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Neotoma anthonyi.

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Neotoma anthonyi Allen, 1898

Anthony's Wood Rat

Neotoma anthonyi Allen, 1898:152. Type locality "Todos Santos Island, Lower California" [Baja California, Mexico].

CONTEXT AND CONTENT. Order Rodentia, suborder Sciurognathi, family Muridae, subfamily Sigmodontinae, genus *Neotoma*, subgenus *Neotoma* (Musser and Carleton 1993). *Neotoma anthonyi* is a member of the *N. lepida* species group (Goldman 1932; Koop et al. 1985; Mascarello 1978). Although its taxonomy has not been carefully reevaluated since the original description, its species level status has been accepted by later authors (Goldman 1910, 1932; Hall 1981; Musser and Carleton 1993). *N. anthonyi* is monotypic (Hall 1981).

DIAGNOSIS. *Neotoma anthonyi* (Fig. 1) and *N. martinensis*, another island endemic, both have hind legs that are conspicuously dark gray on outer sides, and this and their darker color distinguishes them from *N. intermedia* on the nearby mainland. Underparts are dull white in *N. anthonyi* and purer white in *N. martinensis* (Goldman 1910), and hind legs and tail are black in *N. anthonyi*, rather than dark gray as in *N. martinensis*. In *N. anthonyi*, nasals do not extend posterior to plane of lachrymals (Fig. 2), whereas in *N. martinensis*, they do (Goldman 1910). *N. bryanti* is larger and has a grayer, fluffy coat, and its hind legs and tail are not darker than dorsum (Alvarez-Castañeda and Yensen 1999).

GENERAL CHARACTERS. *Neotoma anthonyi* is a medium-sized wood rat. Pelage is grayish-brown dorsally, becoming pale grayish-brown on sides. Head and dorsum are darker due to presence of dusky hairs. Forearms are dusky brown. Hind legs are dark gray on outer side; ankles are dark gray on inner side. Venter is dull white, with a pinkish-buff suffusion on belly and throat. Tail is short (<150 mm), well-haired, and sharply bicolored: brownish-black dorsally and dull white ventrally (Goldman 1910). Juvenile pelage is grayer, slightly darker, and much softer than that of adults (E. Yensen, in litt.).

Skull (Fig. 2) is larger and more massive, but generally similar to that of *N. intermedia*. Compared to the latter, teeth are stronger, nasals are broader, incisive foramina are longer and slightly constricted near maxillary–premaxillary suture, interpterygoid fossae are broader, and mandible is strong and "less squarely spreading" (Goldman 1910:53). Frontals form a deep channel at midline and are higher near the lachrymals. Presphenoid is broader at suture with basisphenoid (Goldman 1910). Nasals do not extend posterior to plane of lachrymals and are rounded in front (Allen 1898; Goldman 1910). Dental formula is i 1/1, c 0/0, p 0/0, m 3/3, total 16.

External measurements (in mm) of males and females, respectively, average (±*SD*, with range and sample size in parentheses): total length, 320.6 ± 18.8 (278–355, 22), 316.8 ± 20.5 (262–355, 38); length of head and body, 182.8 ± 15.4 (154–210, 22), 177.1 ± 11.8 (158–203, 38); length of tail, 137.8 ± 10.0 (116–155, 22), 139.7 ± 14.1 (73–164, 38); length of hind foot, 36.5 ± 1.1 (35–39, 19), 36.1 ± 1.1 (32–38, 37); length of ear, 23.8 ± 3.5 (18–28, 8), 24.7 ± 4.3 (18–30, 6). Body mass averages 221 ± 40.8 g for males (176–277, n = 5) and 169.8 ± 27.4 g for females (143–194, n = 4—Smith 1991). Cranial measurements (in mm) are as follows: length of skull, males 43.9 ± 1.7 (41–47, n = 19), females 42.6 ± 1.7 (39–45, n = 36—Smith 1991); basilar length, 37.3; zygomatic breadth, 23.6; interorbital breadth, 5.6; length of nasals, 17.1; length of incisive foramina, 10.1; length of palatal bridge, 7.5; alveolar length of maxillary toothrow, 8.2 (n = 8–10 adults—Goldman 1910).

DISTRIBUTION. *Neotoma anthonyi* is known only from Todos Santos Islands (Fig. 3), 2 islands 14 km off Ensenada on the west coast of northern Baja California, Mexico (Allen 1898; Goldman 1910; Huey 1964; Nelson 1922). The south island has a surface area of ca. 100 ha (2 km long and 1 km wide—Nelson 1922). The highest of the rounded hills reaches 95 m, with steep cliffs forming the shorelines. The northern part of this island and the north island are low plateaus with rocky, precipitous shorelines. The north island (1 km long and 0.7 km wide) covers 30 ha and rises to 45 m (Winlund et al. 1988). A narrow channel separates the 2 islands (Nelson 1922).

Todos Santos Islands are land bridge islands. They were connected to the mainland during the Pleistocene (Hafner and Riddle 1997) but have been separated for 9,800 years (Smith 1992). A "long line of detached rocks stretch from the point of the cape directly at the largest islet, with which they are connected by a submarine ridge, showing that the islets were once part of a long, narrow cape, of which Punta Banda [6.3 km SE] is the remaining base" (Nelson 1922:85). However, the channel between Punta Banda and Todos Santos Islands is up to 386 m deep (Winlund et al. 1988); thus, the submarine ridge is not continuous. The Pleistocene connection to the mainland was apparently to the north where the water is generally <100 m deep.

Three other wood rats, *N. bryanti*, *N. bunkeri*, and *N. martinensis*, are endemic to single land bridge islands off the coast of Baja California, and all are derivatives of *Neotoma intermedia* on the Baja California peninsula (Orr 1960). No fossils of *N. anthonyi* are known.

FORM AND FUNCTION. *Neotoma anthonyi* exhibits gigantism like other wood rats on land bridge islands off the Baja California mainland (Lawlor 1982, 1983), being 8.5% larger in length of head and body than *N. i. intermedia* on the adjacent Baja California mainland (Smith 1991, 1992).

Wood rats endemic to land bridge islands also exhibit increased sexual dimorphism compared with mainland populations. Males of *N. anthonyi* are about 3% larger in length of head and body than females. This is a 6.2% increase in the amount of sexual dimorphism over that found in *N. i. intermedia*, the most probable source population on the mainland (Smith 1992).

ECOLOGY. Vegetation of Todos Santos Island is California coastal scrub (Pase and Brown 1994; Wiggins 1980). It includes open herbaceous areas dotted with clumps a few meters in diameter

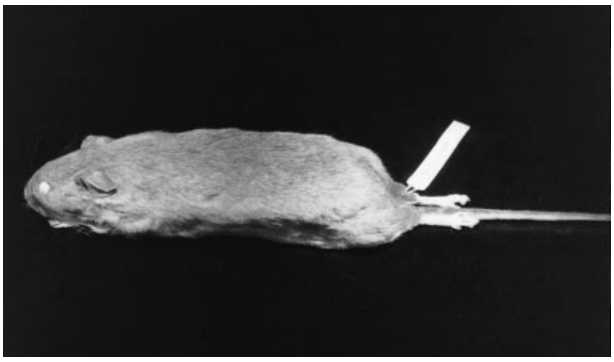

FIG. 1. Male *Neotoma anthonyi* (National Museum of Natural History 137159) collected in 1905. Note the dark hind legs. No photographs of living *N. anthonyi* are known. Photograph by E. Yensen.

FIG. 2. Dorsal, ventral, and lateral views of skull and lateral view of mandible of *Neotoma anthonyi* (adult male from Todos Santos Island, Baja California, Mexico; Museum of Vertebrate Zoology, University of California, Berkeley, #38178). Greatest length of skull is 43.4 mm. Photography by Sergio Ticul Alvarez-Castañeda.

of *Bergerocactus emory, Encelia californica,* and *Opuntia prolifera.* This vegetation is typical for flat areas, including most of the north island, but it is absent at the lighthouse and dwellings on the north island and absent from hilltops, valleys, and low plateaus of the south island (Mellink 1992; Nelson 1922). Climate is similar to the adjacent mainland, but with more fog and humidity (Goldman 1951). *N. anthonyi* and *Peromyscus maniculatus dubius* are the only terrestrial mammals known from Todos Santos Islands (Hall 1981; Nelson 1922). *Neotoma* are considered generalist herbivores, and no native terrestrial herbivores or predators occur on Todos Santos (Lawlor 1982; Smith 1992). The natural history of *N. anthonyi* is unknown (Mellink 1992; Mellink-Bijtel 1992).

Nelson (1922:85) reported that both *N. anthonyi* and *P. maniculatus* were "extremely numerous." L. M. Huey visited the island in 1926, collected several specimens, and noted that *N. anthonyi* "must really be abundant" (L. M. Huey, field notes, 18 May 1926, in San Diego Natural History Museum). However by 1989, the only evidence of the recent presence of wood rats on the island was a

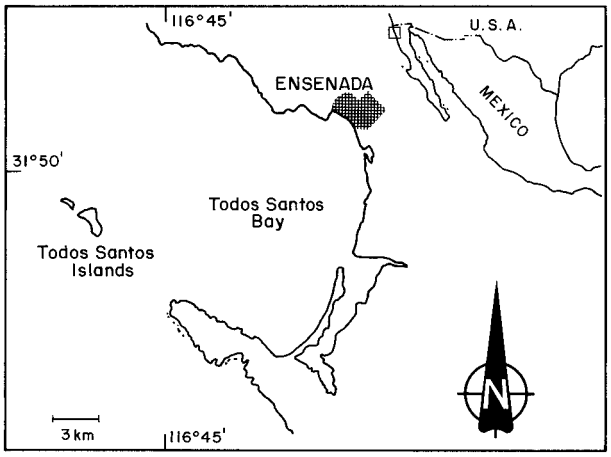

FIG. 3. Distribution of *Neotoma anthonyi* in Baja California, Mexico. *N. anthonyi* is endemic to Todos Santos Island.

skull of *N. anthonyi* found by E. Mellink on the 1st of 5 visits in 1989–1990 (Mellink 1992; Mellink-Bijtel 1992). The skull was in a crevice in the eastern cliffs on the south island. No wood rat nests or feces were found, but midden-type material was present in some small caves (<1 m deep). Thus, *N. anthonyi* is either extinct or very close to extinction. The most plausible explanation for their disappearance is extirpation by domestic cats, which were introduced prior to 1950. Feral domestic rabbits also exist on the south island. Fishermen and the lighthouse keeper stated that the population of both cats and rabbits increased to "high" numbers about 15 years previously (Mellink 1992). Rabbits have almost been extirpated, allegedly by cats and humans. Only cats are now present, and they are in low numbers.

REMARKS. *Neotoma anthonyi* is considered endangered (Norma Oficial Mexicana 1994; World Conservation Monitoring Centre 1990) and threatened (International Union for Conservation of Nature 1994). In reality, Anthony's wood rat, like other wood rats endemic to Baja California islands (e.g., *N. martinensis*—Mellink 1992), may be extinct due to predation by domestic cats.

Mainland Baja California populations, referred to as *N. intermedia* following Planz (1992), are often treated as *N. lepida* (Hall 1981; Musser and Carleton 1993). The specific epithet is in honor of A. W. Anthony, who made many important early collections of mammals in Baja California and adjacent islands, including the type of *N. anthonyi* (Allen 1898). *Neotoma* comes from the Greek *neos* for new and the Greek *tomos* for cut or slice, apparently in reference to a new division of the rodents (Alvarez-Castañeda and Alvarez Solórzano 1996).

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