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Perognathus flavus.

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Perognathus flavus Baird, 1855

Silky Pocket Mouse

Perognatus flavus Baird, 1855:332. Type locality "El Paso [El Paso Co., Texas—Elliot, 1905:302]."

Perognathus bimaculatus Merriam, 1889:12. Type locality "Fort Whipple [Yavapai Co.—Osgood, 1900:17], Arizona."

Perognathus fuliginosus Merriam, 1890:74. Type locality "Cedar belt, northeast of San Francisco Mountain, altitude 7,000 feet [Coconino Co., Arizona—Elliot, 1905:302]."

CONTEXT AND CONTENT. Order Rodentia, Suborder Sciurognathi, Superfamily Geomyoidea, Family Heteromyidae, Subfamily Perognathinae, Genus *Perognathus*. There are nine species of *Perognathus* (Best, 1994; Williams et al., 1993). Fourteen subspecies of *P. flavus* are recognized (Hall, 1981; Lee and Engstrom, 1991):

P. f. bimaculatus Merriam, 1889:12, see above.
P. f. bunkeri Cockrum, 1951:205. Type locality "Conard Farm, 1 mi. E Coolidge, Hamilton County, Kansas."
P. f. flavus Baird, 1855:332, see above.
P. f. fuliginosus Merriam, 1890:74, see above.
P. f. fuscus Anderson, 1972:304. Type locality "2 mi. W Miñaca, 6900 ft.," Chihuahua, Mexico.
P. f. goodpasteri Hoffmeister, 1956:55. Type locality "2¾ miles northwest of Springerville, Apache County, Arizona."
P. f. hopiensis Goldman, 1932:89. Type locality "Oraibi, Hopi Indian Reservation, Navajo County, Arizona (altitude 6,000 feet)."
P. f. medius Baker, 1954:343. Type locality "1 mi. S and 6 mi. E Rincón de Romos, 6550 ft. elevation, Aguascalientes," Mexico.
P. f. mexicanus Merriam, 1895:265. Type locality "Tlalpam, Valley of Mexico (Federal District)," Mexico.
P. f. pallescens Baker, 1954:345. Type locality "1 mi. SW San Pedro de las Colonias, 3700 ft. elevation, Coahuila," Mexico.
P. f. parviceps Baker, 1954:344. Type locality "4 mi. W and 2 mi. S. Guadalajara, 5100 ft. elevation, Jalisco," Mexico.
P. f. piperi Goldman, 1917:148. Type locality "23 miles southwest of Newcastle [Weston Co.—Miller, 1924:274], Wyoming."
P. f. sanluisi Hill, 1942*b*:1. Type locality "nine miles east of Center [Saguache Co.] (twenty miles north northwest of Alamosa, Alamosa County), Colorado, altitude 7580 feet."
P. f. sonoriensis Nelson and Goldman, 1934:267. Type locality "Costa Rica Ranch, lower Sonora River, Sonora, Mexico."

DIAGNOSIS. *Perognathus flavus* (Fig. 1) is smaller and has a relatively shorter, non-penciled tail than allopatric *P. alticolus*, *P. inornatus*, and *P. parvus*. Compared with *P. amplus*, *P. flavus* has a non-penciled tail (Williams et al., 1993) that is shorter, and the tail always is shorter than length of head and body (Hoffmeister, 1986). Hind feet of *P. flavus* are shorter (length of hind foot rarely >18 mm in *P. flavus* and rarely <19 mm in *P. amplus*—Williams et al., 1993), it has a more conspicuous, pale-colored, postauricular patch, and the skull is smaller (Hoffmeister, 1986).

Compared with *P. fasciatus*, *P. flavus* in the Great Plains is smaller with more inflated auditory bullae and narrower interbullar region (Williams et al., 1993). In addition, *P. flavus* has a shorter tail, conspicuous postauricular patches, and a shorter, broader skull (Osgood, 1900).

Compared with *P. flavescens*, *P. flavus* has narrower interparietals (width averages >4.0 mm in Great Plains populations of *P. flavescens* and <3.6 mm in *P. flavus*), it generally has a darker color dorsally due to numerous black-tipped guard hairs, and its postauricular patch appears larger and contrasts more with surrounding areas than in *P. flavescens* (Williams et al., 1993). Body size of *P. flavescens* is ca. 18% larger than sympatric *P. flavus*, with a relatively longer tail (length of tail averages 86% of length of head and body in *P. flavus*). The skull of *P. flavescens* is ca. 11% longer than that of *P. flavus*, with relatively smaller bullae (length of bullae averages 40% of occipitonasal length in *P. flavus*, and 37% in *P. flavescens*), and wider interorbital region (interorbital breadth averages >5.1 mm in *P. flavescens* and <4.5 mm in *P. flavus*—Williams, 1978*a*). Compared with *P. flavescens* in Arizona, the tail of *P. flavus* averages ca. 80–90% of length of head and body rather than ca. 92%, the hind foot is smaller (averaging 16.8 rather than 19.4 mm), the skull is smaller, the width of interparietal is less than length of maxillary toothrow, the interorbital region is narrower, and the skull is narrower across the mastoids (Hoffmeister, 1986). Compared with *P. flavescens* in New Mexico, which usually has a length of tail ≥60 mm, total length ≥120 mm, and length of cranium >21 mm, *P. flavus* usually has a tail <60 mm, total length <120 mm, and length of cranium <21 mm (Findley et al., 1975). Compared with *P. flavescens* in Chihuahua, *P. flavus* has longer ears relative to length of head and body (Anderson, 1972).

Perognathus flavus differs from *P. longimembris* in having an absolutely and relatively shorter, non-penciled tail, smaller average size, smaller hind feet, narrower interorbital width, and wider upper molars (Williams et al., 1993). In addition, the nasals of *P. flavus* are shorter (Hoffmeister, 1986).

The ranges of *P. flavus* and *P. merriami* overlap in southeastern New Mexico and western Texas (Bailey, 1905; Osgood, 1900). *P. flavus* is more similar to *P. merriami* than to any other species of *Perognathus*; these taxa may hybridize at a few localities. Compared with *P. merriami*, *P. flavus* has: a shorter tail; longer, softer, and laxer pelage; darker, more-contrasting mid-dorsal color with a pinkish rather than yellowish or yellowish-orange hue; larger postauricular spots; larger, more-inflated auditory bullae; narrower interorbital and interparietal widths; wider P4 (Williams et al., 1993); smaller translacrimal width; longer ears; smaller length of head and body, length of tail, and length of hind foot. Relative to greatest length of skull, *P. flavus* has longer maxillary toothrows and bullae, shorter and less projecting nasals, greater transdental width, and smaller interorbital breadth (Anderson, 1972). No single set of characters will distinguish all *P. flavus* from all *P. merriami*. Comparisons of individuals from areas of sympatry show *P. f. flavus* and *P. m. gilvus*, respectively, to average: bullar length/occipitonasal length, 0.388, 0.359; length of tail/total length, 0.452, 0.488; distance across mastoid bullae, 11.93, 11.44 mm; width of P4, 0.90, 0.82 mm (Williams et al., 1993).

FIG. 1. A male *Perognathus f. flavus* from near White's City, Eddy Co., New Mexico (photograph by T. L. Best, K. N. Geluso, and T. D. Henry).

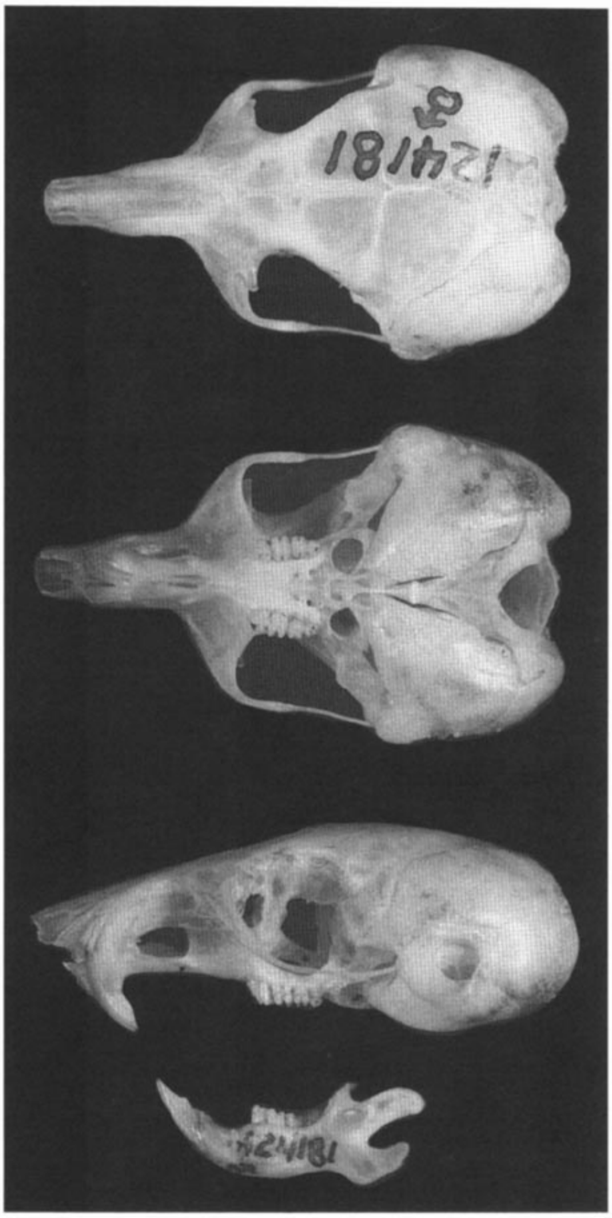

FIG. 2. Dorsal, ventral, and lateral views of the cranium and lateral view of the mandible of *Perognathus flavus bimaculatus* from Seven-V Ranches Headquarters, 25 miles NW Prescott, Yavapai Co., Arizona (male, Museum of Vertebrate Zoology, University of California, Berkeley 124181). Greatest length of cranium is 20.8 mm. Photographs by T. H. Henry.

GENERAL CHARACTERS. Upperparts are finely lined with black on ochraceous buff and in some subspecies yellowish-buff and pinkish-buff. The lateral line is faintly expressed in buff. Ventrally, *P. flavus* is white including the forelegs, but there may be a faint tawny suffusion. The tail is whitish ventrally, and dusky or buffy on the dorsum (Hall, 1981). The dorsal color is heavily overlain with blackish-tipped hairs in most subspecies, contrasting with the clear buffy postauricular patches and a narrow line without black tinge on the side adjacent to the white underparts (Williams et al., 1993).

The silky pocket mouse is the smallest heteromyid (Best, 1993). Length of head and body averages ca. 60 mm or less, and length of tail averages <57 mm and rarely is >60 mm (Williams et al., 1993). The tail is shorter than length of head and body (usually ca. 85%, range is 76–93%—Hoffmeister, 1986). *P. flavus* has the shortest tail and smallest ratio of length of tail to head and body of any *Perognathus* (ratio averaging <0.9—Williams et al., 1993).

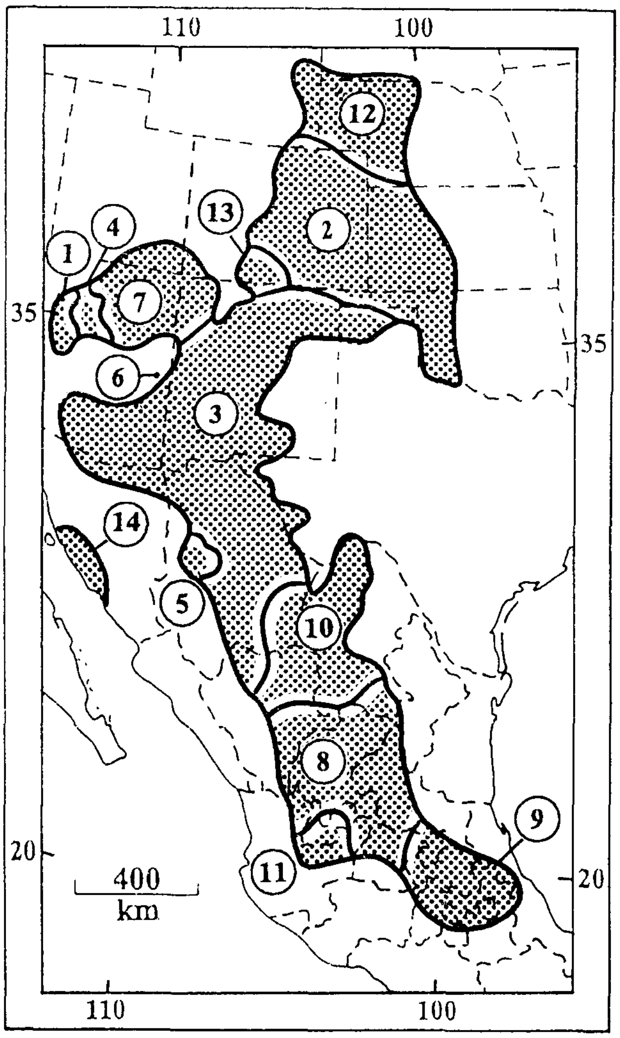

FIG. 3. Distribution of *Perognathus flavus* in central North America (adapted from Hall, 1981): 1, *P. f. bimaculatus*; 2, *P. f. bunkeri*; 3, *P. f. flavus*; 4, *P. f. fuliginosus*; 5, *P. f. fuscus*; 6, *P. f. goodpasteri*; 7, *P. f. hopiensis*; 8, *P. f. medius*; 9, *P. f. mexicanus*; 10, *P. f. pallescens*; 11, *P. f. parviceps*; 12, *P. f. piperi*; 13, *P. f. sanluisi*; 14, *P. f. sonoriensis*.

The skull (Fig. 2) does not have a pronounced posterior bulge of the occipital, it is narrow interorbitally, and the rostrum is short (Hoffmeister, 1986). The posterior region of the cranium has large auditory bullae and is constricted, with short, narrow interparietals. Length of interparietal averages ca. 2.3–2.5 mm and rarely is >2.9 mm, and width of the interparietal averages ca. 3.0–3.3 mm and rarely is >3.9 mm (Williams et al., 1993). The mastoids reach the dorsal surface of the cranium, scarcely compress the interparietal, and project posterior to the occipital (Webster, 1968). The interparietal is almost as long as wide, the auditory bullae do not meet anteriorly (Hall, 1981), and the transverse interparietal dimension is less than the interorbital breadth (Anderson, 1972). The rostrum is slender, maxillary branches of the zygomata are angular, and the interorbital space is well constricted (Osgood, 1900).

Sexual dimorphism in size is not obvious (Forbes, 1964), but length of tail of males is larger than for females. Average measurements (in mm) of adult males and females, respectively, from throughout the range are: total length, 113.2, 111.6; length of body, 59.0, 60.4; length of tail, 54.2, 51.3; length of hind foot, 16.5, 16.7; length of ear, 6.2, 6.2; basal length of cranium, 12.7, 12.5; greatest length of cranium, 20.8, 10.5; width of maxillary arch, 9.9, 9.8; interorbital width, 4.6, 4.6; nasal length, 8.0, 7.8; intermaxillary width, 4.0, 4.0; alveolar length, 3.2, 3.2; lacrimal length, 1.4, 1.5; maxillary arch width, 0.9, 0.9; basioccipital length, 3.4, 3.4; greatest depth of cranium, 7.3, 7.3; greatest width of cranium, 12.0, 11.9;

zygomatic width, 10.9, 10.8; nasal width, 2.1, 2.2 (Best, 1993). Mass is 6–10 g (Jones et al., 1983).

Perognathus flavus exhibits considerable geographic variation (Hall, 1981). In Colorado, color varies widely, particularly in the degree to which the dorsum is overlaid with black hairs (Armstrong, 1972). In Chihuahua, there is geographic variation in cranial, bullar, nasal projection, and occipitobullar lengths when northern and southern populations are compared (Anderson, 1972).

DISTRIBUTION. The silky pocket mouse occupies a broad range in the westcentral, southwestern Great Plains, and intermountain basins of the United States, and the central plateau of Mexico (Fig. 3). A disjunct population occurs along the coastal plain of the Gulf of California in Sonora (Hall, 1981; Williams et al., 1993). In northern Arizona, the Colorado River serves as a barrier (Goldman, 1937). In Mexico, two subspecies (*P. f. medius* and *P. f. pallescens*) are separable at or near the prominent valley of the eastward-flowing Río Nazas, which also marks the dividing line for subspecies of several other mammals of central and eastern Durango (Baker and Greer, 1962). *P. flavus* occupies lower and upper Sonoran life zones (Bailey, 1913) at elevations of 975–2,490 m (Armstrong, 1972; Baker, 1954).

FOSSIL RECORD. The genus *Perognathus* first appears in the Miocene (Wood, 1935). However, earliest remains of *P. flavus* are from late Pleistocene and Recent deposits: Pima Co., Arizona (Mead et al., 1984); Yuma Co., Colorado (Lundelius et al., 1983); Bernalillo Co. and Eddy Co., New Mexico (Harris, 1985); Cimarron Co., Oklahoma (Dalquest and Stangl, 1989).

FORM AND FUNCTION. As in other *Perognathus*, *P. flavus* has external pouches on each side of the mouth for carrying food (Nelson, 1918). The cheekpouches are capable of eversion and their insides are lined with short-white hairs (Baird, 1857).

Compared to size of body, *P. flavus* has a large head; the eyes are small (Baird, 1857; Shufeldt, 1888). The ears are moderately large (Baird, 1857) and rounded (Shufeldt, 1888), with their greatest diameter in a line with the axis of the head. There is no lobe on the antitragus. The ear is sparsely coated with hairs on both surfaces, most scattered on the concavity. The muzzle is coated with coarse stiff hairs all around, the septum and region around the nostrils are naked, and the hairs on the sides and lower part of the muzzle are long and spring out like short-fine whiskers. These are long and black and situated in five rows (Baird, 1857). There is a tuft of whiskers composed of white hairs of varying length on either side of the upper lip (Shufeldt, 1888).

The hind foot is 27% of length of head and body (Hatt, 1932). Soles of hind feet are somewhat hairy (Anderson, 1972; Baird, 1857; Merriam, 1889). The third claw of the forefoot is longest, the fourth is shorter, the second reaches to the middle of the third, and the fifth extends beyond the base of the fourth. The central three toes are nearly equal in length, the middle one is longest, and the fifth extends a little beyond the last articulation of the fourth toe. The foreclaws are long, and the thumb is short and has a flat nail. The first toe is short and set far back, its claw reaches to the base of the second toe. The central three toes are longest, the middle one exceeds the others, the fifth toe is situated posterior to these and its claw reaches the penultimate articulation of the fourth (Baird, 1857).

The tail is cylindrical and tapers to a blunt tip. It is covered with whorls of fine scales, with short hairs between them that do not obscure the whorls. The tail is shorter than the body and sparsely coated with short hairs. There are stiff hairs at the end (Baird, 1857).

Perognathus flavus has soft pelage (Anderson, 1972; Merriam, 1889). Once adulthood is attained, it undergoes one molt annually, during summer, perhaps as late as August. In adults, hair replacement progresses anteriorly, posteriorly, and laterally from the middle of the back. Partial molts may occur and this pattern may become chaotic in older mice (Forbes, 1964).

Coloration may be dark on dark-colored substrates. For example, *P. f. fuliginosus* occurs on a lava field in Arizona and is darkly pigmented (Merriam, 1890). However, *P. flavus* from White Sands, New Mexico, is no paler than populations from elsewhere in the Tularosa Basin (Benson, 1933).

As in all *Perognathus*, the dental formula is i 1/1, c 0/0, p 1/1, m 3/3, total 20 (Hall, 1981). Upper incisors are grooved for their entire lengths, but the lower pair is not grooved (Gray, 1868; Shufeldt, 1888). The lower premolar is no larger than the last molar and is smaller in several subspecies (Hall, 1981). The P4 consists of a curved metaloph of three cusps (metacone, hypocone, entostyle) and a protoloph with one cusp; the protocone. The protoloph, on being worn, unites with the center of the metaloph, i.e., the protoloph shows a tendency to move its point of union buccally, until it reaches the valley between the hypocone and the metacone (Wood, 1935).

Perognathus flavus uses quadrupedal saltation with both forefeet touching the ground in unison followed by both hind feet in unison. It also employs an alternating extension pattern for progression at slow speeds in which the contralateral limbs are about in synchrony (Pinkham, 1973).

The calcaneum of *P. flavus* is long and narrow. The trochlear process is distal and the slope to the sustentaculum is steep (Stains, 1959).

Average endocranial volume is 0.30 cm^3 (Hafner and Hafner, 1984). In the brain, the medial superior olivary nucleus and trapezoid body are both prominent, whereas the lateral superior olivary nucleus is small. There is no prominent ventral bulge caused by the superior olivary complex (Webster, 1969). The middle ear has the following dimensions (in mm unless otherwise indicated): volume, 0.07 cm^3; relative volume, 0.24 cm^3; diameter of tympanic membrane, 3.01; length of stapes footplate, 0.74; width of stapes footplate, 0.44; length of malleus, 1.72; length of incus, 0.67 (Webster and Webster, 1975). The cochlea has three turns and forms a prominent bulge in the roof of the hypotympanic portion of the middle-ear cavity. The bony walls encapsulating the cochlea are so thin that each of its turns is discernible. It is broad and flat with a tapering apex. The organ of Corti and basilar membrane extend into the vestibule. The scale vestibuli is thus part of the vestibule at the beginning of the basal turn. The basal end of the basilar membrane lies close to the round-window membrane. Therefore, cross-sectional area of the scala tympani at this point is small. The scala tympani narrows to 0.026 mm^2 by the beginning of the second turn and to 0.013 mm^2 at the beginning of the third turn, and then dilates to 0.023 mm^2 at the apex. The helicotrema, connecting scala vestibuli and scala tympani, extends less than one-quarter turn and has an area of 0.009 mm^2. Cross-sectional area of the scala media decreases 1.4 fold for the first half-turn to the apex. The basilar membrane has a thin zona tecta in all turns. Its zona pectinata extends from the outer pillar to the spiral ligament and contains a large hyaline mass enclosed by basilar membrane fibers passing above and below it. The basilar membrane is narrowest at the beginning of the basal turn, measuring ca. 100 μm from osseous spiral lamina to spiral ligament. Width of basilar membrane increases and reaches its maximum of ca. 150 μm at the end of the first turn and decreases in the upper two turns (Webster and Webster, 1980).

Perognathus flavus needs no water at relative humidities of 25–60% (Carpenter, 1966) and it can survive for months on dry sand with a diet of dry seeds (Nelson, 1918). In Arizona, annual energy flow (in kcal ha^{-1} $year^{-1}$) is: maintenance energy, 1,250; growth energy, 90; energy flow, 1,340. This represents 1.3% of the total energy flow in the mammal community where *P. flavus* was studied (Chew and Chew, 1970).

Average daily metabolic rate is 6.91 cm^3 of oxygen g^{-1} h^{-1} at an ambient temperature of 20°C (French et al., 1976). Average resting consumption of oxygen at 35°C is 2.085 ml g^{-1} h^{-1}. Evaporative water loss is 3.025 mg of water g^{-1} h^{-1}. Body temperature at an ambient temperature of 5°C is 34.6°C (Hinds and MacMillen, 1985). Usual body temperature is 38°C (Wolff and Bateman, 1978); average lower critical temperature is 30.9°C (Chew and Chew, 1970).

Torpor appears to be a short-term, energy conserving process that may last up to 48 h. When *P. flavus* enters torpor at an ambient temperature of 5°C, its body temperature drops by 5.6–6.9°C. When ambient temperature is 1°C, body temperature remains ca. 5°C. Thus, torpid *P. flavus* return to endothermic regulation below ambient temperatures of 5°C, maintaining a constant body temperature near 5°C. When placed on food rations of 0.25–1.5 g/day at temperatures of 1–15°C, the silky pocket mouse conserved energy by reducing metabolic rate and entering daily periods of torpor. When given food in excess at these temperatures, *P. flavus* did not enter torpor. Ambient temperature and food ration are inversely correlated with time in torpor and loss of body mass. Mid-afternoon feeding on seeds, which have been stored in the burrow, makes it energetically feasible for *P. flavus* to devote earlier evening hours almost exclusively to foraging. This decreases metabolic cost of foraging because temperatures during these hours generally are greater than those later at night when aboveground activity is reduced. It appears that the tendency to gather and store seeds has high survival value in a habitat characterized by periodically inclement weather and an erratic food supply (Wolff and Bateman, 1978).

The baculum is fairly uniform throughout the range of *P. flavus.* The large bulbous basal end is wider than it is high and the shaft curves up in the middle and again at the distal end. Average and range of measurements (in mm) are: total length, 6.8 (6.3–7.2); height of base, 1.1 (1.0–1.2—Burt, 1960). There are two pair of inguinal and one pair of pectoral mammae (Bailey, 1931).

ONTOGENY AND REPRODUCTION. The silky pocket mouse has been bred in captivity (Eisenberg and Isaac, 1963). In New Mexico, reproductive activity in natural populations is most intense from April through July and in September and October (Holdenried and Morlan, 1956), but ceases in winter (Forbes, 1964; Holdenried and Morlan, 1956). In Arizona, *P. flavus* may conceive in late January and give birth in late February, when it is bitterly cold in the habitats that *P. flavus* occupies (Hoffmeister, 1986).

In Arizona, some males are reproductively active in all months (Brown and Zeng, 1989). In New Mexico, the annual curve for length of testes parallels that for body mass. Body mass declines during November, December, and January, when no reproductive activity is apparent. Length of testes is least in November and greatest in February (Britt, 1972).

Condition of vulva is not a reliable criterion for judging reproductive activity. In New Mexico, females may be sexually active 9–11 months of the year (Britt, 1972), but a given female bears only one litter annually (Forbes, 1964). In Arizona, females have two reproductive peaks, one in February and another in May. However, there are some pregnant females in all months (Brown and Zeng, 1989).

Gestation period is 22–26 days (Eisenberg and Isaac, 1963; Hoffmeister, 1986). Average size of litters is three to four and the range is one to six (Bailey, 1931; Benson, 1933; Hill, 1942*a*; Hoffmeister, 1986; Hooper, 1941; Matson and Baker, 1986). Weaning age is ca. 30 days (Hoffmeister, 1986). Half-grown young may be present in late April (Colorado), early July (New Mexico), mid-September (New Mexico—Bailey, 1931), and early October (New Mexico—Benson, 1933).

Eyes open at 15–16 days, auditory meatus opens at 13–15 days, incisors appear at ca. 9 days, first dorsal pelage is completed at ca. 13 days, and first ventral pelage is completed at ca. 16 days (Eisenberg and Isaac, 1963). Juveniles have no evidence of permanent P4. The permanent and deciduous P4 are differentiated by presence of an accessory cusplet on the anterior cusp of the deciduous tooth; the permanent tooth lacks this cusp. Young adults have permanent P4s erupting, with the deciduous teeth in place or shed, or teeth that have erupted, but not yet reached occlusal level. Adults have permanent P4s at occlusal level. Old adults have molariform teeth that are so worn that no cusps remain (Forbes, 1964).

In New Mexico, juvenile pelage is dull gray in color, soft, and thin. Young are in juvenile pelage when they begin to forage outside the burrow. They remain in juvenile pelage until the permanent P4 can be seen beneath the deciduous premolars on a cleaned skull. Post-juvenile molt is first indicated by darkly pigmented skin just posterior to the forelimbs. As dark pigmentation spreads over the back, tips of new hairs appear, and the gray, juvenile hair is replaced by bright yellow, black-tipped hair of adult pelage. Post-juvenile molt may not be completed until adulthood is attained (Forbes, 1964).

In New Mexico, silky pocket mice born in late summer do not become sexually active until the following spring. However, females first become sexually active at about the time that they attain adulthood and complete post-juvenile molt. Young adults differ from adults in mass and occipitonasal length, but not in total, tail, and hind foot lengths (Forbes, 1964).

In New Mexico, ca. 50% of silky pocket mice live for 2 months, 25% live for 6 months, and a few live for 20 months; average lifespan is 3.3 months (Britt, 1972). However, maximum longevity may be 35 months in some populations (Brown and Zeng, 1989). In captivity, silky pocket mice have lived 3.5–5.0 years on a diet of birdseed. At ca. 5 years of age, molariform teeth are loose and well worn (Aldous, 1930).

ECOLOGY. In Wyoming, the silky pocket mouse occurs in *Artemisia*–Graminae, *Bouteloua–Buchloe, Bouteloua–Stipa, Bouteloua–Stipa–Aristida,* and *Yucca*–Graminae associations. *P. flavus* is most common in the *Bouteloua–Stipa–Aristida* association in vegetation 3–25 cm in height; it occupies sandy and loamy soils (Maxwell and Brown, 1968).

In Colorado, *P. flavus* occurs in semiarid grasslands on sandy soils, but shrublands also are occupied (Armstrong, 1972). The silky pocket mouse is abundant on sandy *Artemisia* plains and in habitats with *Atriplex* and *Helianthus* (Cary, 1911), and on grazed sites dominated by *Bouteloua gracilis* and *Buchloe dactyloides* (Moulton et al., 1981). In shortgrass prairie, common plants are *B. gracilis, Hilaria jamesii, Gutierrezia sarothrae, Opuntia imbricata, O. polyacantha,* and *Yucca glauca.* In addition, *P. flavus* occupies *Pinus edulis–Juniperus monosperma* habitats, which include *Cercocarpus montanus, Rhus trilobata, Artemisia bigelovii,* and *Forsellesia spinescens* (Ribble and Samson, 1987).

In Kansas, *P. flavus* occurs in hilly open range where soil is rocky, shallow, and underlain with limestone. Dominant plants are *B. gracilis* and *Gutierrezia*, and subdominants are *Artemisia, B. dactyloides, Bouteloua curtipendula,* and *Andropogon scoparius* (Choate and Fleharty, 1975).

In Arizona, the silky pocket mouse inhabits desert grasslands where ambient temperatures range from >40°C in July and August to −15°C in December and January. Plant productivity tends to be highly seasonal and somewhat unpredictable because of the brief and variable growing season (Wolff and Bateman, 1978). *P. flavus* also inhabits the plains and *Artemisia*–cactus association, extending into junipers. In the southern part of the state, *P. flavus* is found on grassy bajadas, often up to the *Quercus*–woodland or woodland–chaparral zone, as well as *Prosopis* grassland. Presence of a grassy cover may be the most important requisite in habitat selection for these mice. The silky pocket mouse also occurs in areas with boulders and *Salsola kali* (Hoffmeister, 1986). Other vegetation includes *Prosopis juliflora, Cercidium floridum, Acacia greggii, Celtis pallida, Opuntia versicolor, O. fulgida, Haplopappus tenuisectus, Zinnia pumila, Gutierrezia sarothrae, Encelia frutescens, Bouteloua rothrockii, Aristida barbata, Trichachne californica, Andropogon barbinodis, Heteropogon contortus, Ephedra trifurca, Opuntia engelmannii,* and *Ferrocactus wislizeni* (Wondolleck, 1978).

In New Mexico, *P. flavus* occurs in open grasslands, sparse *Pinus–Juniper* habitat (Harris et al., 1963), *Artemisia* flats, plains where soil is sandy (Hooper, 1941), valley bottoms, hillsides, among stones, on rocky soil (Bailey, 1931), and in deserts. The silky pocket mouse is found in various kinds of soils, but prefers those that are loose and friable (Findley et al., 1975). *P. flavus* also occurs on lava fields that are interdigitated with sandy habitat (Bradt, 1932; Elder, 1977). In White Sands, *P. flavus* is most common in gypsum flats within and adjacent to dunes, but it also occurs in the dunes themselves (Benson, 1933). Dominant plants in its habitat are *Aristida divaricata, Euphorbia, Hilaria, Mentzelia pumila, Phacelia, Prosopis juliflora, Salsola kali, Schleropogon brevifolius, Sporobolus cryptandrus, Tridens pulchellus, Yucca glauca* (Lemen and Rosenzweig, 1978), *Artemisia carruthii, A. frigida, Atriplex canescens, Bouteloua barbata, B. eriopoda, B. gracilis, Chenopodium album, Cleome serrulata, Echinocereus, Ephedra torryi, Eriogonum jamesii, Euphorbia glyptosperma, Eurotia lanata, Gutierrezia lucida, G. sarothrae, Haplopappus spinulosus, Helianthus nuttalli, Hoffmanseggia jamesii, Juniperus monosperma, Melampodium cinereum, Mentzelia albicaulis, M. laciniata, Mirabilis grandiflora, Muhlenbergia porteri, Opuntia imbricata, Oryzopsis hymenoides, Psilostrophe tagetina, Solanum elaeagnifolium, Sphaeralcea coccinea, Stephanomeria pauciflora, Thelesperma megapotamicum, Tripterocalyx micranthus, Zinnia grandiflora* (Britt, 1972), *Andropogon, Aristida, Bouteloua curtipendula, Larrea divaricata,* and *Mentzilia pumila* (Schroder and Rosenzweig, 1975). In southern New Mexico, *P. flavus* occurred in highest densities near playas with sparse grass cover where grazing and trampling had been concentrated. When grazing was eliminated and grass cover of the bottom complete, the silky pocket mouse had become a marginal, low-density species. This suggests that *P. flavus* requires sparse or clumped grass cover with considerable open spaces to establish high densities (Whitford, 1976).

In Oklahoma, *P. flavus* occurs in shortgrass prairie and *Pinus–Juniperus* habitat (Dalquest and Stangl, 1989). The silky pocket mouse also occurs in areas with no vegetative cover, including areas of barren rocks (Jackson and Warfel, 1933).

In Mexico, *P. flavus* occupies sandy and rocky soils in most desert areas of the Mexican Plateau (Baker, 1954). In Sonora, the silky pocket mouse occurs in *Prosopis* and *Acacia* grasslands in

Bursera–Jatropha, *Cercidium–Opuntia*, *Larrea–Franseria*, and *Olneya–Encelia* habitats (Caire, 1978). In Durango, *P. flavus* occurs in desert shrub and *Prosopis* grassland (Petersen, 1980). The silky pocket mouse seems to prefer less compacted soils in places where clumps of vegetation are separated by bare ground (Baker and Greer, 1962). In Zacatecas, *P. flavus* is most numerous in grasslands (Matson and Baker, 1986), but may occur adjacent to cornfields (Baker et al., 1980). The silky pocket mouse occurred near isolated bushes in fine sand of the open desert, beneath thorny bushes along the edge of a cornfield, along a sand and gravel bed of an arroyo, and on packed claylike soil in San Luis Potosí. *P. flavus* occurs in open flat desert in a variety of soils and vegetation (Dalquest, 1953). In Veracruz, the silky pocket mouse was present on a nearly white sand dune with scattered clumps of grass, *Agave*, *Opuntia*, and *Yucca* (Hall and Dalquest, 1963).

Perognathus flavus primarily is granivorous (Brown and Munger, 1985). Estimates of foods consumed (in megacalories of food eaten ha^{-1} $year^{-1}$) are: seeds, 1.43; herbs and low shrubs, 0.21; shrub and browse, 0.02; cactus, 0; arthropods, 0.03; vertebrates, 0 (Chew and Chew, 1970). This species selected a preponderance of thistle and millet (small seeds) compared with seeds of milo, wheat, oats, vetch, sunflower, and corn (Mares and Williams, 1977). White contents of the stomach indicate that seeds are shelled and only inner parts are eaten (Bailey, 1931). Tendency to husk seeds appears to be related to size of the rodent. Small heteromyids such as *P. flavus* tend to husk seeds more thoroughly than larger heteromyids and do not pouch entire fruiting heads, e.g., *P. flavus* clips the wings from *Atriplex canescens* while *Dipodomys* does not. *P. flavus* always will husk some species of seeds, while *D. ordii* often does not husk the same species (Lemen, 1978).

In Arizona, cheekpouches contained *Croton corymbulosus* and *C. texensis* (Hoffmeister and Goodpaster, 1954). In New Mexico, cheekpouches usually are filled with small grass and weed seeds, but several contained seeds of *Juniperus* berries. Diet varies with season and seed supply. *P. flavus* often occurs in patches of *Helianthus*, other composites, and *Croton* (Bailey, 1931). In New Mexico, cheekpouches contained (in decreasing order of abundance) seeds of *Salsola*, *Chenopodium*, *Festuca*, *Cryptantha*, *Amaranthus*, *Opuntia*, *Oryzopsis*, *Sphaeralcea*, unidentified grass seed, and *Cucurbita* (Forbes, 1962). Other items in cheekpouches were *Artemisia* leaves, a wad of hair, a few small bones (Hooper, 1941), leaves, flowers, stem parts, soil, Cicadellidae, and a Siphonaptera. Insects do not compose a significant part of the diet. Older mice have empty cheekpouches more frequently than young mice. This, and because young collect soil and miscellaneous bits of vegetation more frequently than older mice, may indicate that older mice are more selective in procurement of food items than are young ones (Forbes, 1962). In Texas, *P. flavus* eats seeds of *Helianthus* and *Amaranthus* (Bailey, 1905). In San Luis Potosí, cheekpouches contained small green seeds; seeds of desert plants that bloom in spring probably constitute the principal foods (Dalquest, 1953). In Mexico, the silky pocket mouse frequents the mounds constructed by harvester ants (*Pogonomyrmex*), seemingly attracted by seeds collected by the ants (Baker, 1954).

In captivity, *P. flavus* will eat birdseed composed of 80% *Phalaris* and 20% *Panicum*. This mixture contains 10% crude protein, 57.5% carbohydrates, 3.5% crude fat, 9% crude fiber and ash, 10% hulls, and 10% water; caloric value is 4,674 cal/g of dry mass (Wolff and Bateman, 1978). One *P. flavus* consumed ca. 23 ml of rolled oats every 10 days, along with maize, lettuce, carrots, and apples (Aldous, 1930). *P. flavus* also will eat green leaves, cactus pulp, other moist vegetation (Bailey, 1931), millet, oats, sunflower seeds, dried dog food (Eisenberg and Isaac, 1963), and guinea pig chow (Martin, 1977).

Perognathus flavus may use abandoned or inhabited burrows of *Dipodomys spectabilis*. These large, mixed-earth and chaff mounds, honeycombed with burrows are built by *D. spectabilis* and form localized sites attractive to this and other species of rodents (Holdenried, 1957). In the Federal District of Mexico, *D. phillipsii* shares its burrows with *P. flavus* (Merriam, 1893). In Colorado, most older mounds left by pocket gophers (Geomyidae) have been tunneled by *P. flavus*, but seldom are these burrows inhabited by pocket gophers. These tunnels usually enter the soft soil of the pocket gopher mound from one side, passing horizontally through, and often connected with other horizontal tunnels. One such burrow was inhabited by an immature silky pocket mouse. This burrow reached a depth of 30 cm in the soft soil, ending in a chamber 2.5 by 5.0 cm, in which was stored a few grass seeds (Cary, 1911). In Texas, *P. flavus* also may use old pocket gopher mounds as burrow sites (Bailey, 1905), or occupy the stick nests of *Neotoma micropus* (M. D. Engstrom, pers. comm.).

In Colorado, burrows usually are beneath *Opuntia*, *Yucca*, or low shrubs (Armstrong, 1972; Cary, 1911). In Arizona, nests are ca. 30 cm under the surface of the soil. Here temperatures fluctuate <0.5°C over a 24-h period and never drop below freezing (Wolff and Bateman, 1978). In Zacatecas, burrows in a plowed field were ca. 5–10 cm deep with a greatest length of ca. 1 m; no seed caches were present (Matson and Baker, 1986).

In New Mexico, burrows of *P. flavus* may be open or closed. They are common under *Artemisia*, *Atriplex*, and *Chrysothamnus*, which provide shelter and protection. Runways or lines of tracks lead from burrows to neighboring patches of *Helianthus* and other seed-laden plants. On warm December mornings, tracks of *P. flavus* are numerous in the fine-textured dust around burrows and lead away in trails from burrows to the nearest *Amaranthus* or *Helianthus* patches (Bailey, 1931). Often, burrows are dug where sand has accumulated around bases of bushes and forms small hummocks, averaging ca. 35 cm above the level of surrounding ground. Most have several entrances around the mound of soil, all lead into a central chamber 7.6–10.2 cm in diameter and ca. 5 cm in height. This chamber is near the top of the mound, usually <20 cm below the surface. Not all entrances are at the same level, some are at the base of the mound, others are near the top, and some are found leading into the central chamber from a distance of 1.2–1.5 m away from the base of the mound. Tunnels leading into the central chamber have many branches that lead off for distances of 5.1–40.6 cm. From the central chamber leading almost straight down for ca. 40 cm is a single tunnel that opens into another chamber, larger than the upper. The nest, composed of dried grasses, is found in the lower chamber. It is ball-shaped, ca. 6.5 cm in diameter, and has one small opening into the inside. The inside of the nest is small. Frequently, seeds hulls are around the nest. Radiating from the nest chamber are seven or eight horizontal tunnels 10.2–45.7 cm in length. These tunnels are ca. 35 cm below the surface of the ground. At the ends of some of these tunnels are hulls or small caches of seeds walled off from the tunnel with loose soil (Blakely, 1936).

In Texas, burrows may be in little sand drifts that are heaped up around the base of *Atriplex* and *Suaeda*. Burrows usually are in groups of three or four, under edges of bushes. Occupied burrows are closed, and are discovered by following lines of tiny footprints across bare patches of sand from bush to bush until they disappear at little mounds of fresh earth that serve as doors and blinds to burrows. Under the tiny mounds are burrows ca. 2 cm in diameter (Bailey, 1905). A burrow in the bank of a water diversion dike had three openings. The openings converged to a single burrow that led along the dike for a distance of ca. 1 m, at no place penetrating >10 cm below the surface. Two side branches diverged from the main burrow, one of them sloping upward to near the surface. This branch probably was an escape burrow, because the occupant escaped from it by breaking through the thin crust of earth at the blind end of the tunnel (Davis, 1974).

Perognathus flavus can be captured in Museum Special traps baited with rolled oats (Forbes, 1964), live traps baited with birdseed (Hill, 1942*a*), and pit-fall traps (Petersen, 1980). At times, it may find food abundant and avoid traps. When there are fewer seeds available, *P. flavus* takes rolled oats and is captured in traps set near its burrows or in artificial trails made by drawing the foot over the ground. Burrows of *P. flavus* are easily recognized, and if it cannot be captured in traps it can be driven out of burrows and caught in the hands (Bailey, 1931). It also can be captured by hand at night with the aid of a lantern or other light source (Baker, 1954; Forbes, 1964).

In Arizona, sex ratios favor males (1.5 males : 1.0 females—Brown and Zeng, 1989; 2.1 males : 1.0 females—Hoffmeister, 1964). However, in New Mexico, sex ratio is ca. 1:1 across seasons (Britt, 1972; Forbes, 1964).

Population composition and density fluctuate among seasons and years (e.g., Baker and Greer, 1962; Findley et al., 1975; Whitford, 1976; Whitford et al., 1978). In Arizona, *P. flavus* is absent for years at a time, but when present it reproduces, successfully recruits juveniles, and is among the most abundant species (Brown and Zeng, 1989). In New Mexico, a winter sample contained 14% young adults, 76% adults, and 10% old adults, but no juveniles or pregnant females. In spring, there were 8% juveniles, 8% young adults, 59% adults, and 25% old adults; 9% of adults and 11% of old adults were pregnant. In summer, 25% were juveniles, 20% were young adults, 51% were adults, and 3% were old adults; 1% of adults were pregnant. In autumn, 2% were juveniles, 89% adults, and 2% old adults; none were pregnant (Forbes, 1964). Average density (number/ha) varied among habitats as follows: *Larrea*, 0; *Atriplex–Prosopis*, 1.25; *Prosopis* dunes, 0.50; annual weeds, 1.75; *Hilaria mutica*, 1.75 (Wood, 1969). In Arizona, *P. flavus* has occurred at densities of 0.93 (Brown and Zeng, 1989), 0.64 (Brown and Munger, 1985), and 1.14/ha (Chew and Chew, 1970). Other reported densities (number/ha) include: New Mexico, 13 (Whitford, 1976), 33.5 (range, 20.8–53.0—Britt, 1972); Oklahoma, 1.5 (McCulloch, 1959); Mexico, 3 (Rogovin et al., 1991). Biomass (g/ha) in Arizona has been reported as 3.9 (Brown and Zeng, 1989), 4.6 (Brown and Munger, 1985), and 7.3 (Chew and Chew, 1970). In New Mexico, biomass was 244.5 g/ha (Britt, 1972).

Average range of movement is 62.5 m (Chew and Chew, 1970) and average dispersal distance during a lifetime is 202 m (Brown and Zeng, 1989). In Arizona, there is no difference in size of home range for males and females; 0.11 ha. However, one male had a home range of 0.27 ha (Vaughan, 1976). In New Mexico, females had an average length of home range of 54.6–62.7 m (0.24–0.31-ha home range), depending upon method of calculation. Males had an average length of home range of 68.4–88.5 m (0.38–0.63-ha home range). Home range of males is larger than that of females (Britt, 1972).

In Wyoming, *P. flavus* is more common in grass communities than *P. flavescens*, and does not occur in sand dune communities with *P. flavescens*. Usually, *P. flavus* is less common than *P. flavescens* (Maxwell and Brown, 1968). North of the range of *P. flavus* in Utah and Colorado, *P. flavescens* has been captured more frequently on non-sand substrates. In areas where *P. flavescens* is not present, *P. flavus* is common on loose sand soils, but the two may occur at the same locality (Williams, 1978*a*).

In Arizona, *P. flavus* occurs sympatrically with five other heteromyids (*Chaetodipus baileyi, C. penicillatus, Dipodomys merriami, D. spectabilis, P. amplus*—Wondolleck, 1978). In the Huachuca Mountains of Arizona, *P. flavus* occurs up grassy bajadas to near the edge of *Quercus* woodland. Here it is the only perognathine. Below the woodland, it occurs with *C. hispidus* and *C. penicillatus* in the *Bouteloua–Senecio* association (Hoffmeister and Goodpaster, 1954).

In New Mexico, *P. flavus* occurs in grassier habitats than either *Dipodomys merriami* or *D. ordii* (Schroder and Rosenzweig, 1975). There may be more than twice as many *P. flavus* as *Dipodomys*, but there is <50% as much biomass (Britt, 1972). *P. flavus* and *D. ordii*, respectively, select (in %): grass habitat, 46.2, 0; near grass habitat, 32.2, 22.5; open habitat, 21.4, 77.4 (Lemen and Rosenzweig, 1978).

Perognathus flavus collected seeds averaging 154 mg, while those collected by *D. merriami* and *D. ordii* were 294 and 152 mg, respectively. Thus, there was no difference in size of seed taken by *P. flavus* and *D. ordii*, but *D. merriami* took larger seeds than either of the other species (Rosenzweig, 1977). Laboratory data also revealed no difference in seed-size selection between *P. flavus* and *D. ordii*. In laboratory feeding experiments with *P. flavus* and *D. ordii*, there was no marked difference in proportions of seed types collected whether rodents foraged in presence or absence of the other. However, analysis of variability in mass of each of the seed types collected by the two species showed than when alone, *D. ordii* was less effective at harvesting all of a uniformly distributed mixture of seeds. When in the presence of the other, both could harvest enough of the mixed, uniformly distributed seed to coexist indefinitely; when the food source was in clumps, foraging effectiveness of *D. ordii* increased so that *P. flavus* harvested few seeds (Hutto, 1978).

Predators may include the reptiles *Pituophis melanoleucus, Arizona elegans, Masticophis flagellum, Crotalus viridis* (Britt, 1972), and *C. atrox* (Wood, 1969), the birds *Bubo virginianus, Speotyto cunicularia*, and *Asio otus* (Britt, 1972), and the mammals *Canis latrans, Lynx rufus, Mephitis mephitis, Taxidea taxus, Urocyon cinereoargenteus, Vulpes macrotis* (Wood, 1969), and *Bassariscus astutus* (Britt, 1972). An impaled head of a *P. flavus* on a cactus thorn indicated that *Lanius ludovicianus* also may be a predator (Hoffmeister, 1986). *P. flavus* may be an easy source of food, e.g., in Arizona, 47% of mammals in the diet of *Bubo virginianus* were silky pocket mice (Hoffmeister and Goodpaster, 1954).

Perognathus flavus does not have antibodies to Fort Morgan virus (Scott et al., 1984), and it is susceptible to inoculation with *Yersinia pestis*. Endoparasites include the coccidian *Eimeria penicillati* (Ivens et al., 1958), the nematode *Trichuris minuta* (Hannum, 1943), but no worms of the genus *Gongylonema* have been found (Kruidenier and Peebles, 1958). Ectoparasites include the tick *Dermacentor variabilis* (Bishopp and Trembley, 1945), the louse *Fahrenholzia pinnata* (Morlan and Hoff, 1957), the mites *Echinonyssus hilli* (Strandtmann and Morlan, 1953; Whitaker et al., 1993), *Euschoengastoides arizonae, E. imperfectus* (Loomis, 1971), *E. loomisi, Pseudoschoengastia hungerfordi, Hyponeocula montanensis* (Loomis, 1956; Whitaker et al., 1993), *H. arenicola* (Loomis, 1954; Whitaker et al., 1993), and *Ischyropoda armatus* (Allred and Beck, 1966), and the fleas *Meringis facilis* (Eads, 1978), *M. jamesoni* (Holdenried and Morlan, 1956), *M. nidi* (Eads et al., 1987), *M. shannoni* (Hubbard, 1947), *M. parkeri, Hoplopsyllus affinis, Epitedia stanfordi, Anomiopsyllus nudatus*, and *Orchopeas leucopus* (Morlan, 1955).

The silky pocket mouse may consume planted grains along edges of fields and its burrows often penetrate banks of irrigation ditches, but are too small and shallow to be of consequence. Destruction of seeds of undesirable weeds may offset any deleterious effects (Bailey, 1931).

BEHAVIOR. *Perognathus flavus* is nocturnal (Cary, 1911), but occasionally may be active outside its burrow in daylight hours (Blakely, 1936; Cary, 1911), particularly when the ground is covered with snow and when nights are cold (Blakely, 1936). However, *P. flavus* appears to be inactive aboveground on damp or rainy nights (Cary, 1911). *P. flavus* can run rapidly between areas of protective cover, but once cover is reached it tends to remain motionless in the grass or bushes (Hoffmeister and Goodpaster, 1954).

Perognathus flavus may (Brown and Munger, 1985) or may not (Brown and Zeng, 1989) hibernate in southern Arizona, but in New Mexico (Blakely, 1936; Britt, 1972) and northern Arizona (Wolff and Bateman, 1978) the species remains active throughout winter, apparently foraging almost nightly aboveground. Activity of *P. flavus*, however, is reduced during winter and it is not active during adverse weather conditions. From November through May, it may appear aboveground at temperatures as low as −10°C. Under some circumstances *P. flavus* may remain inactive for several nights, e.g., when there was 13 cm of snow on the ground in late February, there was no evidence of aboveground activity (Wolff and Bateman, 1978).

In warmer months, the period of greatest activity is 1800–2200 h in northern Arizona, with a decrease in activity throughout the night following the nightly decrease in air temperature. Thus, *P. flavus* is active during the warmest part of the night and retires to its burrow by ca. 0200 h when ground-surface temperatures are colder than earlier. During the coldest part of winter, average air temperature at 1800–2200 h is −3.7°C (range, 4 to −15°C). *P. flavus* awakes from torpor in mid-afternoon and feeds on seeds that are stored within the burrow. After dark, it forages aboveground, gathering seeds that are brought into the burrow and cached. These seeds are consumed the next day when it arouses from torpor, or from normothermic sleep, before any aboveground activity. Time of entry into torpor and time of arousal from torpor depend on amount of food consumed, ambient temperature, and time of feeding. Photoperiod may be an important cue related to timing of torpor cycles (Wolff and Bateman, 1978).

Males and females segregate spatially. Males occur on higher ridges and females on flatter areas (Britt, 1972). *P. flavus* exhibits a high intraspecific aggressiveness (Eisenberg and Isaac, 1963). In captivity, it will fight with conspecifics placed into the same cage (Aldous, 1930). More than one member of the same sex will not live congenially in a limited space. Usually, the pocket mouse that has been longest in the cage will defend it against all newcomers. The tail and hind legs seem to be favorite points of attack. When pursued, *P. flavus* can jump vertically with little effort (Blakely, 1936). Severe wounding from rump and tail bites occurred during attempts to pair this species. Bites often were inflicted by males while chasing anestrous females, but females also could establish a superior status over males (Eisenberg and Isaac, 1963).

Perognathus flavus appears to lose all fear when caught and handled (Nelson, 1918). Initially, it will struggle to escape (Bailey, 1931) and will attempt to bite its captor, but the mouth will not open wide enough to enable it to grasp the skin between the teeth (Blakely, 1936). If held, *P. flavus* soon becomes quiet and may be stroked as its sits on the open hand (Bailey, 1931). *P. flavus* is readily tamed, easy to handle, quite docile, and easily kept in the laboratory. It deposits its excreta in one corner of the cage, uses its fore and hind legs in digging, is extremely active with the forepaws, and it will dig and sandbathe in loose soil (Blakely, 1936).

The silky pocket mouse exhibits foraging behavior typical of many heteromyids; i.e., gather and store seeds whenever they are available regardless of size of cache. For example, all 25 g of food placed near the burrow of one *P. flavus* subsequently was gathered and stored in the burrow during 1 night. A food store of this size would provide an adequate energy source for up to 10 days, yet the animal was active aboveground on the following 2 nights (Wolff and Bateman, 1978). In captivity, *P. flavus* stores food in nesting material, but it never stores green food (Aldous, 1930).

When *P. flavus* feeds, it picks up small seeds or grains with the forepaws, trims away rough edges with the teeth, and then thrusts the seeds into one of the cheekpouches. As soon as both pouches are filled, the mouse will dash into the burrow or nest, store the food, and return for more. As long as the supply of food is present, it will work with great haste and will not stop to eat until the last seed is put away. Seeds carried on successive trips usually are deposited in different caches (Blakely, 1936). Average time required to husk seeds is greater than for many other heteromyids (Rosenzweig and Sterner, 1970).

Compared with *P. merriami*, *P. flavus* is a more efficient swimmer. Body and swimming action are well coordinated, and it has considerable floating ability (25–30 s). After the float period, body motion becomes jerky and sways from side to side. The tail is moved up and down and this motion becomes faster as fatigue sets in. *P. flavus* appears as if it tries to remain above water by use of the tail alone. Average duration of swimming bouts for *P. flavus* is 127 s (range, 90–182 s—Schmidly and Packard, 1967).

GENETICS. Standard, C-banded, and G-banded karyotypes of *P. flavus* and *P. merriami* from many localities in New Mexico and Texas appear identical (Lee and Engstrom, 1991). The diploid number of chromosomes is 50 and the fundamental number is 86. There are 19 pair of biarmed and 5 pair of uniarmed autosomes, the X chromosome is submetacentric, and the Y is metacentric (Patton, 1967).

Of 28 allozymes examined, 23 were variable and 5 were monomorphic. There were no fixed differences among samples from across New Mexico and Texas. However, pronounced frequency differences occurred at five loci between samples referable to *P. f. flavus* and those assignable to *P. merriami gilvus* and *P. m. merriami* (purine nucleoside phosphorylase, phosphogluconate dehydrogenase, esterase, lactate dehydrogenase, superoxide dismutase-1). Generally, these two distinctive allelic complements correspond to the geographic boundary between *P. flavus* and *P. merriami* (Lee and Engstrom, 1991).

REMARKS. The morphologic similarity of *P. flavus* and *P. merriami* often has been noted (e.g., Bailey, 1931; Blair and Miller, 1949; Davis, 1974; Osgood, 1900). In fact, Merriam (1889) used a specimen of *P. merriami* from Mason, Mason Co., Texas, as the basis of his description of *P. flavus* (Osgood, 1900). Based on external, cranial, and pelage characters, *P. flavus* has been considered conspecific with *P. merriami* (Wilson, 1973), and behavioral data support their conspecific status (Martin, 1977). However, based on allozymes, *P. flavus* and *P. merriami* are now considered separate species. The geographic distribution of *P. m. gilvus* is intermediate to the main range of *P. f. flavus* and *P. m. merriami*, and *P. m. gilvus* is in many ways structurally intermediate to *P. f. flavus* and *P. m. merriami*, giving the impression that the two taxa broadly hybridize. However, genic analysis shows distinct genotypes for *P. f. flavus* and *P. m. gilvus* from several localities of sympatry, and only a few probable hybrids from one locality in southeastern New Mexico (Lee and Engstrom, 1991).

The *flavus* group of pocket mice (*P. flavus* and *P. merriami*) is closely related to the *longimembris* group (*P. amplus*, *P. longimembris*, *P. inornatus*—Williams, 1978*b*). Phenetic analyses of morphologic characters places *P. flavus* nearest to *P. parvus* based upon correlation values and well-separated from other *Perognathus* based upon distance values (Best, 1993).

Perognathus is derived from the Greek *pera* meaning pouch and *gnathos* meaning jaw. The specific epithet is from the Latin *flavus* meaning yellow (Jaeger, 1955). Additional common names are yellow pocket mouse (Coues and Allen, 1877) and Baird's pocket mouse (Merriam, 1890).

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