tolerate them more than strange individuals; the olfactory signals are sent by sand bathing (Randall, 1993). Locomotion is almost completely bipedal, and this kangaroo rat can reach high speeds with jumps of 2 m to 3 m in length. This species can jump backward and sideways and change direction during the leap. These skills allow *D. merriami* to avoid attacks by predators, such as owls and snakes, which cannot easily switch the trajectory of their attack (Price and Brown, 1983). Mobility is associated with a high risk of predation (Daly et al., 1990). Auditory bullae are large and the middle ear is hypertrophied, which provides excellent hearing for detection of low-frequency sounds such as those produced by approaching predators (Webster and Webster, 1971). Its life history is characterized by an average lifespan of 3.5 years, a variable but modest reproductive effort with 2 litters per year, and 2 to 3 young on average (range is 1 to 6 young). Young become sexually mature at 2 to 3 months of age (Bradley and Maurer, 1971; Daly et al., 1984; Kenagy and Bartholomew, 1985; Reynolds, 1958; Zeng and Brown, 1987). This combination of features allows this kangaroo rat to confine reproduction to favorable periods. Juveniles exhibit a high fidelity to natal areas (philopatry). There is no evidence of hibernation or estivation. Population densities in the Chihuahuan desert of Arizona had an average of 7.8 individuals/ha, but fluctuated between 3 and 15 individuals/ha (Zeng and Brown, 1987). Apparently, population densities are lower in less-productive sites. This kangaroo rat is among the key factors responsible for propagation of velvet mesquites (*Prosopis velutina*) and whitethorn acacias (*Acacia constricta*) in the Sonoran desert (Cox et al., 1993). Because of their help in propagating mesquites and acacias, they are considered problematic in establishment of grasslands.

DISTRIBUTION: *D. merriami* is among the most widely distributed species in the genus. It occurs from northern Nevada southward through most of Baja California, including Margarita and Tiburón islands. On the mainland, it occurs from Sonora to the foothills of the Sierra Madre Oriental in Nuevo León and southward into Aguascalientes and San Luis Potosí. It has been recorded in AG, BC, BS, CH, CO, DU, NL, QE, SI, SO, SL, TA, and ZA.

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: Merriam's kangaroo rat occurs in xeric scrublands, open pasturelands, and thorny forests from sea level to 2,200 m.

CONSERVATION STATUS: Current status is unknown, but *D. merriami* is locally abundant and widely distributed, which decreases threats to populations. The subspecies *D. merriami mitchelli*, which is endemic to Tiburón Island in the Gulf of California, is listed as threatened (SEMARNAT, 2010).

Nelson's kangaroo rat

Elizabeth E. Aragón

SUBSPECIES IN MEXICO

D. nelsoni is a monotypic species.

Morphologically, *D. nelsoni* is similar to *D. spectabilis cratodon* (Matson, 1980), but most morphometric studies indicate that *D. nelsoni* is a separate species. Studies using genetic variables also support its specific status (Best, 1988a; Williams et al., 1993a, b).

DESCRIPTION: *Dipodomys nelsoni* is similar and closely related to *D. spectabilis*. Both species are large, but *D. nelsoni* is smaller and the white tip of the tail is shorter than in *D. spectabilis*. Sexual dimorphism is present; females are larger than males in some morphological characteristics (Anderson, 1972; Baker, 1956; Best, 1993; Best et al., 1988; Hall, 1981; Petersen, 1978). This kangaroo rat has a large head, eyes, and hind feet, a short neck, and a tail that is longer than the head and body (Anderson, 1972). The mastoids are large, the maxillary arch is moderate with a well-developed and strong angle, the auditory bullae are relatively large, the supraoccipital and interparietal are small, and the external opening of the auditory meatus is oval (Nader, 1978). Coloration is dark brownish-buffy, more intense on the sides, with reddish shades. The upper surface of the distal one-half of the tail is black and there are white lateral stripes for almost two-thirds of the length of the tail (Merriam, 1907).

EXTERNAL MEASURES AND WEIGHT

TL = 258 to 333 mm; TV = 122 to 199 mm; HF = 44 to 50 mm; EAR = 12 to 17 mm. Weight: 55 to 102 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: *D. nelsoni* inhabits open, sandy soils and rocky areas. It excavates burrows among shrubs such as creosotebushes (*Larrea*) and mesquites (*Prosopis*), and it forages along wind-blown hummocks or roadways where seeds dispersed by wind accumulate (Best, 1988a; Best et al., 1988). Burrows contain caches of seeds and leaves (Grenot and Serrano, 1982; Serrano, 1987). Burrows are within mounds that average 2.7 m in diameter and 0.6 m high; they have 1 to 6 openings often interconnected with tunnels. In bare soil, these mounds cover a radius of 3 m to 7 m. Only one to two individuals inhabit each mound (Baker, 1956; Baker and Greer, 1962; Matson and Baker, 1986). Nelson's kangaroo rats are granivores, but also feed on plant material and insects. They can be opportunistic but often select beans of mesquites (*Prosopis*); 75% of stored food within burrows is pods of this legume (Grenot and Serrano, 1980). Reproduction occurs throughout the year, although there is a peak during April–September. The average size of a litter is two, with a range two to three offspring (E. Aragon, pers. obs.; Best, 1988a). In Mapimi, Durango, population density was 8.5 to 28 individuals/ha in 1978 and 1979 (Serrano, 1987). Abundance varies according to habitat, with up to 6 individuals/ha in areas dominated by magueys, cacti, and shrubs, and up to 3 individuals/ha in grasslands (Rogovin et al., 1991). Annual movements cover 40 m to 180 m and activity areas are 0.52 ha to 1.56 ha annually (Grenot and Serrano, 1982).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: This kangaroo rat occurs in xeric scrublands, thorny forests, and open pasturelands. It lives in areas with thorny vegetation, such as *Larrea tridentata*, *Agave asperrima*, *Opuntia rastrera*, *Cordia*

DISTRIBUTION: *D. nelsoni* is a species endemic to Mexico; its distribution is restricted to the northern part of the Chihuahuan desert from Chihuahua into Nuevo León (Anderson, 1972). *D. nelsoni* has been recorded in CH, CO, DU, NL, SL, and ZA.

greggi, *Acacia*, *Prosopis*, *Fouqueria splendens*, *Yucca*, *Myrtillocactus geometrizans*, *Suaeda*, and *Hilaria mutica*, as well as in areas denuded of vegetation. *D. nelsoni* occurs 549 masl to 2,100 masl.

CONSERVATION STATUS: In Mexico, the species has not been included on any list needing protection (SEMARNAT, 2002). Because *D. nelsoni* is an endemic species with a restricted distribution, however, its current status should be evaluated to determine if it is at risk.

Dipodomys ordii Woodhouse, 1853

Ord's kangaroo rat

Gisselle Oliva Valdés

SUBSPECIES IN MEXICO
Dipodomys ordii durranti Setzer, 1949
Dipodomys ordii extractus Setzer, 1949
Dipodomys ordii obscurus (J.A. Allen, 1903)
Dipodomys ordii ordii Woodhouse, 1853
Dipodomys ordii palmeri (J.A. Allen, 1881)
Dipodomys ordii pullus Anderson, 1972

DESCRIPTION: *Dipodomys ordii* is a medium-sized kangaroo rat. The hind feet have five toes, which distinguish *D. ordii* from *D. merriami* and *D. phillipsii*. The tail is short, hairy, dark-colored dorsally, and white ventrally, ending in a brush. Hair is long, silky, and brown, reddish or blackish depending on the subspecies, but with the abdomen and dorsal surfaces of the hind feet always white. Auditory bullae are 14.6 mm to 16.7 mm across (Garrison and Best, 1990; Hall, 1981; Jones, 1985; Whitaker, 1980).

Dipodomys ordii. Grassland. Janos Biosphere Reserve, Chihuahua. Photo: Gerardo Ceballos.

EXTERNAL MEASURES AND WEIGHT
TL = 208 to 281 mm; TV = 100 to 163 mm; HF = 35 to 40 mm; EAR = 12 to 16 mm. Weight: 50 to 96 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: Ord's kangaroo rats are nocturnal, active throughout the year, solitary, and territorial (Ceballos and Galindo, 1984; Eisenberg, 1963; Garrison and Best, 1990). Males are more active than females. They build burrows in sandy soils. They are mainly granivores, but they also may include plant materials and small insects in the diet. They consume seeds of many species of grasses, weeds, and shrubs. Reproduction occurs in spring and summer (Flake, 1974; Hall, 1946; Johnston, 1956). The size of the litter is 1 to 6 young, which are born after a gestation of 28 to 32 days (Day et al., 1956; Duke, 1944; Hall, 1946)

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: This kangaroo rat is associated with grasslands and a variety of xeric scrublands; they are occasionally found in oak forests (Bailey, 1930; Blair, 1943; Hall, 1946; Hallett, 1982). *D. ordii* occurs from 660 masl to 2,025 masl.

CONSERVATION STATUS: The current status of this species in Mexico is unknown. Due to the broad distribution of *D. ordii* and because it often inhabits regions with little disturbance by humans, it is considered not to be at risk.

DISTRIBUTION: *D. ordii* is distributed from the high plains of southern Canada into Hidalgo in central Mexico (Baumgardner and Schmidly, 1981; Garrison and Best, 1990; Hall, 1981; Setzer, 1949). *D. ordii* has been recorded in AG, CH, CO, DU, GJ, HG, JA, NL, QE, SL, SO, TA, and ZA.

Dipodomys phillipsii Gray, 1841

Phillips' kangaroo rat

Gisselle Oliva Valdés

SUBSPECIES IN MEXICO
Dipodomys phillipsii oaxacae Hooper, 1947
Dipodomys phillipsii ornatus Merriam, 1894
Dipodomys phillipsii perotensis Merriam, 1894
Dipodomys phillipsii phillipsii Gray, 1841

DESCRIPTION: *Dipodomys phillipsii* is medium in size. It has four toes on the hind feet; the tail is relatively long, dorsally dark, and white on the bottom. The tip of the tail is usually white, but may be black. Auditory bullae are relatively small, the skull is flattened, the jaw is wide, the post-rostral region is square, the maxillary plate is protected at the second and third molars, and the face is relatively narrow. Dorsal coloration varies from brownish-orange to dark cinnamon with interspersed black hairs (Genoways and Brown, 1993; Genoways and Jones, 1971; Hall, 1981; Jones and Genoways, 1975).

EXTERNAL MEASURES AND WEIGHT
TL = 230 to 304 mm; TV = 149 to 192 mm; HF = 36 to 45 mm; EAR = 12 to 16 mm. Weight: 53 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

Dipodomys phillipsii. Scrubland. Valle del Oriental, Totalco, Veracruz. Photo: Gerardo Ceballos

NATURAL HISTORY AND ECOLOGY: Burrows of this species are built in open areas or near bases of shrubs. Each burrow has several openings with a slight slope. *D. phillipsii* is nocturnal, and its diet is seeds, leaves, and seedlings. In places where there is no available water for drinking, they derive metabolic water from plant material that they consume. Data on reproductive biology are scarce; young may be present through most of the year (except April, August, and November), which indicates a long period of reproduction (Genoways and Jones, 1971; Jones and Genoways, 1975). Each litter contains one to six young (Ceballos and Galindo, 1984).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: Phillips' kangaroo rat inhabits arid areas with sandy soil where dominant vegetation may be grasslands or xeric shrubs (Davis, 1944; Hall and Dalquest, 1963; Jones and Genoways, 1975). Elevational distribution varies from 950 m in Oaxaca to 2,850 masl in Veracruz (Jones and Genoways, 1975).

CONSERVATION STATUS: Little is known about the current status of populations. Probably they are not in danger of extinction. Some populations, however, such as those in the Valley of Mexico and in Oaxaca, are threatened by destruction of their habitat (Ceballos and Galindo, 1984). It is considered as of Special Protection (SEMARNAT, 2010).

DISTRIBUTION: *D. phillipsii* is endemic to Mexico. It occurs in highlands from central Durango into northern Oaxaca (Jones and Genoways, 1975; Ramírez-Pulido et al., 1983). It has been recorded in DF, DU, GJ, HG, JA, MX, OX, PU, QE, SL, TL, VE, and ZA.

Dipodomys simulans (Merriam, 1904)

Dulzura kangaroo rat

Gisselle Oliva Valdés and Edmundo Huerta Patricio

SUBSPECIES IN MEXICO

Dipodomys simulans peninsularis (Merriam, 1907)

Dipodomys simulans simulans (Merriam, 1904)

This species was considered a subspecies of *D. agilis*. Morphometric and genetic stud-

ies, however, have shown they are different species (Best, 1983; Sullivan and Best, 1997). All subspecies of *D. agilis* in Mexico and *D. paralius* are synonyms of *D. simulans simulans* (Best, 1983; Patton and Álvarez-Castañeda, 1999; Sullivan and Best, 1997).

DESCRIPTION: *Dipodomys simulans* is medium in size; its dorsal coloration is dark brown, and the ventral surface is white. The tail is hairy with a dark line in the lower surface that extends to the tip. The ears are small (> 16 mm) and they have 5 toes with claws on each foot (Hall, 1981; Whitaker, 1980; Williams et al., 1993). They usually move by bipedal locomotion, as the hind feet are much longer than the forefeet and aid in hopping locomotion (Álvarez, 1960). The maxillary processes of *D. similans* are broad and thick, and those of *D. gravipes* are narrower and thinner (Álvarez, 1960). The width of the skull between maxillary arches is less than 55% of the total length of the skull (Williams et al., 1993a), the size of the baculum (bone in the penis) is less than 9.40 mm (Best, 1981), and the diploid number of chromosomes is 2n = 60 (Best et al., 1986). Unlike *D. ordii*, the forefeet are less than 43 mm and length of the skull is up to 39.6 mm (Álvarez, 1960).

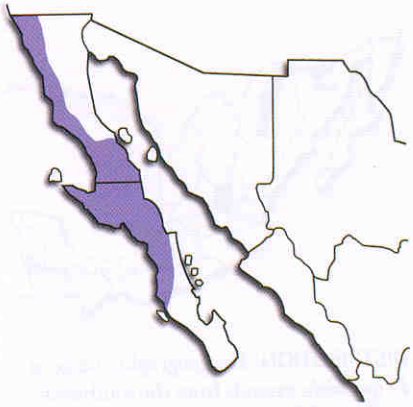
EXTERNAL MEASURES AND WEIGHT
TL = 265 to 319 mm; TV = 155 to 203 mm; HF = 43 to 46 mm; EAR = 12 to 16 mm. Weight: 45 to 77 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: The Dulzura kangaroo rat occurs in arid or semi-arid plains with clay and sandy soils, and in extreme deserts where water is scarce (Álvarez, 1960; Best, 1981; Williams et al., 1993a). It is nocturnal and solitary. Adults generally define territories and defend their burrows. Females maintain and defend their territories and those of other females during the reproductive season (Jones, 1993). It probably is similar to other species of the genus with gestation lasting 27 to 30 days and the size of the litter being 2 to 3 offspring (Jones, 1993). It feeds on seeds collected and carried in its external cheek pouches (Álvarez, 1960).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: This species mainly inhabits xeric scrublands, grasslands, and coastal chaparral. Occasionally, it occupies forests of pine-oak and fir (Lackey, 1967; Williams et al., 1993a). It occurs from 810 masl to 2,250 masl (Hall, 1981).

CONSERVATION STATUS: This species is not included in any list of conservation concern (Ceballos et al., 2002). Although its range is increasingly impacted by humans, it appears abundant and has a relatively broad geographic distribution.



DISTRIBUTION: *D. simulans* occurs from southern California in the United States and northwestern Mexico, across the Sierra de San Pedro Mártir, the Vizcaino desert, and on to the Magdalena Plain in Baja California Sur (Álvarez-Castañeda and Patton, 1999; Best, 1983; Hall, 1981; Sullivan and Best, 1997). It has been recorded in BC and BS.

Dipodomys spectabilis Merriam, 1890

Banner-tailed kangaroo rat

Gisselle Oliva Valdés

SUBESPECIES IN MEXICO
Dipodomys spectabilis cratodon Merriam, 1907
Dipodomys spectabilis intermedius Nader, 1965
Dipodomys spectabilis perblandus Goldman, 1933

DISTRIBUTION: The geographic range of *D. spectabilis* extends from the southwestern United States into northern Mexico, where it has two separate populations, one in Sonora and Chihuahua, and another in Aguascalientes and San Luis Potosí (Best, 1988b; Goldman and Moore, 1946). It has been recorded in AG, CH, SO, SL, and ZA.

Dipodomys spectabilis spectabilis Merriam, 1890
Dipodomys spectabilis zygomaticus Goldman, 1923
Nader (1978) considered *D. nelsoni* a subspecies of *D. spectabilis*, but most authors have not accepted such an arrangement (Best, 1988b; Williams et al., 1993a).

DESCRIPTION: *Dipodomys spectabilis* is among the largest species in the genus. The tail is long and covered with short hairs, and in its distal part the hair is long and forms a brush. Dorsal coloration is pale orange-brown mixed with some black hairs that are paler in the middle. Dorsal and lateral sides of the hind feet, lateral lines, tip of the tail, and supraorbital and postauricular spots are white. Proximally, the tail is dark gray and progressively becomes black or almost black just before the long, white tip. The white lateral lines that stem from the suborbital spots narrow gradually to the middle of the tail and disappear in the terminal part. Juveniles are grayish, almost nut-brown colored and slightly paler on the hind feet (Dalquest, 1953; Nader, 1978). Auditory bullae are large and the auditory system is highly specialized (Best, 1988b).

EXTERNAL MEASURES AND WEIGHT
TL = 310 to 349 mm; TV = 180 to 208 mm; HF = 47 to 51 mm; EAR = 9 to 18 mm. Weight: 97 to 170 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: These are solitary animals (Randall, 1986). Mating occurs February to April. Males frequently visit neighboring burrows of adult females in spring and summer. Gestation is 22 to 27 days (Bailey, 1931; Jones, 1984). They are mainly granivores and store large quantities of seeds in their underground burrows, which may be more than 50 cm deep (Reichman et al., 1985; Vorhies and Taylor, 1922). In San Luis Potosí, it occupies open areas where the soil is deep and sandy (Dalquest, 1953a). It has numerous attributes that allow it to survive in arid regions; for example, the urine is concentrated and alkaline; they consume seeds, stems, and leaves of succulent plants; and their burrows provide shelter from high temperatures on the surface and a subterranean environment that is cool and humid to prevent loss of water (Best, 1988b; Vorhies and Taylor, 1922). Its main predators are the American badger (*Taxidea taxus*), red fox (*Vulpes vulpes*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), and owls (*Bubo virginianus*, *Tyto alba*). They are eaten by humans in some regions of San Luis Potosí (Mellink et al., 1986)

Dipodomys spectabilis. Grassland. Janos Biosphere Reserve, Chihuahua. Photo: Gerardo Ceballos.

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: Banner-tailed kangaroo rats live in xeric vegetation and grasslands with shrubs. The vegetation in northern Sonora is dominated by mesquites (*Prosopis*) and pasturelands dominated by grasses of the genera *Aristida* and *Bouteloua* (Dice and Blossom, 1937; Monson, 1943; Vorhies and Taylor, 1922). It occurs from 570 m in Sonora to 2,100 masl in Zacatecas.

CONSERVATION STATUS: This species faces no significant threat because of its use of disturbed areas and its wide geographic distribution.

Subfamily Heteromyinae

The subfamily Heteromyinae contains two genera (*Heteromys* and *Liomys*) with seven species known from Mexico.

Heteromys desmarestianus Gray, 1868

Desmarest's spiny pocket mouse

Iván Castro Arellano and Mery Santos G.

SUBSPECIES IN MEXICO
Heteromys desmarestianus desmarestianus Gray, 1868
Heteromys desmarestianus goldmani Merriam, 1902
Heteromys desmarestianus temporalis Goldman, 1911
Although Rogers and Schmidly (1982) considered *H. goldmani* different from *H. demarestianus*, Rogers (1990) detected no difference between the two species, hence considering *goldmani* a subspecies of *demarestianus*.

DESCRIPTION: *Heteromys desmarestianus* is a large spiny pocket mouse. Dorsal coloration is gray, with guard hairs that are orangish-brown. The underside is white and a lateral line occasionally is present but never prominent. The tail is longer than the head and body, almost naked, dark dorsally, and white ventrally. The skull is large and the bullae are small (Goldman, 1911; Hall, 1981; Williams et al., 1993a). Based on genetic, chromosomal, and morphological features, populations of *H. desmarestianus* in Mexico can be separated into two groups (Rogers, 1990).

EXTERNAL MEASURES AND WEIGHT
TL = 255 to 347 mm; TV = 130 to 199 mm; HF = 31 to 42 mm; EAR = 15 to 23 mm. Weight: 61 to 83 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: Desmarest's spiny pocket mouse builds burrows, which may contain food-storage chambers (Fleming, 1974). Population density varies considerably in space and time. For example, within one year at Tuxtlas, Veracruz, there were 2 to 50 individuals/ha, with an average of 21 individuals/ha

DISTRIBUTION: *H. desmarestianus* occurs from southern Veracruz and Tabasco, Oaxaca, Chiapas, and south of the Yucatan Peninsula, to northern Colombia (Hernández-Huerta et al., 2000, Jones et al., 1974a; Patton, 1993a; Williams et al., 1993a). It has been recorded in CA, CS, OX, QR, TB, VE, and YU.

(Sánchez-Cordero, 1993). In Costa Rica, density was 10 to 18 individuals/ha and activity areas were 1,060 m^2 for males and 883 m^2 for females (Fleming, 1974). Gestation lasts 28 days. Females are polyestric and may have up to 5 litters per year. Sexual maturity is reached at about 8 months of age in males and 8.6 months of age in females (Fleming, 1974). Breeding season at Tuxtlas, Veracruz, is 8 months with 2 litters per year and 3 offspring per litter (Sánchez-Cordero, 1993). In Costa Rica, the breeding season covers 9 months (July–March), with 3 litters and an average of 3 offspring per litter (Fleming, 1974). Maximum lifespan is about 2 years (Sánchez-Cordero, 1993). It is mainly granivorous, but it also consumes seeds and fruits of trees and shrubs such as palm chocho (*Astrocaryum mexicanum*), *Bactris tricophylla*, ramón (*Brosimum alicastrum*), guazumo (*Cecropia obtusifolia*), palm camedor (*Chamaedora tepejilote*), *Cymbopetalum baillonii*, amate (*Ficus yoponensis*), *Guarea glabra*, *Nectandra ambigens*, *Pentaclethra macroloba*, *Pithecellobium*, *Pleuranthodendron mexicana*, *Poulsenia armata*, *Pseudolmedia oxyphylaria*, *Psychotria*, *Pterocarpus*, *Rauwolfia tetraphylla*, *Sapindus*, *Socratea durissima*, *Spondias*, *Vatairea*, *Virola sebifera*, *Turpina occidentalis*, and *Welfia georgii* (Fleming, 1974; Martínez-Gallardo and Sánchez-Cordero, 1993; Sánchez-Cordero and Fleming, 1993). Of these species, *P. armata*, *C. baillonii*, *B. alicastrum*, *N. ambigens*, and *A. mexicanum* have a high dietary preference by captive individuals (Martínez-Gallardo and Sánchez-Cordero, 1993). Villa-R. (1948) captured two animals whose cheek pouches were filled with leaves of herbaceous plants. They have numerous parasites such as mites, fleas, protozoans, and phoretic moths (Whitaker et al., 1993). Predators include the big-eared woolly bat *Chrotopterus auritus* (Medellín, 1988), coyotes (*Canis latrans*), tayras (*Eira barbara*), skunks, white-nosed coatis (*Nasua narica*), long-tailed weasels (*Mustela frenata*), opossums (*Didelphis*), ocelots (*Leopardus pardalis*), owls (*Ciccaba virgata*, *Tyto alba*), hawks (*Leucopternis semiplumbea*), boas (*Boa constrictor*), and other snakes, including *Spilotes pullatus* and *Bothrops atrox* (Fleming, 1974; Sánchez-Cordero and Fleming, 1993).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: This species is associated with tropical rainforests, coffee plantations, and agricultural crops at 45 masl to 1,860 masl (Hall and Dalquest, 1963; Jones et al., 1974a; Rogers and Schmidly, 1982; Villa-R., 1948; Williams et al., 1993a).

Heteromys desmarestianus. Cloud forest. Photo: Gerardo Ceballos.

CONSERVATION STATUS: This species is abundant in natural and disturbed environments; hence it is not at risk.

Heteromys gaumeri J.A. Allen and Chapman, 1897

Gaumer's spiny pocket mouse

Ma. de Lourdes Romero and Cornelio Sánchez H.

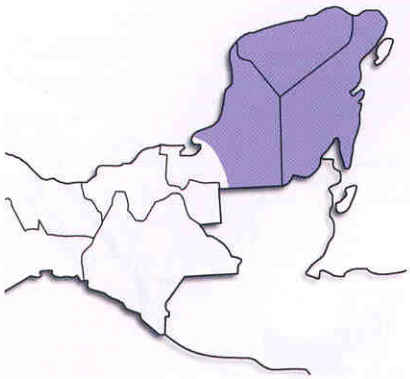
SUBSPECIES IN MEXICO

H. gaumeri is a monotypic species.

Apparently, this species could represent a branch of early lineage that leads to *Heteromys*. It is so different that it could be removed from the *desmarestianus* group and placed into a separate subgenus (Allen and Chapman, 1897; Engstrom et al., 1987; Genoways, 1973).

DESCRIPTION: *Heteromys gaumeri* is medium in size for the genus. Dorsal coloration varies from dark brownish to gray, mixed in large proportion with orange hair, which gives it an orange-brown appearance. It has a wide lateral line, bright and ochre-colored, which extends from the cheek pouches to the base of tail. The underside and legs are white; the tail is bicolored and covered with brownish-gray hair on top and whitish on the bottom. The hair on the tip of the tail ends in a brush. Ears are dark, with the edges slightly white. The back of the body is covered with two types of hair, one soft and another that is stiff and spiny. The feet have six plantar tubers and there is hair on their underside (Genoways, 1973; Goldman, 1911). The baculum (bone in the penis) has a wide base that is about one-third of its total length (Burt, 1960). Unlike other species of the genus, it has hair on soles of the hind feet, which are naked in the other species (Genoways, 1973; Goldman, 1911).

Heteromys gaumeri. Tropical semi-green forest. Caret, Quintana Roo. Photo: Jesús Pacheco.



DISTRIBUTION: *H. gaumeri* is restricted to the Yucatan Peninsula in southeastern Mexico, to El Peten in Guatemala, and to northern Belize (Engstrom et al., 1987). In Mexico, it is sympatric with *H. desmarestianus* on the southern part of the Yucatan Peninsula (Dowler and Engstrom, 1988; Engstrom et al., 1987; Jones et al., 1974a). It has been recorded in CA, QR, TB, and YU.

EXTERNAL MEASURES AND WEIGHT

TL = 250 to 302 mm; TV = 129 to 193 mm; HF = 30 to 34 mm; EAR = 14 to 16 mm. Weight: 43 to 70 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: Gaumer's spiny pocket mouse feeds on seeds. *Ipomoea* has been found in the pouches (Hatt and Villa-R., 1950). Reproductive activity begins almost at the end of the dry season, continuing in the rainy season, and probably extending to the end of January. Apparently, there is asynchrony in reproduction (Schmidt et al., 1989). The size of litters is two to four offspring (Birney et al., 1974; Genoways, 1973). Four pregnant females were observed at the end of April and early May (Birney et al., 1974), another female had two embryos in October (Hatt, 1938), and another was pregnant in December (Genoways, 1973). None of seven females collected in July in Tabasco were pregnant, but some males in the same population had scrotal testes (Dowler and Engstrom, 1988).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: Gaumer's spiny pocket mice occur in tropical subperennial and subdeciduous habitats in the southeastern Yucatan Peninsula, and in tropical deciduous forests and thorny shrubs in the north and northwestern sections of the peninsula. It is common in agricultural areas and in the herbaceous vegetation along roads and sugarcane fields (Engstrom et al., 1987; Schmidt et al., 1989). It inhabits elevations from sea level to 100 m.

CONSERVATION STATUS: There is no precise information on current status. Because of its wide distribution and its resistance to disturbance, however, this species is not at risk of extinction.

Heteromys nelsoni Merriam, 1902

Nelson's spiny pocket mouse

Ma. de Lourdes Romero and Cornelio Sánchez H.

SUBSPECIES IN MEXICO

H. nelsoni is a monotypic species.

In his assessment of genetic and enzymatic data, Rogers (1989, 1990) suggested that the species is more similar to some species of the *desmarestianus*-group than to *H. oresterus*, and that its position within the subgenus *Xylomys* is doubtful.

DESCRIPTION: *Heteromys nelsoni* is the largest species of the genus. The back of the body is dark gray to blackish, darker along the middle part; the belly, lips, and cheek pouches are white, the external parts of the hind feet and forefeet are dark gray; they have no lateral line; the tail is bicolored except at the tip, which is blackish on top and whitish on the bottom (Goldman, 1911; Merriam, 1902; Williams et al., 1993a). Compared to other species of the genus, the hair is long, thin, and soft (Homan and Genoways, 1978). The ears are long, dark, almost without hair and do not have a whitish edge. The hind feet have six plantar tubers. The tail is longer than the length of head and body and is almost naked (Goldman, 1911; Merriam, 1902). The skull is long, thin, high, rather smooth, and rounded (Merriam, 1902; Rogers and Rogers,

1992; Williams et al., 1993a). The diploid number of chromosomes is 2n = 42, with a fundamental number of FN = 72 (Rogers, 1989). It is distinguished from other species of the genus in Mexico because the coat in adults has soft bristles, while in other species the coat is spiny (Williams et al., 1993a).

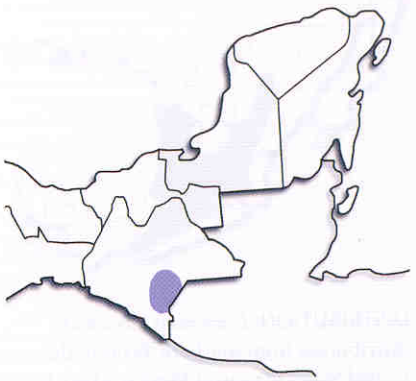
EXTERNAL MEASURES AND WEIGHT
TL = 328 to 356 mm; TV = 174 to 211 mm; HF = 39 to 44 mm; EAR =19 to 23 mm. Weight: 60 to 110 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: Nelson's spiny pocket mouse occurs in humid environments, with abundant vegetation, mosses, and ferns. It probably reproduces in late winter and early spring. Of five males observed in mid-December, four had scrotal testes 21 mm to 26 mm in length, and the fifth was a subadult; also in December, a subadult female was present. In February, a post-lactating adult female was recorded (Rogers and Rogers, 1992). *H. nelsoni* is sympatric with *Peromyscus boylii*, *P. guatemalensis*, *Reithrodontomys mexicanus*, and *R. tenuirostris* (Rogers and Rogers, 1992).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: *H. nelsoni* occupies only cloud forests that are 2,500 masl to 2,850 masl.

CONSERVATION STATUS: Although *H. nelsoni* is considered as of Special Protection (SEMARNAT, 2010), the lack of records possibly is due to the scarcity of studies conducted in cloud forests within its geographic range.



DISTRIBUTION: *H. nelsoni* has a limited distribution, living in the southeastern part of Chiapas and eastern Guatemala (Goldman, 1911; Rogers and Rogers, 1992; Williams et al., 1993b). It has been recorded in CS.

Liomys irroratus (Gray, 1868)

Mexican spiny pocket mouse

Leticia A. Espinosa and Catalina Chávez Tapia

SUBSPECIES IN MEXICO
Liomys irroratus alleni (Coues, 1881)
Liomys irroratus bulleri (Thomas, 1893)
Liomys irroratus guerrerensis Goldman, 1911
Liomys irroratus irroratus (Gray, 1868)
Liomys irroratus jaliscensis (J.A. Allen, 1906)
Liomys irroratus texensis Merriam, 1902
Liomys irroratus torridus Merriam, 1902

DESCRIPTION: *Liomys irroratus* is a medium-sized mouse, and as in other heteromyids, it has a pair of external cheek pouches. Its coat is grayish-brown in the back with a tenuous and pale lateral stripe of pink to buffy yellow coloration. The abdomen is white. Hind feet have only five pads (Dowler and Genoways, 1978; Hall, 1981).

EXTERNAL MEASURES AND WEIGHT
TL = 194 to 300 mm, TV = 95 to 169 mm, HF = 22 to 36 mm; EAR = 12 to 15 mm. Weight: 34 to 50 g.

DISTRIBUTION: *L. irroratus* has a wide distribution from southern Texas in the United States to central Mexico, where it occurs in the eastern Sierra Madre Occidental from Chihuahua into Michoacán, from central Mexico into Oaxaca, and from Tamaulipas into Veracruz (Genoways, 1973; Ramírez and Castro, 1994; Ramírez et al., 1982; Wilson and Reeder, 2005). It has been recorded in AG, CH, DF, DU, GJ, GR, HG, JA, MI, MO, MX, NL, NY, OX, PU, QE, SL, TA, TL, VE, and ZA.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: The Mexican spiny pocket mouse lives in rocky areas, where it builds burrows under logs, rocks, and shrubs that are used for refuge or to store food. Diet consists mainly of seeds that are transported in the cheek pouches; the species also may consume plants and invertebrates. It has many physiological and behavioral adaptations that allow survival in arid places. *L. irroratus* is nocturnal and solitary with little social tolerance. This species coexists with *L. pictus* in central and southern Mexico. Associated species include *Chaetodipus hispidus*, *Perognathus flavus*, *Baiomys taylori*, *B. musculus*, *Neotoma mexicana*, *N. micropus*, *Onychomys leucogaster*, *Oryzomys melanotis*, *O. couesi*, *Peromyscus boylii*, *P. difficilis*, *P. leucopus*, *P. pectoralis*, *P. truei*, *Reithrodontomys fulvescens*, *R. sumichrasti*, *Sigmodon hispidus*, *Sorex saussurei*, *Cryptotis goldmani*, and *C. parva* (Ceballos and Galindo, 1984; Chávez and Espinosa, 1993; Dowler and Genoways, 1978; Genoways and Brown, 1993). Reproduction occurs throughout the year, with greatest activity during August to November. Litters contain two to seven offspring, with an average of four (Dowler and Genoways, 1978). Chávez and Espinosa (1993) noted differences in reproductive activity in two locations in Hidalgo. They reported seasonal reproductive activity in autumn and winter in an area with secondary shrubs, and in crassicaule scrublands, reproductive activity occurred throughout the year with a peak during August to February. Population density was one to six individuals/ha, with peaks during spring and autumn. Lifespan for a male and female after they were first captured was 379 and 480 days, respectively.

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: This species mainly inhabits xeric scrublands and thorny forests, where annual precipitation is more than 500 mm; it also occurs in grasslands, coniferous forests, oak forests, agricultural crops, and open pasturelands (Dowler and Genoways, 1978) from sea level in coastal Tamaulipas and Veracruz to 3,050 masl in the Cerro San Felipe and Mount Zempoaltepec, Oaxaca.

CONSERVATION STATUS: Currently, *L. irroratus* is not in peril because it is widely distributed. It may become abundant enough to damage agricultural crops (Ceballos and Galindo, 1984; González-Romero, 1980).

Liomys irroratus. Scrubland. Xochitepec, Distrito Federal. Photo: Daniel Navarro.

Painted spiny pocket mouse

Yolanda Domínguez and Gerardo Ceballos

SUBSPECIES IN MEXICO

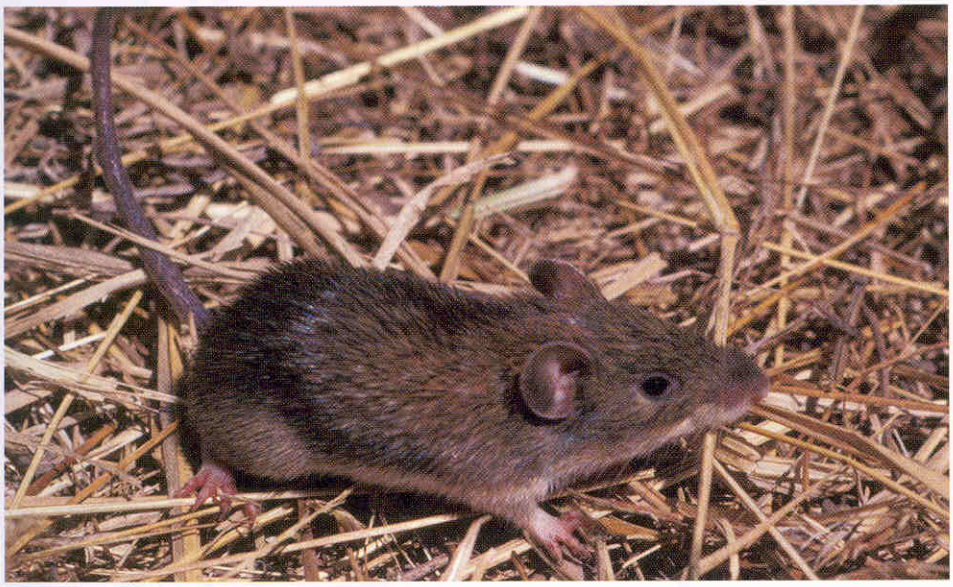
Liomys pictus annectens (Merriam, 1902)
Liomys pictus hispidus (J.A. Allen, 1897)
Liomys pictus pictus (Thomas, 1893)
Liomys pictus plantinarensis Merriam, 1902

DESCRIPTION: *Liomys pictus* is a medium-sized spiny pocket mouse with body and tail about the same length. The coat is coarsely haired. Dorsal coloration is brownish-ochre and white or cream in the abdomen; an ochre or yellow line on the side divides the underside from the upper parts (Ceballos and Miranda, 1986, 2000; Hall, 1981). The tail is bicolored, dark on top, pale on the bottom, and covered with hair (Ceballos and Miranda, 1986, 2000). It has a pair of external pouches, which are folds of skin on the cheeks (McGhee and Genoways, 1978; Reichman and Price, 1993). There is sexual dimorphism; males are larger than females (Hall, 1981). The skull is narrow and the auditory bullae are well developed (Ceballos and Miranda, 1986, 2000; McGhee and Genoways, 1978). *L. pictus* differs from *L. irroratus* by having six plantar tubers (McGhee and Genoways, 1978) and from *L. salvini* and *L. adspersus* by the lateral ochre line, by the dorsal hair that is not incurved, and by no obvious coarse spines in the pelage. Finally, *L. spectabilis* has shorter hind feet and a shorter skull (Hall, 1981).

EXTERNAL MEASURES AND WEIGHT

TL = 218 to 264 mm; TV = 105 to 116 mm; HF = 26 to 31 mm, EAR = 13 to 15 mm. Weight: 30 to 80 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.



Liomys pictus. Tropical dry forest. Chamela-Cuixmala Biosphere Reserve, Jalisco. Photo: Gerardo Ceballos.

DISTRIBUTION: *L. pictus* occurs in areas with marked seasonality from southern Texas in the United States into Central America (Hall, 1981). In Mexico, it occurs in arid and semi-arid areas from Sonora to Chiapas, and also in northwestern Veracruz (Hall, 1981; McGhee and Genoways, 1978; Wilson and Reeder, 2005). It has been recorded in CH, CO, CS, DU, GR, JA, MI, MX, NY, OX, SI, SO, and VE.

NATURAL HISTORY AND ECOLOGY: *L. pictus* is nocturnal, territorial, and aggressive (Eisenberg, 1963). The species is solitary, but forms pairs during the mating season until the birth of offspring (Jones, 1985). *L. pictus* can reproduce all year, but has a peak that coincides with abundance of food. Gestation lasts 26 days and the size of the litter is 2 to 6 (Ceballos, 1989; Ceballos and Miranda, 1986, 2000; Eisenberg, 1963; Pinkham, 1973). Newborns weigh about 2 g and they are weaned at 23 days of age (Ceballos, 1989; Romero, 1993). This species tends to be bipedal and hops. It can live without drinking water, although it needs foods that provide large amounts of water to maintain its metabolic processes and to regulate temperature (Pinkham, 1973). In the Chamela-Cuixmala Biosphere Reserve, *L. pictus* is abundant and occurs at densities of 2 to 71 individuals/ha in lowland forests and 2 to 49 individuals/ha in open forests (Ceballos, 1990; Mendoza, 1997). The species is granivorous and the diet consists mainly of seeds of trees and vines; they help in maintaining the structure and dispersal of vegetation where they occur (Fleming and Brown, 1975; Janzen, 1982c; Matson and Christian, 1977; Mendoza D., 1997; Sanchez-Cordero and Fleming, 1993). In Chamela, more than 150 species of plants have been recorded in the diet, including *Nissolia fructicosa*, *Ipomoea*, and *Panicum*; occasionally, in the rainy season, they consume insects and mollusks (Ceballos, 1989; Mendoza, 1997; Pérez, 1978). Food is carried in the cheek pouches until it is deposited in burrows, which are underground and are composed of tunnels, chambers, and nests. Chambers are used as latrines and to store food. Nests contain a large amount of leaves and are used as shelters or to raise the young (Meadows, 1991a; Reichman and Smith, 1990). Burrows can be as simple as one tunnel or a complex formed by many chambers, nests, and tunnels. There may be 1 to 23 chambers and 1 to 3 nests, and depth of burrows may be 18 cm to 75 cm (Domínguez, 2000; Hernández, 2000).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: *L. pictus* inhabits xeric shrublands, thorn forests, pine-oak forests, disturbed vegetation, agricultural crops, and orchards (Ceballos, 1989; Ceballos and Miranda, 1986, 2000; Matson and Christian, 1977). It occurs from sea level to 2,045 m (Hall, 1981).

CONSERVATION STATUS: The painted spiny pocket mouse is abundant in undisturbed and disturbed areas; it is not in danger of extinction.

Liomys salvini (Thomas, 1893)

Salvin's spiny pocket mouse

Luis Arturo Peña

SUBSPECIES IN MEXICO
Liomys salvini crispus Merriam, 1902

DESCRIPTION: In both cranial and external measurements, *Liomys salvini* is a small species within the genus. The pelage is rough, with rigid hair interspersed with soft hair. Dorsal coloration varies from brownish-gray to chocolate brown, the abdomen is white, and it has no lateral stripes. *L. salvini* has a pair of cheek pouches and six plantar tubers. Sexual dimorphism is present, as males are one-third heavier than females (Fleming, 1983).

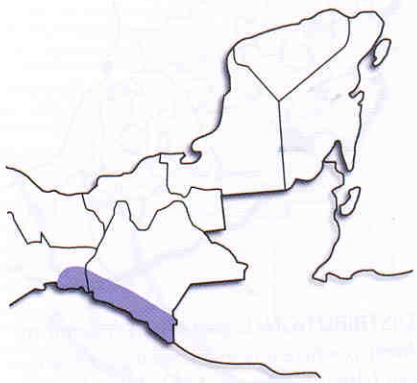
EXTERNAL MEASURES AND WEIGHT
TL = 196 to 235 mm; TV = 88 to 110 mm; HF = 25 to 30 mm; EAR = 13 to 17 mm. Weight: 45 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: These mice are nocturnal and active throughout the year. They feed on seeds and insects (Fleming, 1974). In Costa Rica, an important food item is seeds of *Cochlospermum vitafolium*. Cheek pouches serve to carry seeds, construction material, and offspring. Materials are carried into the burrow, which is used for storage, nests, and refuge (Fleming, 1983). The reproductive period is January to mid-June, gestation lasts 28 days, and females give birth to 1 to 2 litters per year. The size of the litter is 2 to 6 offspring, with an average of 3.8 (Fleming, 1974). Few individuals of *L. salvini* live to 18 months of age. Research on the genus and species suggests that there is little sociability among individuals; in general, they are solitary except in the mating season (Eisenberg, 1963; Fleming, 1974). Size of home range in lowland forests is 0.20 ha. Predators include mammalian carnivores, birds of prey, and snakes.

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: Salvin's spiny pocket mouse occurs in lowland deciduous forests from sea level to 1,500 m (Schmidly et al., 1993).

CONSERVATION STATUS: Apparently, this species tolerates disturbed habitats, as it has been reported in areas with secondary vegetation. It does not appear to be in danger of extinction.



DISTRIBUTION: *L. salvini* occurs from the vicinity of Reforma in Oaxaca to Costa Rica (Williams et al., 1993b). It has been recorded in CS and OX.

Liomys spectabilis Genoways, 1971

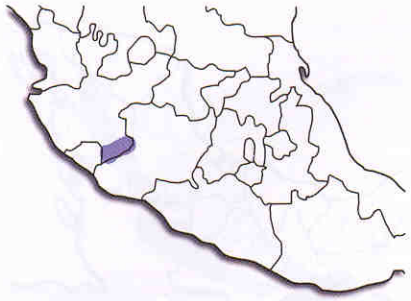
Jaliscan spiny pocket mouse

Ma. de Lourdes Romero and Cornelio Sánchez H.

SUBSPECIES IN MEXICO
L. spectabilis is a monotypic species.

DESCRIPTION: Within its genus, *Liomys spectabilis* is large in both external and cranial measurements. Dorsal coloration is brown with a lateral line that is ochre-colored and bright; the belly is white. The hair is hispid. The feet have six plantar tubers. The skull is similar to that of *L. pictus* but larger (Genoways, 1971). The baculum (bone in the penis) is long with a small rounded base; the head of sperm is longer and wider than that of *L. pictus* (Genoways, 1973). It can be distinguished from *L. irroratus* by the six plantar tubers; from *L. salvini* and *L. adspersus* by the lateral line, by dorsal hairs that are not curved toward the top, and by spines that are not so obvious in the pelage; and from *L. pictus* by the longer hind feet and skull (Hall, 1981).

EXTERNAL MEASURES AND WEIGHT
TL = 242 to 280 mm; TV = 122 to 142 mm; HF = 30 to 32 mm; EAR = 16 to 18 mm. Weight: 65 g.



DISTRIBUTION: *L. spectabilis* is endemic to Mexico, where it is restricted to southeastern Jalisco (Genoways, 1971). It has been recorded in JA.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: The natural history of this species is unknown, but it is probably similar to that of *L. pictus*. Only 1 of 6 adult females observed in September was pregnant; the 5 embryos were 4 mm in length. Average size of testes of 4 adult males in September was 21.5 mm (range, 21 mm to 22 mm; Genoways, 1971). It is sympatric with the closely related *L. pictus* (Genoways, 1971, 1973).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: *L. spectabilis* inhabits tropical deciduous forests and disturbed environments. It has been captured along roads and fences, with weeds, shrubs, and trees (Genoways, 1971). It occurs from 880 masl to 1,500 masl (Genoways, 1971).

CONSERVATION STATUS: Current status is not well known because it is sympatric with other species of the same genus that can be reliably differentiated only by genetic traits. The geographical range is small, so it could be at risk. *L. spectabilis* tolerates anthropogenic disturbance, however. A detailed study to determine its conservation status is needed.

Subfamily Perognathinae

The subfamily Perognathinae contains two genera with eighteen species in the genus *Chaetodipus* and five species in the genus *Perognathus* known from Mexico.

Chaetodipus anthonyi (Osgood, 1900)

Anthony's pocket mouse

Eric Mellink and Jaime Luévano

SUBSPECIES IN MEXICO

C. anthonyi is a monotypic species.

The species has been considered a subspecies of *C. fallax*, but this arrangement is tenuous (Williams et al., 1993a).

DESCRIPTION: *Chaetodipus anthonyi* is average in size for the genus. It has a pair of cheek pouches and relatively small pinnae. The species closely resembles *C. fallax*, which is more reddish and is smaller. *C. anthonyi* has a less-arched skull, with a more robust face, a smaller mastoid, a smaller and shorter interparietal, and wider zygomatic bones (Anthony, 1925; Osgood, 1900).

EXTERNAL MEASURES AND WEIGHT

TL = 168 mm; TV = 92 mm; HF = 23.5 mm; EAR = 7 to 11 mm.
Weight: 16.4 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

Chaetodipus anthonyi. Sand dunes. Isla Cedros, Baja California. Photo: Eric Mellink.

DISTRIBUTION: Anthony's pocket mouse is endemic to Cedros Island, which is located off the western coast of Baja California. The island has an area of 367 km^2. Although it has been reported occupying a large part of the island (Anthony, 1925), this seems incorrect. In recent sampling, it was only detected in sand dunes to the south and in a small orchard of olive trees and other fruit trees in the Sierra de Vargas (Mellink, 1993a). It is likely that *C. anthonyi* occurs at other sites with sandy soil, but there has been only limited fieldwork. It has been recorded in BC.

NATURAL HISTORY AND ECOLOGY: Little is known about the biology of this species. It seems to be restricted to places with sandy soils. In sand dunes, it is abundant, but it does not live in adjacent rocky areas. Reproduction occurs in spring and summer (Mellink, 1992a).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: Anthony's pocket mouse mainly inhabits shrubs in sand dunes, but uses other communities with sandy substrate. It occurs from sea level to 700 m.

CONSERVATION STATUS: Ceballos and Navarro (1991) considered *C. anthonyi* fragile. Due to its restricted range, however, it should probably be considered to be in danger of extinction. Risk factors include domestic carnivores (cats and dogs) and extraction of sand for building materials. Officially, it is considered to be threatened (SEMARNAT, 2010).

Chaetodipus arenarius (Merriam, 1894)

Little desert pocket mouse

Eric Mellink and Jaime Luévano

SUBSPECIES IN MEXICO

Chaetodipus arenarius arenarius (Merriam, 1894)
Chaetodipus arenarius albescens (Huey, 1926)
Chaetodipus arenarius ambiguus (Nelson and Goldman, 1929)
Chaetodipus arenarius mexicalis (Huey, 1939)
Chaetodipus arenarius albulus (Nelson and Goldman, 1923)
Chaetodipus arenarius helleri (Elliot, 1903)
Chaetodipus arenarius ramirezpulidoi Álvarez-Castañeda & Cortés-Calva, 2004
Chaetodipus arenarius siccus (Osgood, 1907)
Recently, *Ch. a. siccus* has been proposed to have specific status (Álvarez-Castañeda and Rios, 2012), but this has not been widely accepted.

DISTRIBUTION: *C. arenarius* is endemic to the Baja California Peninsula, Mexico (Hall, 1981). It has been recorded in BC and BS.

DESCRIPTION: *Chaetodipus arenarius* is a medium-sized mouse. The pelage is moderately silky and the color of the back varies from pale gray or pale yellowish to dark brown. In darker individuals, the hair may end in a black tip, which gives them a speckled appearance. The sides may be paler than the back. The ventral surface is white. The tail is bicolored and has a small terminal fleck. In some populations, there is a pale lateral line. Ears are brown and, in some subspecies, there is a small band of white hairs at the base. In one subspecies, there are two phases of coloration, gray and yellow (Hall, 1981; Huey, 1926, 1964; Lackey, 1991).

EXTERNAL MEASURES AND WEIGHT

TL = 136 to 182 mm; TV = 70 to 103 mm; HF = 20 to 23 mm; EAR = 8 mm. Weight: 15 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: This species occurs in arid environments, primarily in sandy soils (Lackey, 1991). On Cerralvo Island, it was in soil that was finer and not as sandy (Banks, 1964a). Reproduction occurs mainly during summer. In a field study conducted in northeastern Baja California, the largest number of juveniles and greatest numbers of males with scrotal testes were found in July (E. Mellink and J. Plaguing, pers. obs.). In Baja California Sur, the reproductive season was April to late August (Cortés and Álvarez-Castañeda, 1997). On Cerralvo Island, a pregnant female with two embryos was present at the end of May (Banks, 1964a).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: *C. arenarius* is found in arid scrubs and sandy soils, from sea level to 600 masl (Álvarez, 1958; Lackey, 1991).

CONSERVATION STATUS: Three subspecies (*C. arenarius albulus*, *C. arenarius ammophilus*, and *C. arenarius siccus*) are believed to be threatened (SEMARNAT, 2010) because they live on islands, but this assumption does not apply to *C. arenarius albulus* (Álvarez, 1958). *C. arenarius sublucidus* is restricted to a small area isolated from the rest of the species south of Bahía de la Paz. This subspecies may require protection to ensure its survival.

Chaetodipus artus (Osgood, 1900)

Narrow-skulled pocket mouse

Eric Mellink and Sergio Méndez Moreno

SUBSPECIES IN MEXICO

C. artus is a monotypic species.

DESCRIPTION: The upper parts of *Chaetodipus artus* are brownish, obscured by black hair along the midline, especially on the rump. There is also a reddish-buffy and diffuse line that separates the colors of the sides from the white abdomen. This mouse has a well-defined lateral buffy stripe. The pelage is thick, with little or no bristles; the legs have thick and short bristles. Ears are large and rounded (Williams et al., 1993a). *C. artus* is distinguished from *C. goldmani* by its smaller size, a less hairy tail, and a wider dorsal stripe on the tail (Hall, 1981).

EXTERNAL MEASURES AND WEIGHT
TL = 170 to 200 mm; TV = 80 to 106 mm; HF = 24 mm; EAR = 10 to 12 mm.
Weight: 13 to 27 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: There are few data on the biology of *C. artus*. It is granivorous and its diet consists almost exclusively of small seeds (Best, 1992). It probably reproduces all year, with peaks of births at the end of the dry season and beginning of the rainy season (May–July). The size of litters is two to five young (Álvarez-Castañeda and Patton, 2000). It dwells in the foothills of the Sierra Madre Occidental in thorny scrublands and low-elevation forests. In general, it inhabits sites where riparian vegetation occurs, generally following riverbeds, streams, ravines, and edges of agricultural fields (Best, 1992). In Sonora, it is sympatric with *C. goldmani* and occurs in sandy areas with mesquites (*Prosopis*) along the Río Mayo. In northern Sinaloa and southern Sonora, this species occurs at higher elevations that are characterized by higher humidity and more tropical flora than along coastal areas (Anderson, 1964).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: This species inhabits xeric shrublands, thorny forests, riparian vegetation, and tropical deciduous forest (Best, 1992). It occurs from sea level to 1,900 m.

CONSERVATION STATUS: *C. artus* is endemic and rare in Mexico. Current status of populations is unknown. Because it is endemic to Mexico, rare, and with a restricted distribution affected by agricultural development, it may be threatened with extinction.

DISTRIBUTION: *C. artus* is endemic to northwestern Mexico, where it is on the coastal plain of southern Sonora into Nayarit (Anderson, 1964; Hall, 1981). It has been recorded in CH, DU, NY, SI, and SO.

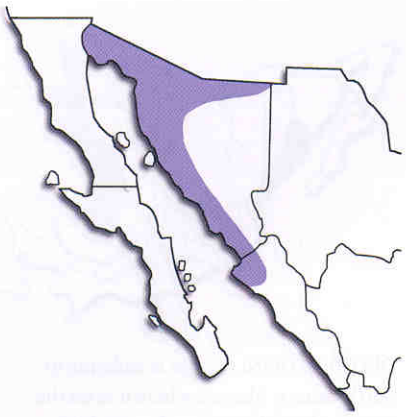
Chaetodipus baileyi (Merriam, 1894)

Bailey's pocket mouse

Sergio Méndez Moreno and Gerardo Ceballos

SUBSPECIES IN MEXICO
Chaetodipus baileyi baileyi (Merriam, 1894)
Chaetodipus baileyi insularis (Townsend, 1912)
Taxonomic relationships among subspecies of *C. baileyi* have been evaluated. Despite evidence that two groups existed within this species based on differences in karyotypes and allozymes (Patton and Rogers, 1993; Patton et al., 1981), the two groups were assigned to the same species for many years. Populations west of the Colorado River, however, have been separated from *C. baileyi* and are now recognized under *C. rudinoris*, which includes the subspecies *extimus*, *fornicatus*, *hueyi*, and *mesidios* (Riddle et al., 2000a).

DESCRIPTION: *Chaetodipus baileyi* is among the largest species of the genus. The tail is heavily crested and is larger than the length of head and body. Ears are relatively large. The pelage is smooth and without spines. Dorsal coloration and sides are washy-gray, mixed with ochre buffy or pale buffy, and slightly striped with black (Hall, 1981; Paulson, 1988). *C. baileyi* can be distinguished from other species of the



DISTRIBUTION: *C. baileyi* has a limited distribution in southern Arizona and northwestern Mexico in Sonora and Sinaloa (Álvarez-Castañeda and Patton, 1999; Riddle et al., 2000a). It has been recorded in SI and SO.

genus because it lacks spines, and by its larger size and dorsal coloration (Hall, 1981). Although its morphology is similar to that of *C. rudinoris*, it is distinguished by genetic differences and allopatric distribution. *C. baileyi* is exceeded in size of head and body only by *C. hispidus*, which can be distinguished from *C. baileyi*. *C. baileyi* has a more grayish coloration, its tail is longer and crested, and the tail of *C. hispidus* is not crested and is shorter than the length of head and body (Williams et al., 1993a).

EXTERNAL MEASURES AND WEIGHT

TL = 188 to 223 mm; TV = 103 to 124 mm; HF = 24 to 27 mm; EAR = 7 to 11 mm. Weight: 24 to 28 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: Bailey's pocket mouse is nocturnal and terrestrial. Burrows are under rocks or shrubs, where temperature is lower and relative humidity is higher. This species is more common in the ecotone between the slopes of hills and desert plains (Álvarez-Castañeda and Patton, 1999). They reach densities of up to 86 individuals/ha. Its diet is primarily seeds, but it also consumes insects and green vegetation (Paulson, 1988). They are generalists and consume seeds of many species such as jojoba (Reichman, 1973). They can survive long periods without drinking water. In general, they mate twice a year during June to October. The average size of a litter is three to four offspring (Reichman, 1973). They are preyed on by foxes, coyotes (*Canis latrans*), hawks, owls, and snakes. To avoid predators, activities are carried out under vegetation. Its color resembles that of the soil, and it uses sudden-prolonged immobility to avoid predators (Reynolds, 1949).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: *C. baileyi* primarily occurs in transition areas of lowlands of the Sonoran desert and desert grasslands, often in plains and rocky slopes. It occurs in xeric shrubs with such dominant elements as cresotebush (*Larrea divaricata*), palo verde (*Cercidium praecox*), sahuaros (*Carnegiea gigantea*), and ocotillo (*Fouquieria*), from sea level to 1,100 m (Hall, 1981). Its distribution coincides in large part with that of jojoba (*Simmondsia chinensis*; Sherbrooke, 1976).

CONSERVATION STATUS: This species has a relatively wide geographic distribution in large, undisturbed areas, and is not considered at risk. *C. baileyi insularis* is in danger of extinction because it is endemic to Tiburón Island (SEMARNAT, 2010).

Chaetodipus californicus (Merriam, 1889)

California pocket mouse

Jaime Luévano and Eric Mellink

SUBSPECIES IN MEXICO

Chaetodipus californicus femoralis (J.A. Allen, 1891)
Chaetodipus californicus mesopolius (Elliot, 1903)

DESCRIPTION: *Chaetodipus californicus* is a large mouse. Coloration is a mixture of yellow and black hair on the back and a yellowish-white abdomen. The legs have rigid hairs that look like spines. In general, the pelage is conspicuously rough. The

tail has a distinctive tuft and is bicolored. The soles of the hind feet are naked. The skull is strongly arched and auditory bullae are separated anteriorly (Brylski, 1990b; Jameson and Peeters, 1988).

EXTERNAL MEASURES AND WEIGHT

TL = 190 to 235 mm; TV = 103 to 143 mm; HF = 24 to 29 mm; EAR = 9 to 14 mm. Weight: 16 to 21 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: *C. californicus* is mainly nocturnal, solitary, and active throughout the year, but it ceases activity in cold weather. Diet is annual grasses, weeds, and shrubs, such as *Salvia*, but at certain times of the year, California pocket mice consume insects. Water is obtained mainly from seeds and leaves. Foraging activity usually takes place on the ground, but they may climb onto bushes (Brylski, 1990b; Jameson and Peeters, 1988). They are most common in areas with shrubs, but also occupy pasturelands, and largest populations occur in ecotones between pasturelands and chaparral. Populational densities are high. Grazing by domestic cattle eliminates vegetational cover that allows this mouse to hide from predators (Brylski, 1990b). *C. californicus* typically produces one litter per year (occasionally two) during April–July. The size of a litter is two to seven and averages four young (Brylski, 1990b; Jameson and Peeters, 1988).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: *C. californicus* occupies various types of chaparral, although localities where it occurs in Baja California are coniferous forests. It occurs from sea level to 1,800 m (Huey, 1964).

CONSERVATION STATUS: It is possible that grazing by livestock has affected some populations. There is no study to clarify this effect, but given the size and density of shrubs in the habitat, overall effect of grazing probably is minimal. The species does not appear to be at risk.

DISTRIBUTION: The California pocket mouse occurs in southern California and northern Baja California, where it occupies Mediterranean plant communities from the coast between Tijuana and Ensenada to highlands of the Sierra de Juarez and the Sierra de San Pedro Mártir (Hall, 1981; Huey, 1964). It has been recorded in BC.

Chaetodipus dalquesti (Roth, 1976)

Dalquest's pocket mouse

Lourdes Martinez-Estevez and Gerardo Ceballos

SUBSPECIES IN MEXICO

Chaetodipus dalquesti ammophilus (Osgood, 1907)
Chaetodipus dalquesti dalquesti (Roth, 1976)
Chaetodipus dalquesti sublucidus (Nelson and Goldman, 1929)

It was originally described as a species (Roth, 1976), but then some authors considered it as a subspecies of *Ch. arenarius*. Presently it is considered a full species (Álvarez-Castañeda and Rios, 2010).

DESCRIPTION: *Chaetodipus dalquesti* is a medium-sized mouse. The pelage is grizzled; ears are large and with black margins; the bullae is moderately inflated; the posterior palatal pits are smaller; and it has long nasal bones (Álvarez-Castañeda and Rios, 2010). Males are larger than females. Its pelage is moderately silky and the color of

DISTRIBUTION: The type locality of *Ch. dalquesti* is four miles southeast of Migriño, Baja California Sur, Mexico (23°10′N, 110°07′W). It is found along the Pacific coastal area from Lopez Mateos to the Cape Region of the Baja California Sur and Margarita Island (Álvarez-Castañeda and Rios, 2010).

the back varies from pale gray or pale yellowish to dark brown. The hair may end in a black tip, which gives it a speckled appearance. The venter is white. The tail is bicolored and has a small terminal fleck. Ears are brown. It is very similar to *Chaetodipus arenarius*, but larger, with a longer and darker tail and the rump covered with weak spine bristles (Álvarez-Castañeda and Rios, 2010).

EXTERNAL MEASURES AND WEIGHT

TL = 172 mm; TV = 96; HF = 24; EAR = 8.9.
Weight: 14 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: This species occurs in moister areas of the coastal plain of the southern part of the Baja California Peninsula (Álvarez-Castañeda and Rios, 2010). The species is poorly known and there is little information on its ecology.

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: *Ch. dalquesti* is found in desert scrubland near sea level which, because of the coastal fogs, also contains epiphytes such as *Gongylocarpus* sp., *Opuntia pycnacantha*, *Ferocactus santa-maria*, *Stenocereus eruca*, and *Harfordia macroptera* (Álvarez-Castañeda and Rios, 2010; Roth, 1976).

CONSERVATION STATUS: *Ch. dalquesti* is an endemic species considered as of Special Protection (SEMARNAT, 2010) and is listed as vulnerable by IUCN (2013). Its habitat is under threat because of tourism development and the populations are fragmented along the range.

Chaetodipus eremicus (Mearns, 1898)

Chihuahuan pocket mouse

Yolanda Domínguez and Gerardo Ceballos

SUBSPECIES IN MEXICO

C. eremicus is a monotypic species.
Lee et al. (1996) raised the subspecies *C. penicillatus eremicus* and *C. penicillatus atrodorsalis* to species level, under the name of *C. eremicus*, based on differences in mitochondrial DNA, karyotypes, and nuclear genes (Patton, 1970; Patton et al., 1981)

DESCRIPTION: Compared to *Chaetodipus penicillatus*, this pocket mouse is medium sized. The pelage is coarser than in other species of the genus. It lacks guard hairs on the rump, the tail ends in a brush, dorsal coloration varies from yellowish-brown to cinnamon-brown peppered with black and dark brown, the venter is white, and there is a well-defined lateral line (Hoffmeister and Lee, 1967). The tail is bicolored, white ventrally and brown dorsally. Hind feet are small in comparison with those of other species of the genus. The skull is medium-sized, but nasal passages are long and the interorbital is wide (Anderson, 1972; Hoffmeister and Lee, 1967). The diploid number of chromosomes is 2n = 46 (Patton, 1967).

Chaetodipus eremicus. Scrubland. Charcas, San Luis Potosí. Photo: Juan Cruzado.

EXTERNAL MEASURES AND WEIGHT

TL = 147 to 179 mm; TV = 77 to 98 mm; HF = 21 to 25 mm; EAR = 7 to 8 mm. Weight: 13 to 19 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: In Chihuahua, *Chaetodipus eremicus* occurs in sandy or alluvial soils, and in thickets dominated by mesquites (*Prosopis*) where it is sympatric with *C. nelsoni*. In Bolson de Mapimi, Durango, it is sympatric with *Dipodomys nelsoni*, *D. merriami*, and *Neotoma albigula* (Grenot and Serrano, 1981). It is granivorous, as are all species of the genus (Grenot and Serrano, 1981; Hoffmeister and Lee, 1967). The Chihuahuan pocket mouse builds underground burrows with many chambers at the base of cacti such as *Opuntia rastrera*. Burrows are used as nests and to store food; in addition, they provide favorable microclimatic conditions (Grenot and Serrano, 1981). There is little information on reproductive biology of this species; in Coahuila, pregnant females have been observed in February and June; nonreproductive females have been reported during February–August and in December (Baker, 1956). Of 12 females examined in Durango in June and July, 9 had no sign of reproductive activity and 3 had embryos (Baker and Greer, 1962).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: *C. eremicus* occurs in pasturelands, areas with *Opuntia rastrera*, dunes with *Larrea divaricata* and *Prosopis*, and up to 1,700 masl (Anderson, 1972; Grenot and Serrano, 1981).

CONSERVATION STATUS: Current status of populations is unknown. The Chihuahuan pocket mouse is not listed as endangered and its wide distribution, which covers large expanses with little disturbance, indicates it faces no risk.

DISTRIBUTION: *C. eremicus* is distributed from southern New Mexico and western Texas in the United States across desert regions of Chihuahua into Durango and western San Luis Potosí (Anderson, 1972; Hall, 1981; Hoffmeister and Lee, 1967; Williams et al., 1993a). It has been recorded in CH, CO, DU, SL, TA, and ZA.

San Diego pocket mouse

Iván Castro Arellano and Gerardo Ceballos

DISTRIBUTION: *C. fallax* occurs from southern California in the United States to Bahía Tortuga and San Bartolomé in northwestern Baja California (Hall, 1981; Huey, 1964). It has been recorded in BC and BS.

SUBSPECIES IN MEXICO

Chaetodipus fallax fallax (Merriam, 1889)
Chaetodipus fallax inopinus (Nelson and Goldman, 1929)
Chaetodipus fallax majusculus (Huey, 1960)
Chaetodipus fallax pallidus (Mearns, 1901)
Chaetodipus fallax xerotrophicus (Huey, 1960)
Some authors consider *C. anthonyi* a subspecies of *C. fallax* (Wilson and Reeder, 2005), primarily because their karyotypes are similar. This taxonomic designation is not widely accepted in Mexico, however (Arita and Ceballos, 1997).

DESCRIPTION: Compared to other members of the genus, *Chaetodipus fallax* is medium in size. Dorsal coloration is brown with the rump darker. The distal part of guard hairs is pale and the belly is creamy colored. Pinnae of ears are dark dorsally and grayish on the underside. The tail is bicolored (Osgood, 1900). There is variation from dark tones to pale tones, however, probably as a result of color of substrates that are occupied (Huey, 1960). The diploid number of chromosomes is 2n = 44 (Patton and Rogers, 1993). *C. fallax* is distinguished from *C. californicus* by its smaller size and more rounded ears.

EXTERNAL MEASURES AND WEIGHT

TL = 176 to 200 mm; TV = 88 to 118 mm; HF = 23 mm; EAR = 9 mm.
Weight: 20 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

Chaetodipus fallax. Scrubland. Valle de San Quintin, Baja California. Photo: Eric Mellink.

NATURAL HISTORY AND ECOLOGY: The San Diego pocket mouse is nocturnal and inhabits rocky substrates in scrublands. These mice are active throughout the year, but are inactive on cold nights. They may remain in burrows for several weeks (Álvarez-Castañeda and Patton, 1999). They feed mainly on seeds, but also consume green vegetation and insects. They can survive for extensive periods on a diet of dried seeds (Macmillen, 1964; Morton, 1979). Its home range is small, about 0.3 ha. Population density is variable, but may reach more than 50 individuals/ha in years with abundant food. They reproduce in spring and summer; there is an average of 4 offspring per litter and gestation is 25 days (Jones, 1993). Predators include barn owls (*Tyto alba*; Banks, 1965).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: Vegetation within the geographic range of this species includes a variety of xeric scrublands from sea level to 1,350 m (Hall, 1981; Huey, 1964).

CONSERVATION STATUS: This species has a relatively wide distribution, including large regions with little anthropogenic disturbance. It is not considered to be at risk.

Chaetodipus formosus (Merriam, 1889)

Long-tailed pocket mouse

Sergio Méndez Moreno

SUBSPECIES IN MEXICO
Chaetodipus formosus cinerascens (Nelson and Goldman, 1929)
Chaetodipus formosus infolatus (Huey, 1954)
Chaetodipus formosus mesembrinus (Elliot, 1904)

DESCRIPTION: *Chaetodipus formosus* is medium in size. Its pelage is smooth, sepia in color with gray hair on the back, and the underside and legs are white. The tail is long; it is buffy on the ventral surface, it has a crest of hair, and it ends with a darker tuft than the rest of the pelage. Ears are blackish with a tuft of black and white hairs on the bases. The subauricular spot is small. *C. formosus* is similar to other species of the genus that do not have bristles or spines (Williams et al., 1993a).

EXTERNAL MEASURES AND WEIGHT
TL = 104 mm; TV = 118 mm; HF = 25 mm; EAR = 5 to 8 mm.
Weight: 18 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: The long-tailed pocket mouse is nocturnal. During the day, they shelter in underground burrows, whose openings are plugged with soil or soft sand to prevent entry of predators such as snakes and to maintain high relative humidity. Openings of burrows are 2.5 cm to 4 cm in diameter (Eisenberg, 1963). Diet consists mainly of seeds from xeric plants. They are capable of using moisture that is contained within seeds. They mate once a year, in spring or summer, and give birth after four weeks of gestation to a litter of two to six offspring that weigh 1 g on average. Young are weaned about three weeks later and reach sexual ma-

DISTRIBUTION: *C. formosus* occurs from California and Utah to northwestern Baja California from the Sierra de San Pedro Mártir to near Santa Rosalia (Hall, 1981; Williams et al., 1993b). It has been recorded in BC and BS.

turity at one year of age. This species hibernates for about three months beginning in November. Males emerge from hibernation two weeks before females (Kenagy and Bartholomew, 1985). In general, they only reproduce once a year, but in favorable conditions, they may produce two litters (Duke, 1957).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: *C. formosus* inhabits xeric scrublands in communities dominated by shrubs and forbs such as *Atriplex corfertifolia*, *A. canescens*, *Sarcobatus*, and sagebrush (*Artemisia*). It is present in flat and rocky lands with abundant plants such as *Opuntia* (Eisenberg, 1963). They are not common on flat and sandy areas (Kenagy and Bartholomew, 1985). It inhabits elevations from sea level to 2,100 m.

CONSERVATION STATUS: Neither the current size nor current status of populations is known. It is probable that *C. formosus* does not face serious conservation issues.

Chaetodipus goldmani (Osgood, 1900)

Goldman's pocket mouse

Lorena Morales Pérez and Iván Castro Arellano

SUBSPECIES IN MEXICO
C. goldmani is a monotypic species.

DISTRIBUTION: *C. goldmani* is endemic to northwestern and southern Sonora, southwestern Chihuahua, and northern Sinaloa, Mexico (Patton, 1993). It has been recorded in CH, SI, and SO.

DESCRIPTION: *Chaetodipus goldmani* is a medium-sized mouse. The back is brown and the rump is darker. The underside is creamy colored; the tail is markedly bicolored, dark dorsally and white ventrally (Osgood, 1900). One population on a lava field near Moctezuma, Sonora, is especially dark colored (Findley, 1967). Ears are blackish with interspersed white hairs, distal edges are whitish, and there is a subauricular spot (Lackey and Best, 1992). Compared with *C. pernix*, Goldman's pocket mouse is larger. *C. baileyi* has darker hair in its back, and *C. goldmani* has a greater occipitonasal length, a wider zygomatic bone, and larger interparietals (Anderson, 1972; Lackey and Best, 1992). The diploid number of chromosomes is 2n = 52 (Patton, 1967).

EXTERNAL MEASURES AND WEIGHT
TL = 194 mm; TV = 106 mm; HF = 24 mm; EAR = 11 mm.
Weight: 19 to 23 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: This mouse is abundant in alluvial soils of southern Sonora and northern Sinaloa; in contrast, in northern and central Sonora, it occurs in shrubby vegetation on a lava field (Burt and Hooper, 1941). In its northern range, it lives on rocky soils, allegedly displacing *C. penicillatus* to areas with sandy soils (Patton, 1969). Reproductive biology is unknown, but in *C. pernix*, a sympatric species of the same genus, young are born October–April and the size of a litter usually is seven (Best and Lackey, 1992). Diet also is unknown, but they do consume grass seeds (Burt, 1938).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: *C. goldmani* inhabits xeric scrublands with shrubs and mesquites (*Prosopis*); it also occurs near agricultural fields (Burt, 1938; Burt and Hooper, 1941). This species has been reported from sea level to 120 m (Hall, 1981).

CONSERVATION STATUS: This species is not included in any list as being in need of conservation (Arita and Ceballos, 1997). Because it is endemic to Mexico and its distribution is relatively restricted, it is necessary to determine if it is at risk of extinction.

Chaetodipus hispidus (Baird, 1858)

Hispid pocket mouse

Ella Vázquez

SUBSPECIES IN MEXICO
Chaetodipus hispidus hispidus (Baird, 1858)
Chaetodipus hispidus paradoxus (Merriam, 1889)
Chaetodipus hispidus zacatecae (Osgood, 1900)

DESCRIPTION: *Chaetodipus hispidus* is a medium-sized to large mouse. Hair is short and dense with thorny awns on the rump (Hall, 1981). The tail lacks a distal ridge, there is long hair on the tip, the top is brown, the bottom is white, and the tail is shorter than the length of body and head (Hoffmeister, 1986). The soles of the forefeet are naked. Dorsally, the body is brown to gray and the abdomen is whitish. The hind feet are larger and longer than the forefeet, which allows them to hop on two feet

Chaetodipus hispidus. Grassland. Janos Biosphere Reserve, Chihuahua. Photo: Gerardo Ceballos.

DISTRIBUTION: The hispid pocket mouse occurs from the plains of south-central North Dakota in the United States to Mexico, where it occurs from Chihuahua and Tamaulipas into Guanajuato, Zacatecas, and Jalisco (Ramírez-Pulido et al., 1983; Williams et al., 1993b). It has been recorded in AG, CH, CO, DU, GJ, HG, JA, NL, SL, SO, TA, and ZA.

(Anderson, 1972; Williams et al., 1993b). This species represents a monophyletic group with a diploid number of chromosomes of 2n = 34 (Patton, 1967).

EXTERNAL MEASURES AND WEIGHT

TL = 152 to 230 mm; TV = 72 to 113 mm; HF = 22 to 29 mm; EAR = 10 to 13 mm. Weight: 15 to 60 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: Hispid pocket mice are solitary, terrestrial, and nocturnal (Jones, 1993). They occur in a variety of substrates, from rocky to sandy soils (Álvarez-Castañeda and Patton, 1999). They are granivorous, but they also consume vegetation and insects. Burrows are underground with nests and chambers to store seeds (Brown and Harney, 1993; Hoffmeister, 1986). They reproduce in spring and summer. Females can produce two litters per breeding season. Litters consist of five young on average, with a range of two to nine. Maximum lifespan is about 2 years and they reach sexual maturity at 60 days old (Jones, 1993).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: This species usually is encountered in arid pasturelands that contain moderately dense stands of grasses with *Cassava* and *Agave* (Hoffmeister, 1986; Petersen, 1980). It also occurs in scrublands dominated by *Prosopis* (Álvarez and Álvarez-Castañeda, 1991; Petersen, 1980). In Tamaulipas, it lives in lowland-deciduous forests and thorny scrublands. It occurs from 600 masl to 2,700 masl (Hall, 1981).

CONSERVATION STATUS: *C. hispidus* is not included in any category of risk (Ceballos and Navarro, 1991). Existing studies do not report populations or habitats in need of conservation efforts (Genoways and Brown, 1993).

Chaetodipus intermedius (Merriam, 1889)

Rock pocket mouse

Iván Castro Arellano and Gerardo Ceballos

SUBSPECIES IN MEXICO

Chaetodipus intermedius intermedius (Merriam, 1889)
Chaetodipus intermedius lithophilus (Huey, 1937)
Chaetodipus intermedius minimus (Burt, 1932)
Chaetodipus intermedius pinacate (Blossom, 1933)

DESCRIPTION: The rock pocket mouse is a medium-sized *Chaetodipus*. Dorsal coloration is highly variable, from pale gray to black brownish; the sides are paler than the back and the belly varies from creamy white to darker shades. The tail is long, and is darker in its dorsal and distal parts. Hairs are coarse with weak spines on the rump (Hall, 1981; Williams et al., 1993a). *Chaetodipus intermedius* is geographically sympatric with *C. penicillatus*, with which it often is confused by similarity in size and proportions. *C. intermedius* differs from *C. penicillatus* by the presence of rump spines and smaller hind feet (< 22 mm), and by its thinner face (Hoffmeister, 1986; Williams et al., 1993a). It can be distinguished from other sympatric species such as *C. baileyi*, *C.*

formosus, and *C. hispidus* because these are larger and have no spines (Williams et al., 1993a). The diploid number of chromosomes is 2n = 46 (Patton and Rogers, 1993).

EXTERNAL MEASURES AND WEIGHT

TL = 152 to 180 mm; TV = 83 to 103 mm; HF = 19 to 24 mm; EAR = 7 to 12 mm. Weight: 10 to 19 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: This species is strongly associated with rocky environments and xeric scrublands; it is so linked with this substrate that its color is nearly the same. For this reason, several subspecies of darker color have been described; these are restricted to lava flows (Hoffmeister, 1986; Williams et al., 1993b). In the desert of northeastern Sonora, it is present only in rocky areas and canyons (May, 1976). They reproduce in spring and summer. In Arizona, pregnant females occur April–July, with a peak in the reproductive activity in June. Number of offspring is one to seven per litter (Hoffmeister, 1986). It is a granivorous species. In Arizona, 82% of diet consists of seeds and 16% of insects, with virtually no presence of vegetation in the diet (Hoffmeister, 1986; Morton, 1979).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: In Mexico, vegetation within the geographic range of this species is xeric scrublands and pasturelands. It occurs from sea level to 1,900 m (Hall, 1981).

CONSERVATION STATUS: The species has a restricted distribution but encompasses vast regions with little impact by humans. Protected populations inhabit the biosphere reserves of Pinacate and Alto Golfo in Sonora. The subspecies *C. intermedius minimus*, which is restricted to Turner Island in Sonora, is regarded as threatened (SEMARNAT, 2010).

DISTRIBUTION: *C. intermedius* occurs from Utah and Texas in the United States into northern Sonora and north-central Chihuahua in Mexico (Hall, 1981; Patton, 1993; Williams et al., 1993b). It also occurs on Tiburón Island, Sonora (Hoffmeister, 1974). It has been recorded in CH and SO.

Chaetodipus intermedius. Grassland. Janos Biosphere Reserve, Chihuahua. Photo: Gerardo Ceballos.

Chaetodipus lineatus (Dalquest, 1951)

Lined pocket mouse

Jorge Ortega R. and Héctor T. Arita

DISTRIBUTION: *C. lineatus* is endemic to the Mexican Plateau. Only five records exist for the state of San Luis Potosí and one for the state of Zacatecas (Hall, 1981; Matson and Baker, 1986). It has been recorded in SL and ZA.

SUBSPECIES IN MEXICO

C. lineatus is a monotypic species.

DESCRIPTION: *Chaetodipus lineatus* is small. The pelage is smooth, which is a feature that distinguishes it from *C. nelsoni*. Its dorsal coloration is dark gray and the underside is white; it has a buffy line in the mid-part of the head (Dalquest, 1951). From the 15 species of the genus, *C. lineatus* is morphologically closest to *C. spinatus* (Claire, 1976).

EXTERNAL MEASURES AND WEIGHT

TL = 174 mm; TV = 95 to 98 mm; HF = 23 mm; EAR = 8 to 10 mm.
Weight: 17 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: As in other members of the genus, the lined pocket mouse has a pair of external cheek pouches in which to carry seeds. Its distribution and habitat suggest that its diet is based on seeds and insects. Reproductive and gestation periods are unknown, but *C. penicillatus*, a similar species, gives birth twice a year with an average of 2 to 8 offspring per litter and a gestation period of 23 days (Nowak, 1999b).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: The species has been observed exclusively in xeric scrublands 1,600 masl to 2,400 masl.

CONSERVATION STATUS: Current status of this species is unknown; however, it is fragile or vulnerable as records show a low population density and a restricted distribution. As it is endemic to Mexico, it should be a priority to study its natural history and current status.

Chaetodipus nelsoni (Merriam, 1894)

Nelson's pocket mouse

Elizabeth E. Aragón

SUBSPECIES IN MEXICO

Chaetodipus nelsoni canescens (Merriam, 1894)
Chaetodipus nelsoni nelsoni (Merriam, 1894)

DESCRIPTION: *Chaetodipus nelsoni* is a small species. Dorsal coloration is brownish-black with the underside white or buffy, and there is a conspicuous lateral stripe. The tail has a thick black ridge on top and is white on the bottom. Coloration varies according to color of soils that it inhabits (Baker and Greer, 1962). Its pelage is dense

and spiny. This species is similar to *C. intermedius*, differing in the larger size, more conspicuous spines on the back, and thicker pelage.

EXTERNAL MEASURES AND WEIGHT

TL = 152 to 204 mm; TV = 72 to 117 mm; HF = 18 to 28 mm; EAR = 7 to 10 mm. Weight: 12 to 20 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: *C. nelsoni* is a granivorous species that also consumes insects and vegetation (Grenot and Serrano, 1981; Petersen and Petersen, 1979). It dwells on bare soils, often occurring in rocky areas on hills, hillsides, and slopes, and in pasturelands with grasses and shrubs. Dominant plants in its habitat are honey mesquites (*Prosopis glandulosa*), cresotebushes (*Larrea tridentata*), sotols (*Dasylirion wheeleri*), magueys (*Agave asperrima*), prickly pears (*Opuntia*), leatherstems (*Jatropha dioica*), and various cacti. It is common in habitats with coarse soils and less common in slopes where the soil has mixed texture and many microenvironments (Álvarez, 1963a; Baker, 1956; Baker and Greer, 1962; Grenot, 1983; Grenot and Serrano, 1981; Matson and Baker, 1986; Serrano, 1987). Associated rodents include kangaroo rats (*Dipodomys*), deermice (*Peromyscus*), southern grasshopper mice (*Onychomys torridus*), and white-throated woodrats (*Neotoma albigula*; Baker and Greer, 1962; Serrano, 1987). Occasionally, it is sympatric with other pocket mice such as *C. penicillatus* and *Perognathus flavus* (Grenot and Serrano, 1981). Reproduction occurs at the end of summer. Pregnant females have been observed in late March and early August, and nonreproductive females have been noted during January–April, June, July, November, and December. Average number of young per litter is 2.8, with a range of 1 to 4 offspring (Baker, 1956; Baker and Greer, 1962; Dahlquest, 1953b; Matson and Baker, 1986). Populational densities vary seasonally, and up to 93 individuals/ha have been reported, with greatest densities in scrublands of cresotebush (*Larrea*; Grenot, 1983). This variation in densities occurs relative to availability of resources during the year. In wet years and during summer, forbs and grasses increase, which is reflected in

DISTRIBUTION: The geographic range of *C. nelsoni* includes plains and arid areas of the Chihuahuan desert from the southern United States into northern Mexico, where it is present on the Mexican Plateau into Aguascalientes (Hall, 1981). It has been recorded in AG, CH, CO, DU, JA, NL, SL, TA, and ZA.

Chaetodipus nelsoni. Scrubland. Santo Domingo, San Luis Potosí. Photo: Juan Cruzado.

an increase in number of juveniles in populations. The population decreases significantly in winter (Whitford, 1976). In early summer, when there is an absence of green sprouts, grasses, and insects, survival and recruitment are related to caloric content of foliage (Serrano, 1987). In Mapimi, Durango, length of movements and size of home ranges are 28 m to 118 m and 0.04 ha to 0.86 ha, respectively; while in autumn–winter these are 28 m to 130 m and 0.01 ha to 0.45 ha (Grenot and Serrano, 1981, 1982).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: *C. nelsoni* occurs in xeric scrublands, thorny forests, and pasturelands at 372 masl to 2,450 masl.

CONSERVATION STATUS: Nelson's pocket mouse is not at risk in Mexico (SEMARNAT, 2002). On the Mexican Plateau, it is one of the most common species.

Chaetodipus penicillatus (Woodhouse, 1852)

Desert pocket mouse

Iván Castro Arellano and Jorge Iván Uribe J.

SUBSPECIES IN MEXICO

Chaetodipus penicillatus angustirostris (Osgood, 1900)
Chaetodipus penicillatus penicillatus (Woodhouse, 1852)
Chaetodipus penicillatus pricei (J.A. Allen, 1894)
Chaetodipus penicillatus seri (Nelson, 1912)
Chaetodipus penicillatus sobrinus (Goldman, 1939)
Chaetodipus penicillatus stephensi (Merriam, 1894)
The subspecies *eremicus* and *atrodorsalis* were elevated to species level, under the name of *C. eremicus*, because of genetic differences in nuclear genes and karyotypes (Lee et al., 1996).

DISTRIBUTION: The desert pocket mouse occurs from southeastern California, Nevada, Arizona, New Mexico, and Texas in the United States into northeastern Baja California and most of Sonora (Hall, 1981; Patton, 1993). The subspecies *C. penicillatus seri* occupies most of Tiburón Island, Sonora (Burt, 1938). It has been recorded in BC and SO.

DESCRIPTION: Within the genus, *Chaetodipus pencillatus* is rather large. Dorsally it possesses a variable coloration of yellowish-brown to yellowish-gray hair; in both cases it is dotted with black hair. Sides, face, and cheeks have the same coloration, but under the ears the color is darker; the underside is white. Usually, it lacks guard hair in the rump. The pelage is smooth. The tail is long and bicolored, white ventrally and brown dorsally. The soles of the hind feet are naked to the heel (Hoffmeister and Lee, 1967; Osgood, 1900). In general, males are larger than females and there is geographic variation in size (Hoffmeister and Lee, 1967). *C. penicillatus* can be confused with *C. intermedius*, with which it is geographically sympatric; however, it occurs on sandy substrates and it can be distinguished by lack of guard hairs on the rump, longer hind feet (usually greater than 22 mm), more-roughened and less-exposed mastoid bone in dorsal view, interparietal with a distinguishable anteriomedian angle, and a wider face (Hoffmeister and Lee, 1967). The diploid number of chromosomes is 2n = 46 (Patton, 1967).

EXTERNAL MEASURES AND WEIGHT

TL = 162 to 216 mm; TV = 83 to 129 mm; HF = 22 to 27 mm; EAR = 7 to 10 mm. Weight: 16.5 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

Chaetodipus penicillatus. Scrubland. Puerto Libertad, Sonora. Photo: Horacio Barcenas.

NATURAL HISTORY AND ECOLOGY: The desert pocket mouse occupies sandy or alluvial soils with mesquites (*Prosopis*) instead of rocky soil and open areas dominated by shrubs such as *Larrea* and *Atriplex*. It is a granivore (Hoffmeister and Lee, 1967; Morton, 1979). Little is known about its reproductive biology in Mexico. Apparently, reproduction occurs in late spring and summer, coinciding with the rainy season. Gestation is about 26 days and the size of a litter is 2 to 8, with an average of 4 offspring (Eisenberg, 1993; Jones, 1993). These mice reach densities of up to 50 individuals/ha. Predators of this species include owls (*Tyto alba* and *Bubo virginianus*; Baker, 1953).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: *C. pencilliatus* occurs in rosetophilous scrublands, mesquitals, microphyllous scrublands, meadows (Álvarez and Álvarez-Castañeda., 1991a), and desert scrublands dominated by *Larrea tridentata* and *Atriplex* (Baker, 1856; Hoffmeister and Lee, 1967). It lives 70 masl to 1,800 masl (Baker, 1956; Baker and Greer, 1962; Hall, 1981).

CONSERVATION STATUS: This species has a broad distribution and has been reported to be common, but the subspecies *C. penicillatus seri* is restricted to Tiburón Island in the Gulf of California and is listed as threatened (SEMARNAT, 2010).

Chaetodipus pernix (J.A. Allen, 1898)

Sinaloan pocket mouse

Iván Castro Arellano

SUBSPECIES IN MEXICO

Chaetodipus pernix pernix (J.A. Allen, 1898)
Chaetodipus pernix rostratus (Osgood, 1900)

DISTRIBUTION: *C. pernix* is endemic to Mexico and is distributed in a narrow band that extends from south-central Sonora into northern Nayarit (Hall, 1981). It has been recorded in NY, SI, and SO.

DESCRIPTION: *Chaetodipus pernix* is a small-sized mouse. Dorsal coloration is yellowish-brown with dark hair. Sides are paler and the belly is white. The tail is brown, but white ventrally. Ears are dark with a white spot on the lower margins (Allen, 1898; Osgood, 1900). Males are larger than females, and there is variation in size among subspecies (*C. pernix rostratus* is the largest; Best and Lackey, 1992b). The diploid number of chromosomes is 2n = 38 (Patton, 1967).

EXTERNAL MEASURES AND WEIGHT
TL = 157 mm; TV = 81 mm; HF = 21 mm; EAR = 10 mm.
Weight: 17 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: The Sinaloan pocket mouse lives in areas with alluvial soil, almost without rocky material, and with a dense shrubby coverage (Patton and Jones, 1972). In Sonora, births have been reported in October and November (Burt, 1938), and in Sinaloa, pregnant animals have been observed in early April (Hooper, 1955). Based on number of placental scars, the usual number of offspring is seven (Patton and Soulé, 1967). This species is a granivore. Remains of seeds of *Opuntia* and grasses have been noted in contents of cheek pouches (Burt, 1938; Morton, 1979).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: *C. pernix* inhabits the coastal plain of Sonora and Sinaloa. It inhabits shrubs and thorny forests characterized by legumes, arboreal cacti, and prickly pears. Wilson (1985) defined this type of vegetation as tropical semi-arid forest. Some species of plants common to this habitat are *Acacia cymbispina*, *Ipomea arborescens*, and columnar cacti (*Pachycerus pecten-arboriginum*). It also occurs along edges of agricultural fields, in prickly pear plantations (*Opuntia*), and near trees of the genus *Ficus* (Best and Lackey, 1992; Burt, 1938; Patton and Jones, 1972). It occurs from sea level to 90 m (Best and Lackey, 1992).

CONSERVATION STATUS: This species is common (Burt, 1938) and does not appear to be at risk. Its current status is unknown. Because it is endemic to Mexico and because it has a limited distribution, it must be considered a priority in assessing its conservation status.

Chaetodipus rudinoris (Elliot, 1903)

Baja California pocket mouse

Gerardo Ceballos

SUBSPECIES IN MEXICO
Chaetodipus rudinoris extimus (Nelson and Goldman, 1930)
Chaetodipus rudinoris fornicatus (Burt, 1932)
Chaetodipus rudinoris hueyi (Nelson and Goldman, 1929)
Chaetodipus rudinoris mesidios (Huey, 1964)
All subspecies were considered as subspecies of *C. baileyi*. Due to differences in karyotypes, allozymes (Patton and Rogers, 1993; Patton et al., 1981), and other features, however, populations west of the Colorado River have been assigned to *C. rudinoris* (Riddle et al., 2000).

DESCRIPTION: *Chaetodipus rudinoris* is one of the largest species in the genus; it is similar to *C. baileyi*, which can be distinguished by its allopatric distribution and genetic characteristics. The tail is longer than the length of head and body, and the tail is conspicuously crested. The ears are large. The pelage is smooth and it has bristles. Dorsal coloration varies from yellowish-gray to buffy ochre or pale buffy (Hall, 1981; Paulson, 1988). It can be distinguished from other species by its soft pelage that lacks bristles, large size, and dorsal coloration (Hall, 1981). Within the genus, *C. rudinoris* and *C. baileyi* are only surpassed in size by *C. hispidus* (Williams et al., 1993a).

EXTERNAL MEASURES AND WEIGHT

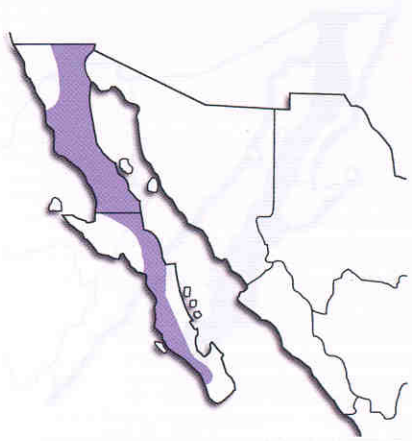
TL = 188 to 223 mm; TV = 103 to 124 mm; HF = 24 to 27 mm; EAR = 7 to 11 mm. Weight: 24 to 28 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: Baja California pocket mice are nocturnal and terrestrial. Burrows are under rocks or shrubs. Within burrows, temperature is lower and more stable and humidity is higher than on the surface, which assists *C. rudinoris* in retaining water and energy. Apparently, they are common on slopes in the ecotone between slopes of foothills and desert plains (Álvarez-Castañeda and Patton, 1999). Densities up to 86 individuals/ha have been reported. They feed mainly on seeds, but also consume insects and green vegetation (Paulson, 1988). They are generalists and consume seeds of many species such as jojoba (Reichman, 1973). If there is no water available, they can survive long periods generating metabolic water. They usually mate twice a year during June–October. Average size of a litter is three to four offspring (Reichman, 1973). They are preyed on by a variety of vertebrates, including foxes, coyotes (*Canis latrans*), hawks, owls, and snakes. To avoid predators, they are active under dense vegetation. Coloration usually is similar to that of the substrate and sudden-prolonged immobility helps them avoid predators (Reynolds, 1949).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: The Baja California pocket mouse mainly inhabits shrublands in arid areas on the plains of the Baja California Peninsula, but on hillsides of the Sierra de San Pedro Mártir it occupies areas that may be rocky. Where it is present on Montserrat Island in the Gulf of California, dominant vegetation is xeric scrubland. It occurs from sea level to 250 m.

CONSERVATION STATUS: This species is not at risk, as it has a wide distribution, including large areas with little disturbance by humans.



DISTRIBUTION: *C. rudinoris* occurs from California in the United States to the southern tip of the Baja California Peninsula in Mexico (Riddle et al., 2000). The Colorado River separates it from *C. baileyi*. The subspecies *C. rudinoris fornicatus* dwells on Montserrat Island. It has been recorded in BC and BS.

Chaetodipus spinatus (Merriam, 1889)

Spiny pocket mouse

Miguel A. Briones and Julia P. López

SUBSPECIES IN MEXICO

Chaetodipus spinatus broccus (Huey, 1960)
Chaetodipus spinatus bryanti (Merriam, 1894)
Chaetodipus spinatus corderoi (Benson, 1930)
Chaetodipus spinatus evermanni (Nelson and Goldman, 1929)

DISTRIBUTION: *C. spinatus* occurs from the southwestern United States in Arizona and California to nearly all of the Baja California Peninsula in Mexico (Eric, 1981; Loomis, 1971; Patton et al., 1981). It has been recorded in BC and BS.

Chaetodipus spinatus guardiae (Burt, 1932)
Chaetodipus spinatus latijugularis (Burt, 1932)
Chaetodipus spinatus lorenzi (Banks, 1967)
Chaetodipus spinatus magdalenae (Osgood, 1907)
Chaetodipus spinatus macrosensis (Burt, 1932)
Chaetodipus spinatus margaritae (Merriam, 1804)
Chaetodipus spinatus occultus (Nelson, 1912)
Chaetodipus spinatus oribates (Huey, 1960)
Chaetodipus spinatus peninsulae (Merriam, 1894)
Chaetodipus spinatus prietae (Huey, 1930)
Chaetodipus spinatus pullus (Burt, 1932)
Chaetodipus spinatus serosus (Burt, 1932)
Chaetodipus spinatus spinatus (Merriam, 1889)

DESCRIPTION: *Chaetodipus spinatus* is a relatively large species. The muzzle is long; the ears are short and rounded. On both sides of the mouth it has external cheek pouches that are used to transport food to its burrow. The tail is long with short hairs and ends in a small brush. The pelage is rough and brownish-yellow; the underside is white or cream colored. The tail is bicolored, brownish above and white below. The legs and base of tail have long hair with coarse spines. Forefeet are shorter than hind feet, allowing bipedal locomotion (Woloszyn and Woloszyn, 1982).

EXTERNAL MEASURES AND WEIGHT
TL = 85 to 89 mm; TV = 107 to 124 mm; HF = 25 to 26 mm; EAR = 9 to 10 mm. Weight: 20 to 22 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: Spiny pocket mice inhabit arid areas with xeric scrublands. They dig burrows under shrubs or between rocks. The species is strictly

Chaetodipus spinatus. Scrubland. Isla Margarita, Baja California. Photo: Eric Mellink.

nocturnal and feeds on seeds that are stored in burrows. It drinks no water; in captivity it eats green parts of plants to provide its water requirements. Reproduction occurs during June–September. Females have two to six young per litter. Natural enemies include owls, foxes, skunks, and rattlesnakes (Woloszyn and Woloszyn, 1982).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: In Sierra de la Laguna, *C. spinatus* mainly inhabits thorny scrublands, plateaus, and slopes of the mountain covered by lowland deciduous forests, and it reaches upper-elevational limits in oak forests. It also may occupy pine-oak forests. It occurs from sea level to 2,000 m.

CONSERVATION STATUS: The species is not considered at risk of extinction. All subspecies on islands, which include *C. spinatus bryanti*, *C. spinatus corderoi*, *C. spinatus evermanni*, *C. spinatus guardiae*, *C. spinatus latijugularis*, *C. spinatus lorenzi*, *C. spinatus marcosensis*, *C. spinatus margaritae*, *C. spinatus occultus*, *C. spinatus pullus*, and *C. spinatus seorsus*, however, are listed as endangered, threatened, and extinct (SEMARNAT, 2010).

Perognathus amplus Osgood, 1900

Arizona pocket mouse

Adrián Quijada Mascareñas and Jorge Ortega R.

SUBSPECIES IN MEXICO

Perognathus amplus amplus Osgood, 1900

Perognathus amplus taylori Goldman, 1932,

The taxonomic status of Mexican subspecies is unclear (Hoffmeister, 1986).

DESCRIPTION: *Perognathus amplus* is a small-sized mouse. Coloration varies among subspecies but, in general, it is salmon-ochre on the back and yellowish-white on the abdomen; the orbital region is paler than the back (Hall, 1981). *P. amplus* is closely related to *P. longimembris*. These species can be separated by the larger skull of *P. amplus*, and by its well-developed mastoid bones and small bullae (Hoffmeister, 1986). There are also external features that distinguish the two species (Williams et al., 1993a).

EXTERNAL MEASURES AND WEIGHT

TL = 123 to 170 mm; TV = 79 to 95 mm; HF = 17 to 22 mm; EAR = 7 to 12 mm. Weight: 17 to 21 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: This species occurs in areas with loose and soft soil. It is nocturnal and diet is mainly seeds. In a study conducted in Arizona, diet included 94.3% seeds, 3.7% insects, and 2% green vegetation (Reichman, 1975). They forage indiscriminately, and seeds collected are transported to the burrow (Reichman and Oberstein, 1977). Reproduction occurs from late winter into early summer. In each litter, three to five offspring are born (Reichman and Van de Graaff, 1973). When temperature decreases in winter, Arizona pocket mice stay in burrows and lower their body temperature.

DISTRIBUTION: The Arizona pocket mouse occurs from western and central Arizona in the United States into northwestern Sonora in Mexico. It has been recorded in SO.

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: Ecological distribution is limited to xeric scrublands, associated with mesquites (*Prosopis*), cresotebushes (*Larrea tridentata*), and palo verdes (*Cercidium*). This species occurs from sea level to 500 m.

CONSERVATION STATUS: Current status of populations is unknown in Mexico. Due to its restricted distribution, it probably is a fragile species. It is protected in the El Pinacate Biosphere Reserve in Sonora (Caire, 1985).

Perognathus flavescens Merriam, 1889

Plains pocket mouse

Jesús Pacheco R.

SUBSPECIES IN MEXICO

Perognathus flavescens melanotis Osgood, 1900

DESCRIPTION: *Perognathus flavescens* is a small-sized mouse. It has a pair of external cheek pouches situated on both sides of the muzzle. The pelage is smooth. Dorsal coloration of the body is ochre intermingled with black, particularly in the middle region; the underside is white (Osgood, 1900). Post-auricular spots are inconspicuous and yellow (Hoffmeister, 1986). The tail is shorter than the length of body (less than 92 %), dark on top, and white on the bottom (Hoffmeister, 1986; Osgood, 1900; Williams et al., 1993a). Across its range, it shows wide variation in coloration, depending on that of the local substrate and indirectly on amount of annual precipitation. The skull is short and wide, and the nasal passages are long (Hall, 1981). It is slightly larger than *P. flavus* and *P. merriami*, the tail and feet are relatively larger, the pelage is paler, and it has more interspersed black hairs in the back (Findley, 1987); in addition, the ears are relatively smaller (Anderson, 1972). It differs from other species of *Perognathus* in cranial features such as greater length of the skull and nasals (Anderson, 1972; Hoffmeister, 1986).

EXTERNAL MEASURES AND WEIGHT

TL = 113 to 154 mm; TV = 56 to 73 mm; HF = 15 to 21 mm; EAR = 6.5 mm. Weight: 8 to 11 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: Plains pocket mice are nocturnal. The diet primarily is seeds of a variety of species, which are transported in the cheek pouches for storage and later consumption. Insects and green plants also are part of the diet (Wilson and Ruff, 1999). They rarely drink water, as they obtain water from the food they eat. Burrows are small and built under shrubs. During the day, they cover the main entrance and leave less-conspicuous openings unplugged. Presumably, this is done to maintain a lower temperature and higher humidity in the burrow compared to on the surface of the ground. The size of the home range is 0.04 ha. Reproduction takes place in April–July, with four to five young per litter. They probably mate twice a year (Burt and Grossenheider, 1976; Findley, 1987). When it occurs sympatrically with *P. flavus*, *P. flavescens* usually occupies sandy soils (Findley, 1987). This species

DISTRIBUTION: *P. flavescens* is a widely distributed species in the Great Plains and prairies of the United States from North Dakota into New Mexico. In Mexico, it has a marginal distribution in Chihuahua, where it is restricted to two small areas in sand dunes and scrublands of Samalayuca and pasturelands and shrublands in Janos-Casas Grandes (Pacheco et al., 1999; Patton, 1993a; Williams, 1978a; Williams et al., 1993b). It has been recorded in CH.

lives in dry environments with sandy soils or dunes. Apparently, the nature of the substrate is more important than vegetation, which consists of grasslands, ephedrines (*Ephedra*), shrubs (*Chrysothamnus*, *Gutierrezia*), and yuccas (*Yucca*; Hoffmeister, 1986). Sometimes the ground where it occurs is completely bare (Hoffmeister, 1986).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: The plains pocket mouse mainly inhabits arid grasslands and xeric scrublands; that is, arid, semi-arid, and open areas with scattered vegetation and sandy soils (Anderson, 1972; Findley, 1987; Williams et al., 1993b). Occasionally, it may occur in pine forests (Hoffmeister, 1986). In Chihuahua, it inhabits sand dunes and scrublands in Samalayuca, as well as grasslands and scrublands in Janos-Casas Grandes at 1,000 masl to 1,350 masl (Anderson, 1975; Pacheco et al., 1999).

CONSERVATION STATUS: Status of this species is unknown. In Mexico, it probably is fragile or vulnerable because it has a marginal distribution that is restricted to a small region in northwestern Chihuahua (Ceballos et al., 1998; Pacheco et al., 2000). An assessment of its status is needed to determine current conservation needs.

Perognathus flavus Baird, 1855

Silky pocket mouse

Gisselle A. Oliva Valdés

SUBSPECIES IN MEXICO
Perognathus flavus flavus Baird, 1855
Perognathus flavus fuscus Anderson, 1972
Perognathus flavus medius Baker, 1954
Perognathus flavus mexicanus Merriam, 1894
Perognathus flavus pallescens R.H. Baker, 1954
Perognathus flavus parviceps R.H. Baker, 1954
Perognathus flavus sonoriensis Nelson and Goldman, 1934

DESCRIPTION: *Perognathus flavus* is the smallest species of the family Heteromyidae in Mexico. It has a pair of external, fur-lined cheek pouches. The back has two fine black lines that are distinct from the ochre coloration; some subspecies may also have yellow and pink hairs. The lateral stripe is buffy and fades in the post-auricular area, where the spots become paler. The underside is completely white. The pelage is smooth and the soles of the hind feet are somewhat furry. The tail is sparsely haired, white at the tip and gray at the base. Auditory bullae are medium sized. The interparietal bone is small, pentagonal, and symmetrical (length equal to width), the face is thin, and the interorbital space is compressed (Ceballos and Galindo, 1984; Findley, 1987; Hall, 1981; Hoffmeister, 1986; Osgood, 1900).

EXTERNAL MEASURES AND WEIGHT
TL = 100 to 122 mm; TV = 44 to 60 mm; HF = 15 to 18 mm; EAR = 5 to 6 mm. Weight: 6 to 9 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

DISTRIBUTION: *P. flavus* occurs from Wyoming in the United States to Mexico, where it occurs across the Mexican Plateau to Jalisco, Morelos, Puebla, and a small area in east-central Veracruz (Anderson, 1972; Hall, 1981; Matson and Baker, 1983; Ramírez Pulido et al., 1983; Sanchez-Hernandez et al., 1999; Wilson, 1973c). It has been recorded in AG, CH, CO, DF, DU, GJ, HG, JA, MI, MO, MX, NL, PU, QE, SL, SO, TA, TL, VE, and ZA.

Perognathus flavus. Grassland. Janos Biosphere Reserve, Chihuahua. Photo: Gerardo Ceballos.

NATURAL HISTORY AND ECOLOGY: These animals are nocturnal. Activities are conducted among patches of vegetation and near rocks. They carry seeds and green vegetation in their cheek pouches. They build burrows at the foot of shrubs and trees or between cracks in rocks. They mainly feed on seeds, but also include vegetation and some insects. Predators are ringtails (*Bassariscus astutus*), long-tailed weasels (*Mustela frenata*), and owls (*Bubo virginianus*, *Tyto alba*). They reproduce during March–August. Each female has two or more litters per year. Gestation period is unknown, but probably is 28 to 32 days. Each litter consists of two to six offspring (Baker, 1954, 1956; Ceballos and Galindo, 1984).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: The silky pocket mouse inhabits areas with xeric vegetation, including scrublands and grasslands. It also occurs in agricultural crops and in areas devoid of vegetation; they rarely occur in rocky areas or where vegetation is dense. They tolerate a wide range of conditions, selecting open spaces (Baker, 1954, 1956; Ceballos and Galindo, 1984). Elevations occupied range from 975 m in Coahuila to 2,400 m in Puebla.

CONSERVATION STATUS: Silky pocket mice are abundant, with a wide distribution and a great tolerance to anthropogenic disturbances, so they are not considered at risk of extinction.

Perognathus longimembris (Coues, 1875)

Little pocket mouse

Jaime Luévano and Eric Mellink

SUBSPECIES IN MEXICO

Perognathus longimembris aestivus Huey, 1928

Perognathus longimembris bombycinus Osgood, 1907

Perognathus longimembris internationalis Huey, 1939
Perognathus longimembris kinoensis Huey, 1935
Perognathus longimembris venustus Huey, 1930

DESCRIPTION: As its common name indicates, *Perognathus longimembris* is a small mouse, with a pink-creamy coloration. The tail is long, greater than the length of body and head, bicolored or pale, hairier on the distal one-third, and with a tuft of hair at the tip. The posterior one-third of the soles of the hind feet is hairy. The baculum (bone in the penis) has a small hook on its distal part. It has 56 pairs of chromosomes (Hall, 1981; Hoffmeister, 1986; Jameson and Peeters, 1988).

EXTERNAL MEASURES AND WEIGHT
TL = 110 to 115 mm; TV = 53 to 83 mm; HF = 15 to 20 mm; EAR = 5 to 7 mm. Weight: 7 to 10 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: The little pocket mouse inhabits places with sandy or stony soil, where it builds burrows. It shows greater activity during spring, two to five hours after sunset, with less activity immediately before dawn; it is affected by moonlight. During the day, it plugs entrances to the burrow with soil. When food is scarce or when the temperature is low, they become lethargic. During winter, they lower activity and body temperature, and they consume seeds stored during summer and autumn (Brylski, 1990g; Hoffmeister, 1986; Jameson and Peeters, 1988). The diet consists mainly of seeds of desert plants, and contents of cheek pouches have included seeds of plantains (*Plantago*), goosefoots (*Chenopodium*), desert trumpets (*Eriogonum inflatum*), and fescues (*Festuca*). They also consume green vegetation and insects. They search for seeds under shrubs. Temperature, amount of food, and plant phenology influence reproduction, which occurs January–August with peaks during March and May. Gestation is 21 to 31 days, with a litter of 2 to 8 offspring per year. Young are weaned 30 days after birth. Females reach sexual maturity at 50 days old and males at 150 days (Brylski, 1990g; Hoffmeister, 1986; Jameson and Peeters, 1988).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: This species inhabits plant communities, including desert scrublands in Sonora and central and northwestern Baja California, and grasslands in the intermountain valleys of northern Baja California. In Mexico, it occurs from sea level to 750 m.

CONSERVATION STATUS: Despite the fact that much of its range in northwestern and central Baja California are now agricultural areas, the rest of its geographic range is little changed. Therefore, it is not considered at risk of extinction.

DISTRIBUTION: *P. longimembris* occurs in the southwestern United States and northwestern Mexico. In northwestern and central Baja California, it is known only from small isolated localities in the valleys of Jacumé, San Rafael (now Ojos Negros), La Trinidad, and San Augustín. It also occurs on the plains of the Colorado River, south of San Felipe, and in part of the Great Desert (Sonora) into El Pinacate. The subspecies *P. longimembris kinoensis* occupies coastal Sonora from Puerto Lobos to Estero Tastiota near Guaymas (Caire, in press; Hall, 1981; Huey, 1964). It has been recorded in BC and SO.

Perognathus merriami J.A. Allen, 1892

Merriam's pocket mouse

Astrid Frisch Jordán and Héctor T. Arita

SUBSPECIES IN MEXICO
Perognathus merriami merriami J.A. Allen, 1892
Perognathus merriami gilvus Osgood, 1900

P. merriami is similar to *P. flavus* (Mayr, 1978) and phylogenetically they are closely related (Steyskal, 1972). In fact, *P. merriami* was considered a subspecies of *P. flavus* until Lee and Engstrom (1991) conducted a genetic study, which revealed two distinct species.

DESCRIPTION: *Perognathus merriami* is a small-sized rodent. The pelage of Merriam's pocket mouse is soft and brownish-yellow or yellowish-pink, the belly is whitish, and the tail is yellow dorsally and white beneath. It has conspicuous yellowish postauricular spots and white subauricular spots. Juveniles are gray (Anderson, 1972; Hall, 1981; MacMahon, 1985). It differs from *P. flavus* by its slightly paler coloration and less contrast between dorsal and lateral coloration. The tendency to develop a dark dorsal stripe is not seen in *P. merriami*. Compared to *P. merriami*, *P. flavus* has auditory bullae that are smaller, the skull is narrower, the interparietal bone is wider, the interorbital space is larger (4.80 mm versus 4.25 mm), and probably the width of the mastoid is larger (Anderson, 1972). The hind feet are longer than the forefeet, which have long nails for digging.

DISTRIBUTION: *P. merriami* occurs from New Mexico and Texas in the United States into northern Mexico, from Chihuahua into Tamaulipas (Hall, 1981; Wilson and Ruff, 1999). It has been recorded in CH, CO, NL, and TA.

EXTERNAL MEASURES AND WEIGHT
TL = 100 to 122 mm; TV = 44 to 60 mm; HF = 15 to 18 mm; EAR = 5 to 6 mm. Weight: 7 to 10 g.

DENTAL FORMULA: I 1/1, C 0/0, PM 1/1, M 3/3 = 20.

NATURAL HISTORY AND ECOLOGY: *P. merriami* is a digging and nocturnal rodent that only leaves its burrow to mate and to collect seeds that are carried in its cheek pouches. Although it is granivorous, it also consumes insects and plant material. It rarely drinks water, as it relies on metabolic water and that obtained from its food (Nowak, 1999b). These mice primarily consume seeds of *Salsola*, *Chenopodium*, *Festuca*, *Cryptantha*, *Amaranthus*, *Opuntia*, *Oryzopsis*, and *Sphaeralcea* (Forbes, 1962). Burrows consist of nest chambers, tunnels for storage of food, and places to deposit feces. In addition, they build several escape burrows scattered throughout the home range. These escape burrows are simple tunnels without an exit that are used to escape from predators (MacMahon, 1985; Nowak, 1999b). Various openings to burrows, which generally are hidden under shrubs, are plugged with soil to maintain low temperature and high humidity inside the burrow. Burrows usually are at bases of vegetation, probably because the root system gives stability to the opening and so that the scattered soil does not make the opening conspicuous to predators (Chapman and Packard, 1974; Nowak, 1999b). During winter, they enter torpor for up to 48 hours but remain active and consume food at other times. In Texas, reproduction occurs in April–November and each female produces more than two litters (Chapman and Packard, 1974). In general, members of this genus produce one or more litters per year, each one with two to seven offspring and four on average. Population density can vary widely, with an average of up to 10/ha (Britt, 1972; Findley, 1975).

VEGETATIONAL ASSOCIATIONS AND ELEVATION RANGE: This species inhabits grasslands, arid plains, and deserts (Findley, 1975; Lee and Engstrom, 1993; MacMahon, 1985). It occurs from 54 masl to 1,181 masl (Álvarez, 1963a).

CONSERVATION STATUS: Current status in Mexico is unknown. It has a wide distribution, which includes extensive regions with little disturbance by humans, so it probably is not at risk.