

Thylamys pallidior (Didelphimorphia: Didelphidae)

JANET K. BRAUN, NATHAN L. PRATT, AND MICHAEL A. MARES

Sam Noble Oklahoma Museum of Natural History, University of Oklahoma, Norman, OK 73072, USA; jkbraun@ou.edu (JKB)
Sam Noble Oklahoma Museum of Natural History and Department of Zoology, University of Oklahoma, Norman, OK 73072, USA; npratt@uga.edu (NLP); mamares@ou.edu (MAM)

Abstract: *Thylamys pallidior* (O. Thomas, 1902) is a didelphid marsupial commonly called the white-bellied fat-tailed mouse opossum. A small mouse opossum, with tricolored pelage and a white venter, it has a seasonally incrassated tail, where fat deposits, primarily at the tail base, function in food storage. It is the most widely distributed species in the genus occurring from southwestern Peru and northern Chile southward along the eastern slopes of the Andes to southern Argentina. This species is found primarily in arid and semiarid habitats at elevations from sea level to about 4,500 m. It is not of special conservation status but may be uncommon in some areas. DOI: 10.1644/856.1.

Key words: didelphid, fat-tailed mouse opossum, marsupial, South America, white-bellied fat-tailed mouse opossum

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Thylamys pallidior (O. Thomas, 1902) White-bellied Fat-tailed Mouse Opossum

Marmosa elegans pallidior O. Thomas, 1902:159, 161. Type locality “Challapata, east of Lake Poopo,” Oruro, Bolivia.

[*Didelphys (Marmosa) elegans*] *pallidior*: Trouessart, 1905:856. Name combination.

[*Didelphys (Thylamys)*] *pallidior*: Matschie, 1916:271. Name combination.

[*Marmosa (Thylamys) elegans*] *pallidior*: Cabrera, 1919:40. Name combination.

Marmosa bruchi O. Thomas, 1921:519. Type locality “Alto Pencoso, just west of San Luis city,” San Luis, Argentina.

Marmosa elegans fenestrae Marelli, 1932:68. Type locality “Sierra de la Ventana (provincia de Buenos Aires),” Argentina.

Marmosa pallidior: Tate, 1933:229. Name combination.

Marmosa pulchella: Cabrera, 1958:32. Name combination.

Marmosa [(Thylamys)] pusilla bruchi: Cabrera, 1958:32. Name combination.

Marmosa [(Thylamys)] pusilla pallidior: Cabrera, 1958:32. Name combination.

[*Thylamys*]. *pallidior*: Gardner and Creighton, 1989:4. First use of current name combination.

CONTEXT AND CONTENT. Order Didelphimorphia, family Didelphidae, subfamily Didelphinae (Gardner 2005). *Thylamys pallidior* is monotypic. Northern and southern clades of *T. pallidior* differed by 5.56% sequence divergence and may warrant specific or subspecific status (Braun et al. 2005).

NOMENCLATRURAL NOTES. As noted in the synonymy and in the “Literature Cited,” a number of genus and species names have been applied to this species. The synonymy follows Creighton and Gardner (2007), except that we note that the 1st use of the specific name and a brief original description of *Marmosa elegans pallidior* (Thomas, 1902) is given on page 159 with a more detailed description given on page 161. Our use of literature in preparing this monograph is based on our work in clarifying the distribution and systematics of *Thylamys* (Braun et al. 2004, 2005; Mares and Braun 2000) and that of Flores et al. (2000, 2007), Palma and Yates (1998), Palma et al. (2002), and Solari and Voss (pers. comm.). Literature in which species determination was unclear was not included.

The etymology of the genus name is derived from *thylakos* (Greek), meaning pouch, and *mys* (Greek), meaning mouse; the etymology of the specific epithet is derived from *pallidus* (Latin), meaning pallid, and *ior* (Latin), the masculine and feminine comparative ending (Braun and



Fig. 1.—An adult *Thylamys pallidior* from Neuquén, Argentina. Used with permission of the photographer R. D. Sage.

Mares 1995). Common names for *T. pallidior* are pallid fat-tailed opossum, comadreja enana, comadreja común, comadreja de vientre blanco, llaca de la puna, llaca del norte, marmosa, and marmosa pálida (Barquez et al. 2006; Díaz and Ojeda 2000; Iriarte Walton 2008; Muñoz Pedreros and Yáñez Valenzuela 2000; Wilson and Cole 2000).

DIAGNOSIS

Thylamys pallidior is distinguished from other species in the genus by its grayish dorsal coloration (Fig. 1) and white venter. Other species have predominately brownish or darker dorsal pelage and hairs of the venter that are cream-white or cream buffy. *T. pallidior* differs from *T. velutinus* (dwarf fat-tailed mouse opossum), *T. karimii* (Karimi's fat-tailed mouse opossum), *T. pusillus* (common fat-tailed mouse opossum), and *T. macrurus* (Paraguayan fat-tailed mouse opossum) in having well-developed periocular rings that extend toward the rostrum rather than weakly developed eye rings that are limited to the area around the eyes. The tail of *T. pallidior* is longer than the length of the head and body (shorter in *T. velutinus* and *T. karimii*) and is indistinctly colored (distal one-third of tail parti-colored in *T. macrurus* and the tip is whitish in *T. tatei* [Tate's fat-tailed mouse opossum]). Compared with *T. pusillus*, *T. pallidior* has longer hair (usually >10 mm middorsally) and longer claws on the forefeet. Nasals that are slightly expanded at the maxilla–frontal suture in *T. pallidior* differ from those that are parallel sided in *T. venustus* (buff-bellied fat-tailed mouse opossum), *T. elegans* (elegant fat-tailed mouse opossum), and *T. sponsorius* (Argentine fat-tailed mouse opossum). *T. pallidior* differs from *T. pusillus*, *T. venustus*, *T. sponsorius*, and *T. macrurus* in having nasals that narrow posterior to the maxilla–frontal suture rather than nasals that do not narrow. It differs from *T. pusillus* in having little pronounced postorbital constriction and from *T. pusillus*, *T. venustus*, *T. velutinus*, and *T. macrurus* in the interorbital region lacking pronounced supraorbital edges or well-developed processes and smooth, rounded supraorbital ridges; supraorbital ridges are beaded to squared and extend posteriorly and merge with temporal ridges in *T. pusillus* and *T. venustus* and are squared to sharpened in *T. velutinus* and *T. macrurus*. *T. pallidior* differs from *T. macrurus* and *T. pusillus* in lacking stylar cusp C of M2 and M3 and having a notched, rather than serrated, ectoflexus.

GENERAL CHARACTERS

Pelage of *Thylamys pallidior* is tricolored. The pelage is a mixture of grayish brown hairs dorsally, darker on the midline, lighter on the flanks and sides, and white on the venter. An intermediate band of gray-based hairs is absent or not conspicuous (Solari 2003; Tate 1933; Voss and Jansa

2003). Coloration of the face is paler than the pelage of the dorsum or sides (Solari 2003; Tate 1933). Periocular rings are black, well developed, and extend toward the nose (Solari 2003; Voss and Jansa 2003). Individuals captured in February, March, April, and July in Argentina exhibited patterns of molting (Díaz and Barquez 2007; Mares et al. 1981, 1997).

Tail is slightly longer than the length of the head and body, prehensile, and covered with short, fine hairs (Hershkovitz 1992; Solari 2003). It is bicolored (Solari 2003), dark (gray or drab) dorsally and lighter (whitish to yellowish white) ventrally (Solari 2003). Caudal scales are in annular series, each scale with 3 hairs on the posterior border (Solari 2003; Tate 1933; Voss and Jansa 2003).

Feet are small and covered with white or whitish hairs. Ungual tufts are well developed and densely cover the digits (Solari 2003); the plantar epithelium of the tarsus is densely furred (Voss and Jansa 2003). Manus is mesaxonic (dIII longest > dIV), central palmar surface of manus is densely tuberculate, lateral carpal tubercles are absent in both sexes (Voss and Jansa 2003), and thenar and hypothenar pads are not fused with the interdigitals (Solari 2003). The hallux is opposable (Hershkovitz 1992).

Description of cranial and dental characters and character states are given by Voss and Jansa (2003), Solari (2003), and Reig et al. (1987). Braincase is globose, zygomatic arches slightly expanded, and the rostrum is long, narrow, and pointed (Fig. 2). Rostral process of maxillae absent. Nasals slightly expanded at the maxilla–frontal suture and narrowing posterior to the suture. Postorbital constriction little pronounced. Interorbital region lacks pronounced supraorbital edges or well-developed processes; supraorbital ridges are smooth and rounded, but may be slightly beaded in old adults. Auditory or tympanic bullae are large, well developed, round, and separated by a small space; slender anteromedial process of alisphenoid bulla present. Secondary foramen ovale present. Fenestra cochlea is concealed in a bony sinus. Palate highly fenestrated; vacuities well developed and enlarged. Posterolateral palatal foramina large and generally extending lingual to protocones of M4. Molar length is compressed; molar width is expanded; and M4 is wider than M1. Upper canine is simple without accessory cusps. Relative height and length of P2 is <P3; stylar cusp C of M2 and M3 is absent; ectoflexus is a notch; and anterior cingulum of M3 is incomplete. Relative height of p2 is about equal to p3.

External measurements (mean and range, mm; body mass, g; sexes combined) were: total length, 190.7 (174–210; $n = 50$); length of head and body, 89.7 (73–105; $n = 50$); length of tail, 101.1 (90–115; $n = 50$); length of hind foot, 14.2 (9–30; $n = 50$); length of ear, 22.3 (18–27; $n = 49$); and body mass, 19.3 (13.0–38.5; $n = 48$ —Mares and Braun 2000). Cranial measurements (mean and range, mm; sexes combined) were: greatest length of skull, 26.7 (24.6–28.0; n

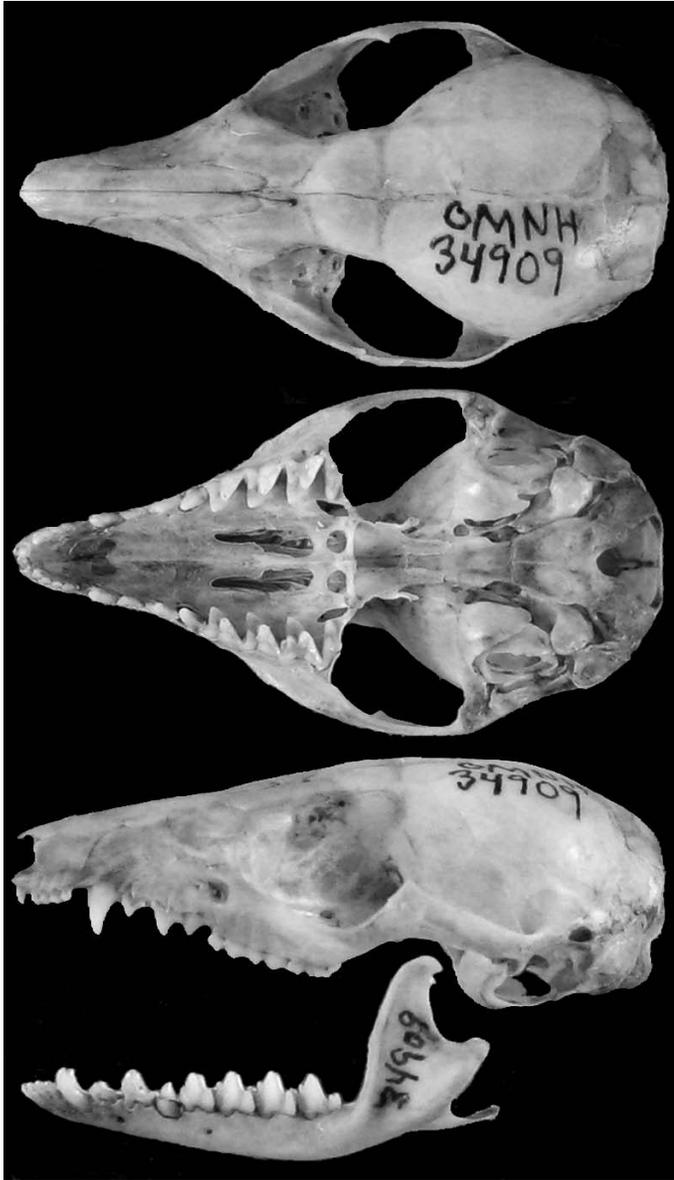


Fig. 2.—Dorsal, ventral, and lateral views of skull and lateral view of mandible of an adult male *Thylamys pallidior* (Sam Noble Oklahoma Museum of Natural History [OMNH] specimen 34909) from Salta Province, Argentina. Greatest length of skull is 25.57 mm. Photograph by M. A. Mares.

= 25); condylobasal length, 26.0 (21.1–27.5; $n = 25$); least interorbital breadth, 4.2 (3.9–4.5; $n = 25$); zygomatic breadth, 13.9 (13.1–15.0; $n = 25$); breadth of braincase, 10.0 (9.4–10.4; $n = 25$); length of maxillary tooththrow, 10.3 (9.4–11.1; $n = 25$); length of palate, 13.7 (12.8–14.2; $n = 23$); length of mandibular tooththrow, 11.0 (10.1–11.6; $n = 25$); and greatest length of mandible, 18.9 (17.6–19.9; $n = 25$ —Mares and Braun 2000).

External measurements (mean and range, mm; body mass, g; sexes combined) for juveniles were: total length, 173.5 (150–193; $n = 13$); length of head and body, 80.0 (70–

91; $n = 13$); length of tail, 93.5 (75–104; $n = 13$); length of hind foot, 12.3 (8–18; $n = 50$); length of ear, 20.7 (18–25; $n = 13$); and body mass, 12.9 (10–16; $n = 12$ —Mares and Braun 2000). Cranial measurements (mean and range, mm; sexes combined) for juveniles were: greatest length of skull, 24.3 (22.6–25.7; $n = 6$); condylobasal length, 23.9 (22.3–25.2; $n = 6$); least interorbital breadth, 4.0 (3.4–4.2; $n = 6$); zygomatic breadth, 13.2 (12.5–13.9; $n = 6$); breadth of braincase, 9.5 (9.3–9.9; $n = 6$); length of maxillary tooththrow, 9.5 (8.6–10.2; $n = 6$); length of palate, 12.3 (11.4–13.0; $n = 6$); length of mandibular tooththrow, 10.1 (9.2–10.8; $n = 6$); and greatest length of mandible, 17.3 (15.9–18.1; $n = 6$ —Mares and Braun 2000). Variation with age (averaging 35%) was present in 7 of 16 cranial measurements for 2 samples from Peru; variation between sexes was low or nonsignificant, and geographic variation was absent (Solari 2003).

DISTRIBUTION

Thylamys pallidior ranges from southwestern Peru, northern Chile, and southwestern Bolivia, southward along the eastern slopes of the Andes to about 42°S in southern Argentina (Fig. 3; Braun et al. 2005; Cabrera and Yepes 1960; Gardner 2005; Solari 2003). Distribution of *T. pallidior* in northern Chile was clarified by Palma (1995a) and Meynard et al. (2002). Elevational range is sea level to 4,500 m (Anderson 1997; Mares and Braun 2000; Solari 2003).

FOSSIL RECORD

Thylamys is known from middle Miocene Honda Group deposits of the Villavieja Formation of Colombia (Goin 1997a), the late Miocene (Huayquerian) Cerro Azul Formation in La Pampa Province, Argentina (Goin et al. 2000), and the Epecuen Formation in Buenos Aires Province, Argentina (Goin 1997b). Remains also are known from the Pliocene (Monte Hermoso Formation) from Río Quequen Salado, Buenos Aires Province, Argentina (Mones 1980; Reig et al. 1987), and the Pleistocene–Holocene from caves in Lagoa Santa, Brazil, and Córdoba, Argentina (Reig 1958; Reig et al. 1987; Winge 1893). *T. pallidior* is known from the Inca Cueva 5 Holocene archaeological sequence in Argentina (Teta and Ortiz 2002).

FORM AND FUNCTION

Form.—Distribution of vibrissae for each body side of *Thylamys pallidior* is: 2 superciliary, 5–8 genal, 3 submental, 2 interramal, 1 antebrachial, 1 anconeal, and 3 or 4 carpal (Solari 2003). One ventrolateral groove is present on each side of the rhinarium (Voss and Jansa 2003). A cutaneous gular (throat) gland is present, which often is indicated by a

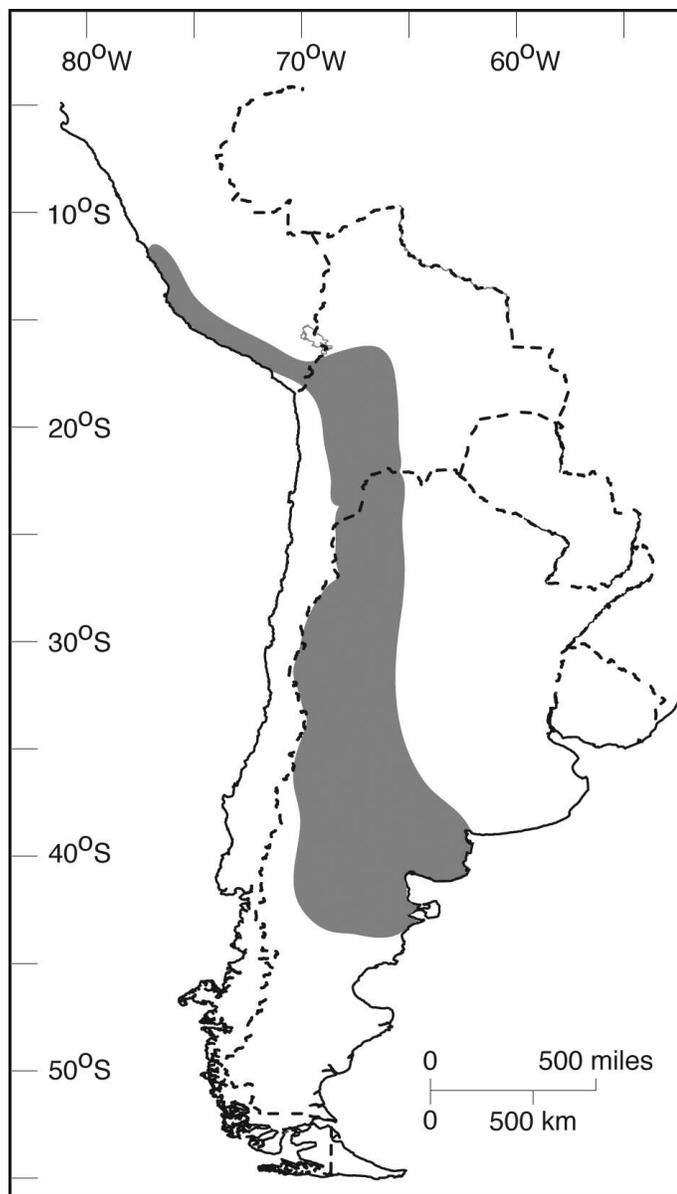


Fig. 3.—Geographic distribution of *Thylamys pallidior* in west-central and southern South America from Braun et al. (2005) with modifications.

median bare area of skin and may be surrounded by discolored hair (Voss and Jansa 2003). The cloaca is precaudal in position (Hershkovitz 1992).

Pouch is absent. Mammary are arranged in the abdominal region, with 2 pairs positioned pectorally (Hershkovitz 1992; Solari 2003); all mammary may not be functional at the same time (Tate 1933; Voss and Jansa 2003). Number of mammary is 15, 7 on each side of the abdomen and 1 centered in the pubic region (Cabrera and Yepes 1960; Hershkovitz 1992; Solari 2003; Tate 1933); however, 9 abdominal mammary, 8 forming a circle around a central 1, have been reported (Díaz and Barquez 2007). Voss and Jansa (2003)

indicated an indeterminate number and arrangement of mammary. Hair surrounding active mammary is discolored (Díaz and Barquez 2007).

The scrotum is pigmented (Hershkovitz 1992). In immature individuals, the glans penis is simple, but it is bifid in mature individuals (Hershkovitz 1992; Solari 2003). The urethral groove extends over the internal side of each half allowing both urinary and ejaculatory functions; a fold of skin on the inner side of each half is present (Solari 2003). The glans cleft in *T. pallidior* is short, and the halves of the penis are short in length (6–7 mm); the urethra ends subterminally (Solari 2003).

Dental formula is $i\ 5/4, c1/1, p3/3, m4/4$, total 50. Molars are tritubercular and crowns are W-shaped (Hershkovitz 1992). Number of caudal vertebrae is 20 or 21 (Solari 2003). The astragalus and calcaneus of the ankle joint of *T. pallidior* exhibit the separate pattern; 2 facets of the dorsal surface of the calcaneus meet with the paired facets of the plantar surface of the astragalus (Solari 2003).

Description of the muscles and tendons of the manus was given by Abdala et al. (2006). The palmaris longus muscle originates on the ulnar side of the forearm and has 1 belly that is piriform, elongated, and flattened. The flexor carpi ulnaris muscle arises from the medial surface of the humerus, is flat and piriform, and inserts on the pisiform. The flexor carpi radialis muscle originates from the ventral radial surface of the distal end of the humerus, inserts on the scaphoid, and has 1 belly. The origin of the flexor digitorum superficialis muscle is independent of the flexor carpi ulnaris muscle; tendons of insertion join the common tendon of flexor digitorum profundus muscle, which lack muscle fibers. The flexor digitorum profundus muscle originates from 3 sites on the forearm; it has 3 bellies, and muscle fibers that reach only to the proximal middle one-third of the forearm. Adaptations of the flexor tendons of *T. pallidior* show a pattern related to grasping ability although the digits do not show individual manipulability.

Measurements of the kidney of *T. pallidior* are: mass, 0.135 g; mean thickness of the renal cortex, 0.76 mm; and mean thickness of the renal medulla, 6.83 mm. Renal indices are: relative medullary thickness, 11.76; relative medullary area, 1.68; and mean thickness of the renal medulla/mean thickness of the renal cortex, 9.37 (Díaz et al. 2001). Renal papillae are elongated.

Function.—The tail of *Thylamys pallidior* begins to thicken (incrassation) during the seasonal storage of energy reserves in autumn (fat—Cabrera and Yepes 1960). Seasonal accumulation of fat functions as “food storage” for use during periods of torpor and stress, including times when water and food are limited or scarce (Ojeda and Tabeni 2009; Roig 1962). Fat is accumulated throughout the length of the tail, but primarily at the base, which thickens to 4–5 times the normal diameter (≤ 10 mm [Tate 1933]; ≥ 45 mm in circumference [Thomas and St. Leger 1926]); tail thickness decreases gradually toward the tail tip (Cabrera and Yepes

1960; Tate 1933). Individuals with incrassated tails have been captured from February through July, and December (Díaz and Barquez 2007; Tate 1933; J. K. Braun, in litt.).

The diet of *T. pallidior* is independent of availability of drinking water. Decreased dietary water intake results in increased urine concentration, lower urine volume, and reduced body mass. Urine osmolality ranged from 847 mOsm/l (ad libitum) to 9,015 mOsm/l (fasting); the maximum value was the highest reported for a marsupial and was similar to those reported for desert rodents (Díaz et al. 2001; Ojeda and Tabeni 2009). Urine volume ranged from 10 μ l (fasting) to 3,500 μ l (ad libitum). The ability to conserve water is an important strategy in responding to periods of food shortages and high levels of nitrogenous waste resulting from an insectivorous diet (Díaz et al. 2001; Ojeda and Tabeni 2009). *T. pallidior* in captivity did not drink water but, if offered, would drink \leq 30 g of milk/day (Bruch 1917).

Thylamys pallidior may be active at least sporadically throughout the year (Mares 1973). Individuals have been captured in all months except January, August, and December (Mares and Braun 2000; J. K. Braun, in litt.) and during winter in southern Argentina (Thomas and St. Leger 1926). The circadian rhythm corresponds to nocturnal activity. At an ambient temperature of 25°C, body temperature was highest (38°C) between 1800 h and dawn and lowest (28°C) during daylight. At ambient temperatures < 15°C or body temperatures < 29°C or 30°C, individuals entered torpor. During torpor, body temperature ranged from 15.8°C to 17.6°C; if awakened, body temperature rapidly increased by 5°C, and individuals aroused from torpor within 25–60 min (Roig 1971). In the field or in the laboratory, animals in torpor may be cold and lethargic, but they regain activity when warmed or at higher temperatures (Contreras and Alvarado 1969; Roig 1971). During fasting experiments, *T. pallidior* was inactive or possibly in torpor (Díaz et al. 2001); in contrast, Roig (1971) found that animals would not enter torpor due to lack of food but only at lower ambient temperatures. Low metabolic rate and torpor are adaptations for energy maintenance and prevention of water loss by evaporation (Ojeda and Tabeni 2009).

ONTOGENY AND REPRODUCTION

Thylamys pallidior have \leq 15 young (Cabrera and Yepes 1960). A female with 3 young about the size of small house mice (*Mus musculus*) was captured in February (Bruch 1917). Females breed 1–3 times annually as a generality for small mouse opossums previously considered in the genus *Marmosa* (Tate 1933) and 2 times annually according to Cabrera and Yepes (1960). A female captured in Bolivia in July had no embryos, but a 2nd female had 4 uterine scars (Anderson 1997). Lactating females have been reported in Argentina in December and February, the latter with an

ochraceous venter (Díaz and Barquez 2007; Flores et al. 2000, 2007). Juveniles and young individuals were collected in Argentina in February, March, April, May, and June (Díaz and Barquez 2007; Flores et al. 2000, 2007; Mares and Braun 2000; Olrog 1959), with the youngest animals captured at the 1st of the year and individuals of increasing age captured through the year (Contreras and Alvarado 1969). A young animal that was accompanying its mother and 2 siblings was captured in the wild and lived in captivity for 1.5 years; it tripled in size by the time of death (Bruch 1917).

ECOLOGY

Population characteristics.—The population characteristics of *Thylamys pallidior* have not been studied in depth. Field studies have yielded low numbers of individuals, and it consistently has been found to be 1 of the least-captured species, generally <5–7% of captures (Gonnet and Ojeda 1998; Ojeda 1989). *T. pallidior*, however, may be common locally in some habitats or localities (Birney et al. 1996; Mares and Braun 2000; M. A. Mares, in litt.).

Captures of *T. pallidior* are more common in snap traps than in Sherman live traps (H. B. Sherman Traps, Inc., Tallahassee, Florida—Birney et al. 1996; Campos et al. 2001). Use of rolled oats as bait may be a cause of low trap success if *T. pallidior* prefers other bait (Corbalán and Ojeda 2004). Relative abundance (percentage of captures) was lowest in winter (0% July—Contreras and Alvarado 1969) and highest in summer (Ojeda 1989) or autumn (9.25% March and April—Contreras and Alvarado 1969). At Ñacuñán, a United Nations Educational, Scientific and Cultural Organization Man and the Biosphere Programme Reserve, *T. pallidior* showed little population variation over seasons and several years (Corbalán and Ojeda 2004).

Space use.—*Thylamys pallidior* is found in high- and low-elevation deserts, semideserts, and steppe habitats, including the Coastal Desert, Andes, Puna, Prepuna, Monte Desert, and Patagonian steppe (Braun et al. 2005; Flores et al. 2000, 2007; Solari 2003). The species generally is found in areas with little vegetation that may be rocky or associated with water (Birney et al. 1996; Flores et al. 2000, 2007; Mares 1973; Thomas 1926). It also is known to occur in *Polylepis* woodlands in Bolivia (Tarifa et al. 2007), *Larrea* shrub lands, *Prosopis* woodlands, and dry thorn scrub in the Monte Desert of Argentina (Mares et al. 1981, 1997; Ojeda and Tabeni 2009), and scrubby steppe vegetation in Patagonia (Birney et al. 1996). In some areas, *T. pallidior* shows a preference for habitats on slopes or hillsides (Campos et al. 2001; Corbalán and Ojeda 2004; Gonnet and Ojeda 1998; Mares et al. 1981; Thomas 1926). Elevational range of *T. pallidior* is from sea level to about 4,500 m.

Thylamys pallidior is nocturnal and terrestrial (Campos 1997; Contreras and Alvarado 1969; Pearson 1995; Roig 1962; Tate 1933). Although quadrupedal, it also is scansorial and has good ability to climb, particularly in bushes (Ojeda and Tabeni 2009; Pearson 1995; Roig 1962). Shelters may be constructed in tree holes, beneath rocks, or in holes under shrubs (Bruch 1917; Cabrera and Yepes 1960; Roig 1962). *T. pallidior* constructs nests using grass, feathers, and other items beneath or between rocks (Bruch 1917).

There is little information on the behavior of *T. pallidior*. In captivity, an individual maintained a clean nest, slept on its side, and washed its face after eating. During winter months, it entered torpor or hibernation, stopped eating, and rarely came out of the nest (Bruch 1917).

Diet.—*Thylamys pallidior* is primarily an insectivore (Cabrera and Yepes 1960; Campos 1997; Pearson 1995; Roig 1962) or an omnivore tending toward insectivory (Campos et al. 2001; Ojeda and Tabeni 2009). The diet consists primarily of small arthropods, but leaves, fruits, and seeds also are an important part of the diet (Campos et al. 2001) or are consumed incidentally (Birney et al. 1996). In the rainy season, the diet was composed entirely of plant material, primarily leaves of *Prosopis flexuosa* (Campos 1997). Stomach contents contained remains of larva and insects, primarily Coleoptera (Contreras and Alvarado 1969) but also arthropod orders Araneae, Chilopoda, Hymenoptera, Coleoptera, Lepidoptera, and Diptera (Birney et al. 1996). An animal maintained in captivity preferred a varied diet depending on time of year; black coleopterans were favored, but mantises, grasshoppers, and small pieces of meat also were eaten (Bruch 1917). Up to 20 beetles were eaten each night; wings and exoskeletons were discarded (Bruch 1917). Bruch (1917) also noted that *T. pallidior* ate only live insects. Vertebrates are an uncommon part of the diet, although a small lizard (Birney et al. 1996), small rodents (Contreras and Alvarado 1969), and small birds (Roig 1962) have been found in the diet.

Diseases and parasites.—Ectoparasites include *Craneopsylla minerva wolffhugeli* (Siphonaptera: Stephanocircidae; host listed as *Thylamys pusillus*—Lareschi et al. 2004), *Acanthochela chilensis* (Acari: Laelapidae—Radovsky and Gettinger 1999), *Marmosopus peruvianus* (Acari: Glycyphagidae; host listed as *Marmosa pusilla*—Fain and Lukoschus 1977). Endoparasites include *Pterygodermatites (Paucipectines) kozeki* (Nematoda: Rictulariidae [Jiménez et al. 2008]; host listed as *Thylamys pusilla* [Navone 1989; Ramallo and Claps 2007]), *Mathevotaenia sanmartini* (Cyclophyllidea: Anoplocephalidae—Jiménez et al. 2008), and *Eimeria* (Apicomplexa—Heckscher et al. 1999).

Interspecific interactions.—Small terrestrial mammals found in association with *Thylamys pallidior* in central and southern Argentina include *Akodon iniscatus* (Patagonian akodont), *Akodon molinae* (Molina's akodont), *Calomys musculus* (drylands laucha), *Eligmodontia typus* (eastern

Patagonian laucha), *Graomys griseoflavus* (common pericote), *Oligoryzomys longicaudatus* (long-tailed colilargo), and *Phyllotis xanthopygus* (yellow-rumped pericote—Campos 1997; Campos et al. 2001; Corbalán and Ojeda 2004; Gonnet and Ojeda 1998; Mares 1973; Monjeau et al. 1997; Ojeda 1989). In northern Argentina, small mammal associates include *Abrothrix andinus* (Andean akodont), *Akodon albiventer* (white-bellied akodont), *Akodon dolores* (Córdoba akodont), other *Akodon* species, *Andalgalomys olrogi* (Olrog's pericote), *Andalgalomys roigi* (Roig's pericote), *Andinomys edax* (Andean mouse), *C. musculus*, *Eligmodontia bolsonensis* (highland gerbil mouse), *E. moreni* (Monte laucha), *E. typus*, *G. griseoflavus*, *P. xanthopygus*, and *Reithrodon auritus* (hairy-soled conyrat—Díaz and Barquez 2007; Mares et al. 1997; J. K. Braun, in litt.).

Thylamys pallidior is prey for several carnivores in Patagonia, including *Bubo magellanicus* (Magellanic horned owl—Martin 2003; Nabte et al. 2006) and *Tyto alba* (common barn owl—Martin 2003). In Buenos Aires Province, *T. pallidior* comprised 4.3% of the remains in pellets of *T. alba* (Massoia et al. 1993). In the Atacama Desert of northern Chile, it was the 2nd most frequent prey species of *T. alba* and comprised 25.9% of the total prey remains in September (spring—Carmona and Rivadeneira 2006).

GENETICS

The diploid number (2n) of *Thylamys pallidior* is 14 chromosomes; the fundamental number (FN) is 20. The karyotype consists of 3 large submetacentric (chromosomes 1–3), 1 medium metacentric (chromosome 4), and 2 small acrocentric (chromosomes 5 and 6) autosomes. The X chromosome is a small acrocentric. The Y chromosome is absent; males have a diploid number of 13 (Braun et al. 2004; Palma 1995b; Palma and Yates 1996, 1998; Wainberg et al. 1978). Translocation of the Y chromosome has been proposed (Palma 1995b; Palma and Yates 1996, 1998). The mode of pairing of sex chromosomes in meiosis and the formation of the dense plate may be similar to that of *T. elegans* (Page et al. 2005, 2006). Enzymatic loci showed low levels of polymorphism (3.84) and heterozygosity (0.01) in the genus. Populations of *T. pallidior* had fixed alleles at IDH-2, PEP-A, PEP-B, and ME-1 (Palma and Yates 1998).

Phylogenetic analysis of DNA hybridization data (Kirsch et al. 1997) and the interphotoreceptor retinoid-binding protein (*Irbp*) gene (Jansa and Voss 2000; Voss and Jansa 2003) found *Thylamys* to be sister taxon to *Lestodelphys*, as suggested based on nonmolecular characters (Creighton 1984; Reig et al. 1987; Voss and Jansa 2003); analysis of the *Irbp* gene by Steiner et al. (2005) found *Gracilinanus* to be the sister taxon. Based on allozyme data, *Thylamys* was sister to *Marmosops* + *Gracilinanus* (Palma and Yates 1998).

Within the genus, *T. pallidior* was sister to the clade of *T. pusilla* + *T. venustus* based on DNA hybridization data (Kirsch et al. 1997), *T. elegans* (west of the Andes) based on allozymes (Palma and Yates 1998) and the mitochondrial DNA cytochrome-*b* gene (Palma et al. 2002), and *T. elegans* + *T. tatei* based on mitochondrial DNA (Braun et al. 2005). Arid-dwelling species (*T. pallidior*, *T. pusilla*, *T. elegans*, and *T. tatei*) comprised a clade within the genus *Thylamys* (Braun et al. 2005; Palma 1995a). Northern and southern clades of *T. pallidior* differed by 5.56% sequence divergence (Braun et al. 2005).

Examination of molecular data suggests that the genus diversified during the Miocene about 14 million years ago (Steiner et al. 2005). Estimates for divergence of *T. pallidior* range from about 2.2 million years ago based on DNA hybridization data (Kirsch et al. 1997) to 4–6 million years ago based on mitochondrial DNA cytochrome-*b* gene data (Braun et al. 2005). Northern and southern clades of the species diverged between 1 and 2 million years ago (Braun et al. 2005).

CONSERVATION

The species is rated as “Least Concern, Population Trend Unknown” on the 2008 *International Union for Conservation of Nature and Natural Resources Red List of Threatened Species* based on its broad distribution and occurrence in protected areas (Díaz and Teta 2008). The conservation status in Argentina also is “Least Concern” (Díaz and Ojeda 2000). Although no major threats to the species are known, some populations may be threatened by conversion of natural habitat to other uses (Díaz and Teta 2008).

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