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Ototylomys phyllotis.

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Ototylomys Merriam, 1901

Ototylomys Merriam, 1901:561. Type species *Ototylomys phyllotis* Merriam.

CONTEXT AND CONTENT. Order Rodentia, Suborder Myomorpha, Family Muridae, Subfamily Cricetinae. The taxonomy of the genus was reviewed by Lawlor (1969). *Ototylomys* includes only one species.

Ototylomys phyllotis Merriam, 1901

Big-eared Climbing Rat

Ototylomys phyllotis Merriam, 1901:562. Type locality Tunkás, Yucatán, México.
Ototylomys fumeus J. A. Allen, 1908:658. Type locality Matagalpa, Matagalpa, Nicaragua.
Ototylomys guatemalae Thomas, 1909:32. Type locality Tucuru, Río Polochic, about 50 mi. E Cobán, Guatemala.
Ototylomys connectens Sanborn, 1935:82. Type locality Cobán, Alta Verapaz, Guatemala.
Ototylomys brevirostris Laurie, 1953:389. Type locality Kate's Lagoon, 17°57'N, 88°30'W, British Honduras.

CONTEXT AND CONTENT. Context noted in generic summary. Three subspecies are currently recognized (Hall, 1981; Lawlor, 1969), as follows:

O. p. australis (Osgood, 1931:145). Type locality San Gerónimo, near Pozo Azúl de Pirris, Costa Rica.
O. p. connectens Sanborn, 1935:82, see above.
O. p. phyllotis Merriam, 1901:562, see above (*affinis* Laurie, *brevirostris* Laurie, *fumeus* Allen, *guatemalae* Thomas, and *phaeus* Merriam are synonyms).

DIAGNOSIS. *Ototylomys* is most similar morphologically to *Tylomys*. *Ototylomys* differs from *Tylomys* as follows (modified from Lawlor, 1969, unless otherwise noted): size smaller, both externally and cranially (total length less than 400 mm); tail uniformly brownish or blackish, without a yellow or white tip; ears much larger relative to length of body; auditory bullae larger, much more inflated, and without anterior protuberances; rostrum narrower, more elongate; zygomatic notch deep (contrasting with shallow or absent); coronoid process of lower jaw reduced, rami slenderer; dental topography more complex, the primary folds of molars less prominent owing to numerous accessory ridges and cusps; anterior cingulum, endostyles, and endostylids of molars well developed; baculum much longer and narrower relative to size of animal, dorsal face deeply concave proximally (instead of flat or slightly concave), and distal end with small rounded head (rather than none); glans penis with baculum extending into a large internal crater at distal end of urethra; dorsal prostate and ampullary glands absent; sperm with straight, pointed acrosome (not hook-like), head slightly curved and triangular, widest at base (not bullet-shaped or cylindrical), midpiece without mitochondrial helix (Helm and Bowers, 1973); diploid chromosome number 48 (rather than 36, 40, 42 or 52) (Hsu and Benirschke, 1973; Pathak et al., 1973).

GENERAL CHARACTERS. The body (Fig. 1) is slender and usually bicolored (dark above, light below). The tail is long, virtually hairless, and covered with relatively large scales. Eyes and ears are large. Size varies geographically. The largest animals occur in the states of Tabasco and Chiapas, México, the highlands of Guatemala, and in Costa Rica; the smallest forms inhabit the Yucatán Peninsula. Color of pelage is also geographically variable. The dorsum is dusky-brown (Yucatán Peninsula), grayish-brown (Costa Rica), blackish-brown (eastern Nicaragua), or dark grayish-brown with an admixture of cinnamon (highlands of southeastern México and Guatemala). Most populations have creamy white or dull white venters, but individuals from southern México and Guatemala have slate-colored bellies. The length and density of the fur is greater in highland individuals from Chiapas and Guatemala than in individuals from adjacent lowlands (Lawlor, 1969).

The skull (Fig. 2) is flattened and has well-developed supraorbital ridges and a prominent interparietal bone. Molars have nearly symmetrical cusps; folds in crown are nearly opposite one another, deep, and nearly meeting at middle of tooth (Hall, 1981). The dental formula is i 1/1, c 0/0, p 0/0, m 3/3, total 16. Selected average measurements (in mm) of 21 adults (combined sample of 10 females and 11 males) from Nicaragua (Lawlor, 1969) are: total length, 309 (284 to 337); tail length, 156 (142 to 174); length of hindfoot, 27.3 (26 to 28); greatest length of skull, 40.5 (39.0 to 41.8); zygomatic breadth, 19.48 (18.45 to 20.40); interorbital breadth, 6.25 (5.85 to 6.75); length of rostrum, 14.80 (13.75 to 15.70); breadth of rostrum, 6.23 (5.85 to 6.80); length of maxillary toothrow, 6.95 (6.35 to 7.30). There is no discernable sexual dimorphism. Other descriptions may be found in Hall (1981), Hall and Kelson (1959), Merriam (1901), and Walker et al. (1975).

DISTRIBUTION. The principal range of *O. phyllotis* extends from southeastern México to central Costa Rica (Fig. 3). Lawlor (1969) suggested that the Isthmus of Tehuantepec provides a barrier to northwestward dispersal. However, Ramírez-P. and Sánchez-H. (1972) discovered parts of two skulls of climbing rats in owl pellets (*Tyto alba*) from a cave in central Guerrero, a location approximately 700 km west of the nearest known occurrence of *O. phyllotis* (Fig. 3).

FORM. The fur of *O. phyllotis* is long, soft, and dense, contrasting sharply with the naked ears and tail. Molt sequences are imperfectly known. Two pelages, juvenile and adult, have been described (Helm, 1975). There is no regular pattern of hair replacement during molts. Mammae number four; all are inguinal.

The baculum and glans penis were detailed and figured by Burt (1960) and Hooper (1960). The baculum is wider than deep at its base and tapers into a narrower shaft. Dorsal and ventral surfaces are concave. The bone measures slightly less than one-third the length of the hindfoot. The glans is simple, containing a smooth-walled internal crater that opens at the tip of the laterally compressed distal end. The surface is clothed with dense, sharp spines. On the basis of these features, Hooper (1960) considered *Ototylomys* to be morphologically intermediate between *Neotoma* and *Tylomys*.

Accessory reproductive glands of males were described and illustrated by Lawlor (1969). The absence of dorsal prostate glands and an ampulla on the ampullary glands links *O. phyllotis*

FIGURE 1. Adult female and young of *Ototylomys phyllotis*. Photograph courtesy of John Helm.

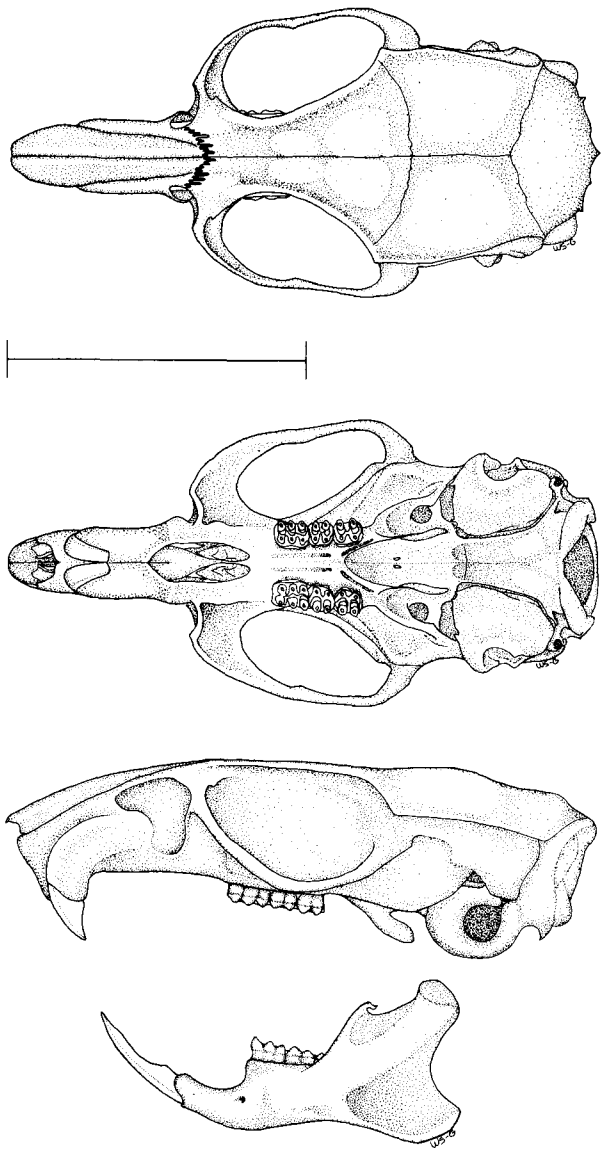

FIGURE 2. Dorsal, ventral, and lateral view of cranium and lateral view of lower jaw of *Ototylomys phyllotis*. The scale represents 20 mm.

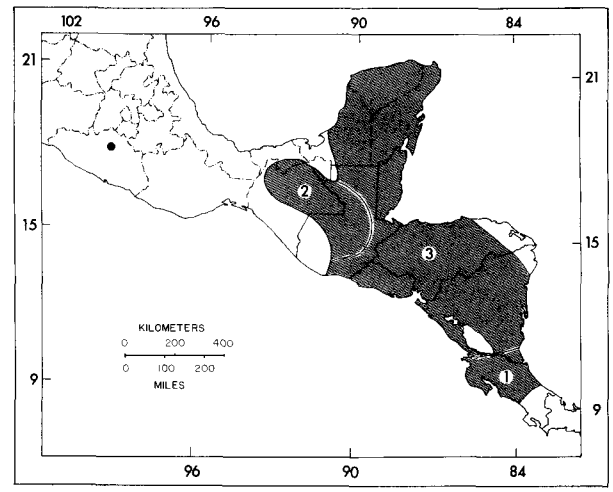

FIGURE 3. Distribution of *Ototylomys phyllotis*. Subspecies are: 1, *O. p. australis*; 2, *O. p. connectens*; 3, *O. p. phyllotis*. The dot identifies the location of a cave (13 km S Mezcala, 720 m, Guerrero) from which owl pellets containing two specimens of *O. phyllotis* were taken (Ramírez-P. and Sánchez-H., 1972).

with *Neotoma*, whereas the small, compact ventral prostate glands and large vesicular gland ally the species with *Tylomys*.

Additional illustrations of *O. phyllotis* were provided by Hall (1981), Hall and Kelson (1959), and Walker et al. (1975).

ONTOGENY AND REPRODUCTION. Pregnant females or juveniles have been recorded at all months of the year (Disney, 1968; Lawlor, 1969), but breeding phenology is poorly known for specific localities. Disney (1968) observed a marked decline in reproductive activity during the dry season (October, November) in British Honduras. There is no regular or predictable estrous cycle as evidenced by vaginal cytology (Helm, 1975). The gestation length of 52 days is the longest of any myomorph rodent for which data are available; it exceeds that of *Tylomys* by 10 days (Helm, 1975). There is no difference in length of gestation between lactating and non-lactating females (Helm, 1975). Disney (1968) reported a pregnancy lasting 174 days in a captive female, suggesting that delayed implantation may occur in this species. Climbing rats exhibit a post-partum estrus.

Litter size varies from 1 to 4. Largest average litters are found in northwestern parts of the geographic range, whereas smallest litters are reported from southeastern parts, as follows (from Lawlor, 1969, unless otherwise noted): southern Tabasco, 2.75 (n = 4); Yucatán Peninsula, 2.25 (n = 16); El Petén, Guatemala, 2.00 (n = 5); British Honduras, 2.27 (n = 83; data compiled from Disney, 1968, and Lawlor, 1969); El Salvador, 1.75 (n = 8; Burt and Stirton, 1961); western Nicaragua, 1.83 (n = 7). Helm (1975) recorded a litter size of 2.4 (range 1 to 4) for 36 births in a captive population established with climbing rats trapped at Escarcega, Campeche, Mexico. The litters comprised a total of 46 males and 40 females. Disney (1968) also noted that litter size varied with body size of females.

Postnatal development was detailed by Helm (1975). Neonates are very precocious. They chased their mothers almost from birth. Head and body length was 46.4% of adult size at birth. Average measurements (±1 SD, in mm) of newborn (n = 86) were: total length, 119.5 ± 0.9; tail length, 47.1 ± 0.8; length of hindfoot, 16.4 ± 0.2; ear length, 9.4 ± 0.2. Weight was 10.2 ± 0.3 g. Young reached 50% of adult body length by day 2 and 90% by 58 days of age. They clung to the teats of their mothers for about 30 days. Hearing usually preceeded eye opening. Most offspring responded to loud noises by day 2 and opened their eyes by day 6. The skin of newborn is sparsely haired, gray on the dorsum and pink on the venter. Dorsal hairs were black with white tips, giving an overall gray appearance to the pelage, and measured 2 to 4 mm in length. Hairs on the venter were short (<1 mm) and white. Brown hair begins replacing the gray pelage at about day 21 and adult coloration is attained by day 43. No definite molt pattern was observed. Timing of sexual maturation varied considerably. First vaginal openings occurred from 21 to 70 days of age (n = 40) and first descent of testes varied from 15 to 38 days (n = 46). The earliest recorded mating for a female was day 29 and for a male day 175.

ECOLOGY. Climbing rats frequent mostly tropical dry and wet primary forests and dense second-growth vegetation. They are scansorial, foraging both on the ground and in trees. *O. phyllotis* has been collected among rocks and litter on the forest floor, in rocky outcroppings, under logs or roots of fallen trees, in sink holes, caves, and tree holes, on stumps, and in shrubs and trees (Disney, 1968; Hatt et al., 1953; Jones et al., 1974; Lawlor, 1969, and references therein). Nest locations have yet to be reported. The discovery of mostly young and pregnant animals in ground traps led Disney (1968) to conclude that they nest in holes among rocks. Adult males and non-gravid females were trapped chiefly in trees.

Ecological associates of *O. phyllotis* include *Heteromys gaumeri, H. desmerestianus, Tylomys nudicaudus, Nyctomys sumichrasti, Otonyctomys hatti, Oryzomys palustris, O. melanotis, Sigmodon hispidus, Peromyscus leucopus, P. yucatanicus*, and *Mus musculus* (Disney, 1968; Hatt, in litt.; Lawlor, 1969). The closest ecological counterparts of *O. phyllotis* are probably *T. nudicaudus, O. hatti*, and *N. sumichrasti*. All are arboreal. In Nicaragua, Lawlor (1969) observed numerous *Ototylomys* and *Nyctomys* active at night in the same trees. Usually *N. sumichrasti* was restricted to upper levels of trees (>3 m), whereas *O. phyllotis* foraged nearer the ground (<3 m). In a trapping study

in British Honduras, Disney (1968) found that both species were most abundant at heights less than 4 m from the ground, but *O. phyllotis* was relatively more common at low levels (<4 m), whereas *N. sumichrasti* was relatively more abundant at greater heights (4 to 8 m).

Food habits of climbing rats are poorly known, but the diet apparently consists chiefly of fruit and leaves (Felten, 1958; Lawlor, 1969; Pearse and Kellogg, 1938).

Instances of predation on *O. phyllotis* are anecdotal. Goodwin (1946) reported remains of climbing rats from owl pellets and Disney (1968) observed a 'black-tailed snake' eating an *Ototylomys*.

External parasites identified from *Ototylomys* include ticks (*Ixodes* sp., *Ornithodoras* sp.) and laelaptid and spinturnicid mites (Lawlor, 1969). Climbing rats are highly susceptible to internal infestations of *Trypanosoma cruzi* (Petana, 1969). Disney (1968) concluded that *O. phyllotis* is the principal reservoir host of cutaneus leishmaniasis (*Leishmania mexicana*) in British Honduras. Female sandflies (*Lutzomyia* spp.), which are attracted to climbing rats for blood meals, are the chief vectors of the disease.

Climbing rats have been successfully housed in laboratories. Curiously, the tails of captive animals often become necrotic and fall off, presumably because of some nutritional or other deficiency.

BEHAVIOR. Climbing rats are arboreal and nocturnal. In Nicaragua, Lawlor (1969) observed that their activity was limited mostly to low creepers and branches of trees; occasionally they were seen on the ground. Disney (1968) trapped *O. phyllotis* both on the ground and in trees.

By using open-field techniques, Wilson et al. (1976) compared exploratory behavior of *O. phyllotis* and nine other species of murid rodents. Climbing rats ranked in the middle of the distribution of square-entries (a measure of exploratory activity) and showed low amounts of defecation.

Copulatory behavior was observed by Estep et al. (1977). The combination of a copulatory lock and intravaginal thrusting prior to ejaculation is peculiar to *Ototylomys* and *Tylomys*.

GENETICS. The karyotype of *O. phyllotis* from the Yucatan Peninsula comprises 32 metacentrics and submetacentrics, and 14 acrocentrics (2n = 48, FN = 78). The sex chromosomes are largest; they consist of metacentric X and submetacentric Y chromosomes (Engstrom and Tucker, in litt.; Hsu and Benirschke, 1973). Engstrom and Tucker (in litt.) reported that two of five specimens from Palenque, Chiapas, contained a heterochromatic supernumerary chromosome (2n = 49). Otherwise G-band patterns were identical to those of climbing rats from the Yucatan Peninsula, but differed from those of specimens from near Berriozabal, Chiapas, by three pericentric inversions.

REMARKS. *Ototylomys*—Greek *otus* (ear), *-tylos* (knob, knot, swelling), and *-mus* (mouse), in reference to the large ears and shelf-like supraorbital ridges of these rats.

The skull illustrations was prepared by Wendy Griswold.

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