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Peromyscus perfulvus (Rodentia: Cricetidae)

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Abstract: *Peromyscus perfulvus* Osgood, 1945, is a medium-sized rodent with the English name of tawny deermouse. It is 1 of 56 species in the genus *Peromyscus* and has upperparts of bright cinnamon rufous along with creamy white underparts. This Mexican endemic is distributed from coastal lowlands of Jalisco and Colima to the interior of Michoacan, northernmost Guerrero, and the southwestern corner of the state of Mexico. The species is highly arboreal and inhabits tropical deciduous forest, semideciduous forest, and thorn scrub. Given its small geographic range coupled with microhabitat preferences and the fact that relevant habitats increasingly have been altered, *P. perfulvus* should be considered to be of conservation concern. DOI: 10.1644/833.1.

Key words: cricetid, *melanophrys* species group, Mexican endemic, Mexico, Muroidea, Neotominae, tawny deermouse

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Peromyscus perfulvus Osgood, 1945
Tawny Deermouse

Peromyscus perfulvus Osgood, 1945:299. Type locality "10 kilometers west of Apatzingan, Michoacan, Mexico, altitude 1040 ft."

CONTEXT AND CONTENT. Order Rodentia, suborder Myomorpha, superfamily Muroidea, family Cricetidae, subfamily Neotominae, tribe Reithrodontomyini (Musser and Carleton 2005). *Peromyscus perfulvus* is a member of the *melanophrys* species group (Carleton 1989; Hooper 1968; Lee and Elder 1977; Schmidly et al. 1985). *P. perfulvus* was considered to differ substantially from *P. melanophrys* by Osgood (1945). In a number of skull features, *P. perfulvus* resembles *P. evides* (now considered to be a synonym of *P. aztecus*; Musser and Carleton 2005), *P. aztecus*, *P. spicilegus*, and *P. simulus*, and it was suggested that the closest relationship of *P. perfulvus* might be with *P. simulus* (Osgood 1945). A later study (Hooper 1955) based on samples from various parts of the range of *P. perfulvus* identified what were considered to be trenchant similarities between *P. perfulvus* and *P. melanophrys*, suggesting that the 2 species may not be as distantly related as Osgood (1945) intimated. Both species have a short rostrum, large braincase, slight zygomatic notch, supraorbital shelf, large interparietal, short palate, small teeth with inconstant mesolophs, and large sphenopalatine vacuities.

Fig. 1.—*Peromyscus perfulvus* approaching nest located just inside entrance to the Tiamaro Mine, 4 km southeast of Lajas del Bosque, Michoacan, Mexico (19°13′43″N, 100°28′39″W, 1,010 m). Photograph by Cornelio Sánchez-Hernández.

Twenty-seven species of *Peromyscus* were categorized on the basis of structure of the phallus, placing them in 7 divisions, some of which were further partitioned into groups (Hooper 1958). This resulted in *P. perfulvus* being referred to the *boylii* group of the *maniculatus* division, together with the species *boylii*, *nasutus*, *yucatanicus*, *truei*, *mexicanus*, *difficilis*, *melanophrys*, *guatemalensis*, *furvus*, *nudipes* (now considered to be a synonym of *mexicanus*; Musser and Carleton 2005), and *megalops*. Hooper and Musser (1964), considering the observations of Hooper (1958) and new data for a number of species, constructed a classification with divisions and groups of the subgenus *Peromyscus*. Although they placed *P. perfulvus* together with *P. melanophrys* and *P. mekisturus* in the *melanophrys* group, they considered this position as uncertain. In a later study, *P. perfulvus* was tentatively included in the *melanophrys* group because the group was considered in a sense to be transitional between temperate *boylii*-like forms and tropical *mexicanus*-like species (Hooper 1968).

Peromyscus perfulvus was included in an analysis of immunological data to assess relationships among taxa (Fuller et al. 1984). In reciprocal tests, the closest affinity of *P. perfulvus* was with *Osgoodomys banderanus*. In more extensive 1-way comparisons, *P. perfulvus* was equally close to *O. banderanus* and *P. melanophrys*; it was considered to be closer to these taxa than to *P. boylii*.

Based on karyotype information, a close relationship between *P. perfulvus* and *P. melanophrys* was confirmed (Lee and Elder 1977). The results of an electrophoretic analyses of enzymes and nonenzymatic proteins suggested that *P. perfulvus* was appropriately placed in the *melanophrys* group; a close relationship of the *melanophrys* and *leucopus* groups was noted (Zimmerman et al. 1978). Schmidly et al. (1985), also using electrophoretic results, concluded that the position of *P. perfulvus* in the *melanophrys* group was supported. Based on characteristics of G- and C-banded chromosomes and the shared-derived tiny biarmed Y chromosome, *P. perfulvus* and *P. melanophrys* were sister taxa in an analysis of *Peromyscus* and several other taxa (Stangl and Baker 1984). These 2 taxa of the *melanophrys* group share a pericentric inversion with members of the *mexicanus* group and 1 species (*P. pectoralis*) of the *boylii* group (Stangl and Baker 1984); *P. perfulvus* and *P. melanophrys* also share a similar pattern of acrocentric and metacentric chromosomes (Smith 1990). Bradley et al. (2007) constructed a molecular phylogeny for *Peromyscus* based on mitochondrial cytochrome-*b* sequences. In both a strict-consensus tree based on trees generated from unweighted character analyses and a maximum-likelihood tree obtained using Bayesian inference methods, the sister taxon for *P. perfulvus* was *P. melanophrys*, a relationship for which there was strong support; the analysis did not include *P. mekisturus*. In a pilot analysis of a retrotransposon (*Mys*), *P. perfulvus* was indistinguishable from *P. melanophrys* (Lee et al. 1996). Recently, it has been proposed based primarily on morphological characteristics that an island endemic, *P. slevini*, of Santa Catalina Island in the Sea of Cortez, also is a member of the *melanophrys* group (Carleton and Lawlor 2005); the species lacks a pericentric inversion of chromosome 2 and the small Y chromosome found in *P. perfulvus* and *P. melanophrys*.

Two subspecies have been recognized (Hall 1981; Hall and Kelson 1959):

P. p. chrysopus Hooper, 1955:18. Type locality "México, Jalisco, 1/2 mi N Barro[a] de Navidad, 50 feet elevation."

P. p. perfulvus Osgood, 1945:299. See above.

DIAGNOSIS

Peromyscus perfulvus (Fig. 1) is a medium-sized rodent. Upperparts of the body are bright cinnamon rufous with thinly scattered dusky hairs only slightly more numerous on the back than on the sides. Underparts are creamy white, the hairs having plumbeous bases except on the chin and throat where they are wholly white. The face from nose through eyes to base of ears is irregularly grayish, with a very narrow dusky eye ring. Ears are pale brownish. Forefeet are white without any dusky wrist marking. Hind feet are white with a brownish metatarsal area, which in some specimens extends as a narrow wedge to the middle of the upper surface. Soles of hind feet are hairy for the proximal one-fourth. The tail is uniformly brownish (sepia) with the underside slightly paler than the upper; it is long, hairy, and well penciled at the tip (Osgood 1945). Immatures are mainly cinnamon drab with the underside of tail slightly paler than upper side (Osgood 1945), or immatures are plumbeous above, lacking the cinnamon color (Hall and Villa R. 1949, 1950).

Peromyscus perfulvus can be distinguished from other members of the *melanophrys* species group by its long and hairy tail, which as indicated above is uniformly brownish (sepia) with the underside slightly paler than the upper and is well penciled at the tip. The ears of *P. perfulvus* are brown instead of blackish, and its hind feet are white but with coloration on the tarsus, whereas in other species of the group feet are uniformly white.

Characteristics separating *P. perfulvus* from members of the *boylii* species group include the uniformly brownish tail in the former. Tails of species in the *boylii* group are notably bicolored or, if unicolored, are grayish black.

In areas where *P. perfulvus* and *O. banderanus* are sympatric, the species can be separated because *O. banderanus* has an almost hairless and scaled tail that is not penciled at the tip, its feet are white, and its ears are blackish. In addition, *P. perfulvus* has a gray facial mask, and in *O. banderanus* the facial mask is blackish gray. On the skull, *P. perfulvus* has a sharply angled supraorbital border, which is rounded in *O. banderanus*.

GENERAL CHARACTERS

Peromyscus perfulvus is bright cinnamon rufous in color with dusky hind feet and a hairy tail. The braincase is fairly long and not greatly inflated. Supraorbital borders are sharply angled but not beaded, although somewhat elevated in aged specimens; the slight salient angle of frontals just in front of parietal suggests an incipient postorbital process. Interparietals are rather large. Tympanic bullae are small, proportionately similar to those of species in Osgood's (1945) *boylii* group. *P. perfulvus* has an entepicondylar foramen (Rinker 1960). This is a characteristic shared by many species of *Peromyscus*.

Averages and ranges of external measurements (mm) for 7 adult topotypes of *P. p. perfulvus* are: total length, 244.4 (230–254); length of tail, 132.4 (125–138); length of hind foot, 25.3 (25–26). The type specimen had the following measurements: greatest length of skull, 29.4; basilar length, 22.5; length of nasals, 10.2; interorbital constriction, 4.7; zygomatic width, 15.4; interparietal 10.2 by 4.5; palatine slits, 5.3; diastema, 7.0; length of maxillary toothrow, 4.3 (Osgood 1945).

Averages and ranges of measurements (mm; $n = 15$) of *P. p. chrysopus* are: total length, 223 (208–246); length of tail, 119 (110–134); length of hind foot, 24 (23–25); length of ear from notch, 19 (18–20); greatest length of skull, 28.2 (27.3–29.0); breadth of braincase (measured above root of zygomata about at squamosal–parietal junction), 12.8 (12.5–13.1); length of rostrum (from tip of nasal to notch, lateral to lacrymal, on superior inner border of zygomatic arch), 10.2 (9.8–10.7); interorbital breadth, 4.7 (4.5–4.9); anteroposterior length of interparietal (excluding attenuations), 3.3 (2.8–3.8); zygomatic width, 14.7 (14.1–15.7); length of palate, 3.9 (3.7–4.2); length of molar row, 4.2 (4.1–4.5); length of incisive foramen, 5.7 (5.1–5.9—Hooper 1955). Means and ranges of measurements (mm; $n = 11$) of *P. p. perfulvus* are: total length, 223.4 (200–255); length of tail, 118.1 (99–141); length of hind foot, 23.7 (23–25); length of ear from notch, 18.7 (16–21); breadth of the braincase, 13.3 (12.4–13.8); length of nasals, 10.5 (9.4–11.3); interorbital breadth, 4.7 (4.6–5.1); zygomatic width, 15.4 (14.2–16.8); length of molar row, 4.4 (4.2–4.6); diastema, 7.4 (6.9–8.1—Álvarez and Hernández-Chávez 1990). Length of incisive foramen was reported but seemed in error because the mean was 5.4 and range was 5.4–6.6 (Álvarez and Hernández-Chávez 1990).

Values for body mass have not been reported previously. During field studies at Playa de Oro in Colima in January 2003–2005 (for first 2 years, see Schnell et al. [2008]), average values (g; ± *SD*, range, *n*) for adults were: males, 37.7 ± 3.70, 29.7–42.0, 13; and females, 33.8 ± 2.60, 31.1–36.0, 4. The difference between sexes was not statistically significant (2-tailed *t*-test, $P = 0.071$).

Peromyscus perfulvus chrysopus is similar externally to *P. p. perfulvus* but smaller and with upper surfaces of forefeet buffy rather than white. The skull (Fig. 2) is smaller, and molars 1 and 2 usually have ectostylids and complete mesolophs. In *P. p. perfulvus*, ectostylids are absent, and mesolophs are absent or short, not reaching the labial border of the tooth. Nasals are acute posteriorly, their limits short of posterior limits of ascending branches of premaxillae. Premaxillae extend posteriorly to the nasals in *P. p. chrysopus* but not in *P. p. perfulvus*. Nasals and premaxillae were conterminous in 3 *P. p. chrysopus* and 1 *P. p. perfulvus*, and the nasals exceeded the premaxillae in 2 *P. p. chrysopus* and 6 *P. p. perfulvus* (Hooper 1955). In specimens from the state of

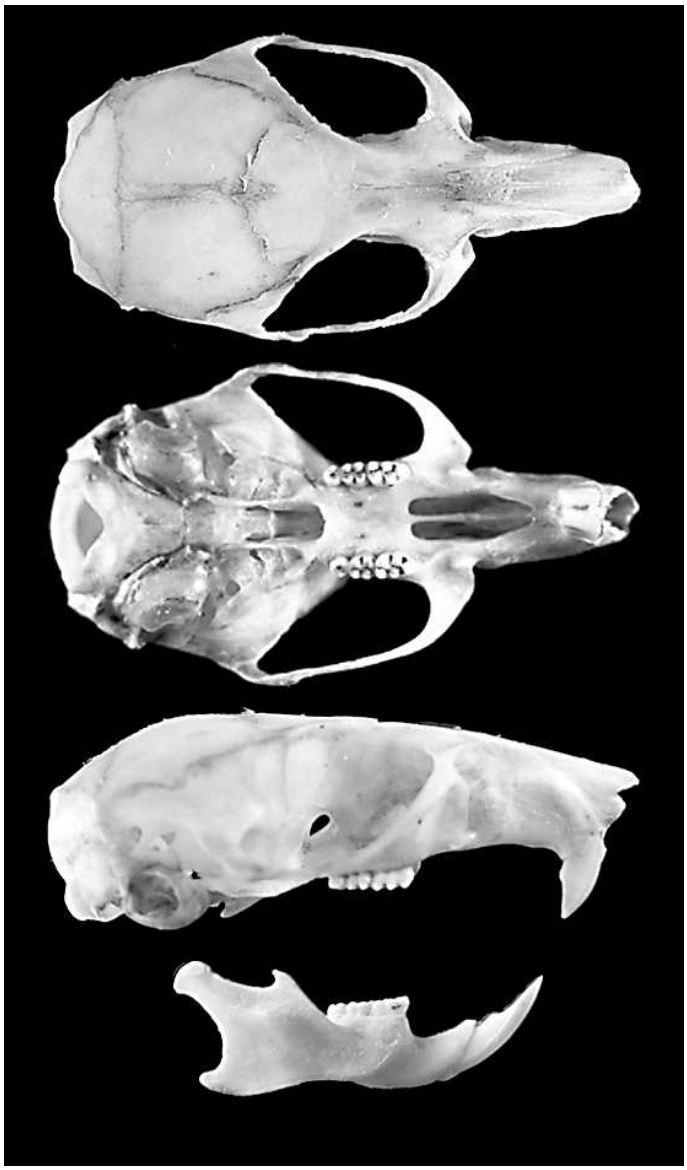

Fig. 2.—Dorsal, ventral, and lateral views of skull and lateral view of mandible of adult female *Peromyscus perfulvus* from 1.5 km south of Petembo, Michoacan, Mexico (19°06.922′N, 101°29.979′W, 1,227 m; catalog no. 2749, M. L. Romero-Almaraz). Greatest length of skull is 30.45 mm. Photograph by Cornelio Sánchez-Hernández.

Fig. 3.—Geographic distribution of *Peromyscus perfulvus* in Mexico. Subspecies are: 1, *P. perfulvus chysopus*; and 2, *P. perfulvus perfulvus*. Modified from Hall (1981) and Carleton (1989).

Mexico, these characters were not sufficient to separate the 2 subspecies (Álvarez and Hernández-Chávez 1990).

DISTRIBUTION

Peromyscus perfulvus is endemic to a small geographic area in western Mexico (Fig. 3). It is known to occur only in the coastal lowlands of Jalisco, Colima, and along the Río Balsas to the interior of Michoacan and northernmost Guerrero (Musser and Carleton 2005), and the southwestern corner of the state of Mexico (Álvarez and Hernández-Chávez 1990). Elevational distribution is from sea level to about 1,300 m (Helm et al. 1974; Hooper 1955; Osgood 1945).

One other member of the *melanophrys* species group—*P. mekisturus*—has an even more restricted distribution than *P. perfulvus* (Carleton 1989). In addition, *P. slevini*, possibly a member of the *melanophrys* group (Carleton and Lawlor 2005), is an island endemic with a very small geographic distribution. The geographic ranges and ecologies of *P. perfulvus* and *O. banderanus* are very similar suggesting that the 2 species have similar biogeographic histories (Musser and Carleton 2005). No fossils of *P. perfulvus* are known.

FORM AND FUNCTION

The glans of *Peromyscus perfulvus* is much like that of *P. boylii* or *P. truei* in shape and proportions (Hooper 1958). It is a rod-shaped, tough-bodied organ, flared distally around a terminal segment of softer tissue. There are 2 attenuate dorsal processes and a ventral lip. Immediately dorsal to the lip is the urethral opening. Length of the gland ($\bar{X}$ = 9.7 mm, n = 2) is 5 times its greatest diameter and two-fifths the length of the hind foot. In 3 specimens of *P. perfulvus* (2 adults and 1 subadult), the surface was comparatively smooth, with minute tubercles, but no spines, unlike in *P. boylii* and *P. truei*. However, Hooper (1958) opined there was a strong possibility that, when sexually active, the glans body is spinous in all species in his *maniculatus* division of *Peromyscus* of which he considered *P. perfulvus* to be a part. In addition, for the 18 species of his *maniculatus* division the glans is topographically divisible into 2 parts: a fibrous body that ends in 2 dorsal lappets and a ventral lip; and a cone-shaped, nonspiny, somewhat protractile tip that terminates in a knob of tissue surrounding the apex of the baculum. The urethral opening lies in the ventral sector, comparatively far removed from the end of the glans. Distinctions among the 18 species can be observed mainly in relation to absolute or relative size of 1 or more parts of the glans or baculum. In his *maniculatus* group, the glans and bone are comparatively short, and there is a long cartilaginous spine capping the bone. In his *boylii* group, by comparison, the glans and bone are relatively longer and the cartilaginous spine is shorter (Hooper 1958).

The baculum resembles that of *P. boylii*, and its length in *P. perfulvus* ($\bar{X}$ = 12.6 mm, n = 2—Hooper 1958) is one-half the length of the hind foot. The terminal cartilaginous cone is evenly rounded and <0.1 mm long. Burt (1960:55) judged that for *P. perfulvus* "The baculum in this species is peculiar in that it has a double S-curve in many cases" (6 of 13 individuals). The bulbous base is moderately expanded and flattened relatively high for its width, and has a definite concavity on the dorsal side. In some specimens, the basal portion is U-shaped in cross section. Although definitely of the *Peromyscus* type, the configuration of the bone is unique in the species (Burt 1960). Length measurements (mm) of the baculum for 3 specimens from Michoacán were 12.3, 13.7, and 14.0; width of base was 1.4 in each (Burt 1960).

ONTOGENY AND REPRODUCTION

Reproductive activity occurs throughout the year. At the Chamela Biological Station in Jalisco, pregnant females were present in February, August, September, and November; a lactating female with embryos was caught in October; lactating females were present in February and August; and a female with a newborn occurred in February (Helm et al. 1974). Males with scrotal testes were examined in February, May, and August (Helm et al. 1974). Pregnant females and males with scrotal testes were collected in all months at the Chamela Biological Station (Ceballos 1990) although, for the Jalisco coast, where the station is located, reproduction has been said to occur only in summer (Ceballos and Miranda 2000). Males with testis lengths of 25–26 mm (n = 5) were captured in August (Collett et al. 1975). In July at El Tuito, Jalisco, 1 female had 2 embryos (lengths 18 mm),

another female was recently inseminated, and a 3rd was inactive reproductively; 1 of 3 males had scrotal testes (length 18 mm—Núñez et al. 1981). Juveniles have been recorded in March in Michoacan (Hall and Villa R. 1950) and July in Jalisco (Núñez et al. 1981). None of 4 adult females captured in January in Jalisco evidenced reproductive activity (Genoways and Jones 1973). In January 2003 and 2004 along the coast of Colima, the 3 adults examined were reproductively active; 1 was postlactating, 1 lactating and pregnant, and 1 lactating (Schnell et al. 2008).

Average litter size in the laboratory was 2.6 (range 1–3) for 4 females that produced 11 litters (Helm et al. 1974) and 3.0 (range 2–4) for 3 females (Ceballos 1990). Gestation periods for 4 females were 39, 43, 45, and 46 days, and females had sperm in their vaginas after 24 h (Helm et al. 1974). Lactating and pregnant females with 2 and 3 embryos confirm postpartum estrus (Helm et al. 1974). Four neonates weighed 2–3 g each and were pink, hairless, and blind. Weaning occurred at about 25 days, and adult mass was attained after 7 weeks (Ceballos 1990). On average, incisors erupt from the maxilla at 8.9 days (7–10 days, $n = 13$). One-half of total length, tail length, and body mass for adults was obtained at ages of 22, 17, and 35 days, respectively; adult size and body mass were reached at 6 weeks (Helm et al. 1974). Nests are spherical, are made with grasses and plant fibers, and have been found in trees and in accumulations of litter among vines (Mendoza Durán 2002), and in litter on the forest floor (Ceballos 1990).

ECOLOGY

Population characteristics.—This is a solitary, nocturnal, and semiarboreal species. The sex ratio appears to be strongly male biased (males : females; 3.3:1 [Ceballos 1990], 3:1 [Collett et al. 1975], and 3:1 [Schnell et al. 2008]).

Population densities of *Peromyscus perfulvus* have been shown to fluctuate throughout the year from 2 to 14 individuals/ha (Ceballos 1990). Maximum density in tropical deciduous forest has been reported to be about 3.7 individuals/ha, probably representing mostly dispersing individuals; in tropical semideciduous forest, density can reach 30 individuals/ha (Mendoza Durán 1997). In Colima in 2004, estimated density was 13.6 individuals/ha on 1 trapping grid, with the value being 2.7 individuals/ha if one included the effective areas of all 5 trapping grids being sampled (Schnell et al. 2008). The maximum recorded residency of an individual in a given area has been 11 months (Mendoza Durán 2002).

Space use.—Near Chamela, Jalisco, *Peromyscus perfulvus* was collected in trees and on the ground in tropical dry forest (Helm et al. 1974), and all 8 of the specimens obtained by Collett et al. (1975) were on trees (1–3 m above the ground) in tropical subdeciduous forest. Núñez et al. (1981), using only ground traps, captured specimens in tropical subdeciduous forest with oak, shrubs, and palms (*Brehea dulcis*) at El Tuito, Jalisco. Ceballos (1990) had 85% of captures of *P. perfulvus* in above-ground traps (≤5 m above the ground), although only 20% of the traps were elevated; had there been an equal number of elevated and ground traps, the effective above-ground trapping rate would have been 95.8% (Fig. 4). In a later study (Mendoza Durán 2002), 75% of captures on the ground were of females based on a multiyear compilation of trapping results. Along the Colima coast, *P. perfulvus* was caught in elevated traps 91.4% of the time based on 47 captures of 16 individuals and 16,200 trap-nights, equally divided between ground and elevated traps (Schnell et al. 2008).

Fig. 4.—*Peromyscus perfulvus* in elevated vegetation, which is typical for the species. Photograph taken at the Chamela Biological Station, Jalisco, Mexico (19°29′51″N, 105°02′39″W, 106 m) by Cornelio Sánchez-Hernández.

Habitats used by *P. perfulvus* include tropical deciduous and semideciduous forest (Baker 1968; Helm et al. 1974), as well as thorn scrub (Osgood 1945). The type locality is an arid tropical zone characterized by thorn bush and cacti. However, F. C. Wonder, who collected the specimens, reported that they were trapped in luxuriant growth surrounding a spring-fed lake rather than in desert scrub (Osgood 1945). *P. perfulvus* is an inhabitant of humid situations and dense vegetation in the arid tropics. Specimens have been obtained in fields of sugarcane in tall grass (1.5 m) growing in a 3-m belt alongside a stream near Tacambaro, Michoacan (Hall and Villa R. 1949, 1950). Hooper (1955) reported trapping specimens in a number of places: dense stand of shrubs (some thorny), vines, grass, and small trees in open arid tropical scrubland south of Tzitzio, Michoacan; grass at the base of a coconut palm (*Cocos nucifera*); dense brush and grass along an irrigation ditch in a tropical fruit orchard at Apatzingan, Michoacan; at the bases of fig trees and other large trees east of Barra de Navidad, Jalisco; and at the base of fig trees and up to 3 m above the ground on their buttresses in a forest of luxuriant

oil palms (*Orbignia*) and tropical broadleaf trees near Barra de Navidad, Jalisco. *P. perfulvus* also has been found under the following ecological conditions: on trees (1–3 m above the ground) in tropical subdeciduous forest east of Chamela, Jalisco (Collett et al. 1975); on the ground with considerable secondary vegetation, coconut palms, tamarind (*Tamarindus indica*), lime trees (*Citrus aurantifolia*), and thorny brush (*Acacia hindsii* and *A. fernesiana*) northeast of Francisco Villa, Jalisco (Helm et al. 1974); and on the ground in tropical subdeciduous forest with oaks, shrubs, and palms (*B. dulcis*) at the Río Las Juntas south of El Tuito, Jalisco (Núñez et al. 1981). Near Chamela, Jalisco, *P. perfulvus* was mainly in wet habitats and was abundant in palm and semideciduous forest, but was not captured in mangrove, thorn forest, or grassland habitats (Ceballos 1990).

At Playa de Oro, Colima, in January 2003 and 2004, Schnell et al. (2008) conducted 8-night grid mark-and-recapture studies, with 5 grids each year. Each grid had 100 trap stations, each with 1 ground trap and 1 above the ground (thus, 1,600 trap-nights/grid). Vegetation in the area consisted of a mosaic of microhabitats, including thorn forest, palm trees, mangrove forest, and open grassland. Thirteen structural vegetation and environmental variables were measured at each trap station. Only 1 *P. perfulvus* was caught in 2003, but 16 were captured a total of 47 times in 2004, all on a single grid. When considering stations on all grids in 2004, logistic regression indicated that *P. perfulvus* tended to inhabit locations with trees close by, sparse low-level vegetation, little litter, and dense high-level vegetation. In a similar analysis for the 1 grid where the species occurred, only distance to nearest tree was significantly predictive, with *P. perfulvus* avoiding even small forest openings.

The maximum recorded distance between successive capture sites for the species was 70 m (Mendoza Durán 2002), whereas Schnell et al. (2008) found the maximum distance moved to be 67 m by a male and 36 m by a female. In a study near Chamela, Jalisco, distances moved ranged from 4.00 to 21.81 m for 28 female *P. perfulvus*, and for 49 males the range was 2.15–26.76 m; average distance moved for the 77 marked individuals was 12.66 m (Domínguez Castellanos 2006).

Diet.—Food habits of *Peromyscus perfulvus* in the wild have not been studied in detail; Ceballos and Miranda (2000) indicated that its diet consists of seeds, fruits, and insects. Accepted dietary items in the laboratory included seeds, leaves, other plant material, and insects (Orthoptera—Ceballos 1990).

In a fruit- and seed-removal experiment at the Chamela Biological Station, rodents were judged to be important agents in removal, with the abundant *Liomys pictus* being the most important species (Briones-Salas et al. 2006). It was suggested that the less-abundant *P. perfulvus* and *O. banderanus* may have played a role in seed and fruit removal. However, the influence of *P. perfulvus* likely was minimal, given its highly arboreal habits and the fact that experimental food patches were located on the ground.

Interspecific interactions.—*Peromyscus perfulvus* has been preyed on by *Leopardus pardalis* (de Villa Meza et al. 2002). Mammals found associated with *P. perfulvus* are *O. banderanus* (Osgood 1945); *Hodomys alleni* and *Pappogeomys bulleri* (Ceballos and Miranda 1986); *Tlacuatzin canescens*, *Baiomys musculus*, *L. pictus*, *Nyctomys sumichrasti*, *Oryzomys couesi*, *O. melanotis*, *O. palustris*, *Reithrodontomys fulvescens*, *Sigmodon mascotensis*, *Sciurus colliaei*, and *Xenomys nelsoni* (Ceballos 1990; Collett et al. 1975; Helm et al. 1974); and *P. spicilegus* (Núñez et al. 1981).

GENETICS

The diploid number (2n) of *Peromyscus perfulvus* is 48; fundamental number (FN) is 58 (Lee and Elder 1977). Females have 4 pairs of large-to-medium biarmed, 2 pairs of small biarmed, and 18 pairs of large-to-small acrocentric chromosomes. In males, a small biarmed chromosome (Y) is present, and the number of acrocentrics is reduced by 1. Although the karyotype of *P. perfulvus* is identical to that of *P. melanophrys*, an apparent difference is encountered in the selection of sex chromosomes of the 2. It has been postulated that *P. melanophrys* has an unusual sex chromosome involving a partial Y-to-autosome translocation (Zimmerman 1974). This sort of chromosomal rearrangement would result in 4 heteromorphic chromosomes in males (1 autosome, 1 Y–autosome translocation, a biarmed X, and a remnant Y—Zimmerman 1974). The simplest pairing of chromosomes in *P. perfulvus* suggested that the X chromosome is a large acrocentric and the Y a small biarmed chromosome. Such an arrangement does not require invoking a complex sex-chromosome mechanism. This interpretation received support from preliminary banding studies of chromosomes of *P. perfulvus* (Zimmerman 1974). *P. perfulvus* was the 1st *Peromyscus* to be determined to have an acrocentric X chromosome (Lee and Elder 1977), a characteristic now known to be shared with *P. nudipes* (Stangl and Baker 1984; *P. nudipes* is considered to be a synonym of *P. mexicanus* by Musser and Carleton [2005]). G-banded chromosomes of *P. perfulvus* were presented and analyzed by Stangl and Baker (1984). Heterochromatin was restricted to centromeric regions; autosomes were acrocentric, except for pairs 1, 2, 3, 9, 22, and 23.

CONSERVATION

Information relevant to determining the conservation status of *Peromyscus perfulvus* is incomplete, and the species is not listed in the Norma Oficial Mexicana, NOM-059-ECOL-2001 (Secretaría de Medio Ambiente y Recursos Naturales 2002). However, based on analysis of data on current land uses and vegetation types, Sánchez-Cordero et al. (2005) judged that *P. perfulvus* faces a high risk of extirpation due to >40% of habitats it frequents having been

significantly transformed. The species is endemic with a small geographic distribution, and relevant habitats within this region have been highly altered in recent decades through outright loss, fragmentation, and degradation (Schnell et al. 2008). Furthermore, the species has highly arboreal habits, as well as microhabitat preferences within an already restricted set of habitats that superficially seem suitable. As a result, the species has characteristics that make it subject to considerable risk. It has been recommended (Schnell et al. 2008) that the potential vulnerability of *P. perfulvus* to extinction be recognized.

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