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Tympanoctomys barrerae.

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Tympanoctomys Yepes, 1942

Octomys Lawrence, 1941:43. Type species *Octomys barrerae*.
Tympanoctomys Yepes, 1942:69. Type species *Octomys* [*Tympanoctomys*] *barrerae*.

CONTEXT AND CONTENT. Order Rodentia, suborder Hystricognatha (Caviomorpha), superfamily Octodontoidea, family Octodontidae, subfamily Octodontinae. The genus is monotypic.

Tympanoctomys barrerae (Lawrence, 1941)

Red Vizcacha Rat

Octomys barrerae (Lawrence, 1941:43). Type locality "La Paz, Mendoza Province, Argentina." The type specimen (No. 39716), skin and skull of adult male collected in April 1939, is housed in the Museum of Comparative Zoology, Harvard.
Tympanoctomys barrerae Yepes, 1942:69. See above.

CONTEXT AND CONTENT. Generic context given above. No subspecies are recognized.

DIAGNOSIS. The red vizcacha rat (Fig. 1) resembles other members of the family Octodontidae such as the close relatives *Octomys mimax* and *Octodontomys gliroides*. *T. barrerae* is smaller and has shorter hind foot and tail than *O. mimax*. General color pattern is very similar to that of *O. mimax*, but skull is shorter and smaller. Distinctive features of the skull (Fig. 2) of *T. barrerae* are developed tympanic bones, short and rounded nasals, and short maxillary toothrow (De Santis et al., 1991; Lawrence, 1941; Yepes, 1942).

GENERAL CHARACTERS. *Tympanoctomys barrerae* is a medium-sized rat with a relatively large head. Ears are short, with a preauricular tuft of pale hairs. Tail is bicolor, long (49–53% of head and body length), and covered with long hairs. Hairs at tip of tail are 19–25 mm in length. Terminal portion of tail is dark brown to reddish brown. Dorsal pelage is buffy yellowish colored and underparts are white; hind feet are short and covered with long whitish hairs (Lawrence, 1941; Ojeda et al., 1989). External measurements (in mm) of 13 adult males and females average (± *SD*): total length, 274.08 ± 19.15; length of head and body, 128.92 ± 17.25; length of tail, 145.15 ± 7.89; length of hind foot, 34.08 ± 1.11; and length of ear, 17.14 ± 1.80. Body mass (in g) of 10 males and 6 females from Nihuil, Mendoza Province, averaged 91.25 ± 1.52 and 88.92 ± 3.1, respectively. Mass of one male from Desaguadero, Mendoza Province, was 104 g, whereas that of six females was 81.83 ± 2.49.

Maximum width of cranium of *T. barrerae* is greater than its length. Bullae extend over 45% of greatest length of skull (Ojeda et al., 1989) and extend posteriorly beyond occiput. Upper and lower incisors are orange. Specialized stiff hair bundles are posterior to upper incisors (Mares et al., 1997*b*). *T. barrerae* has op-

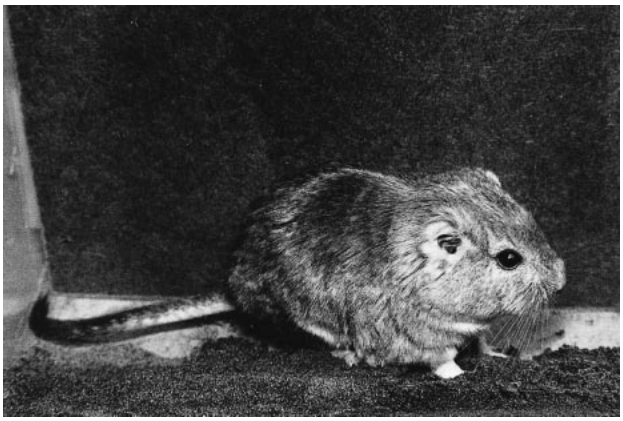

FIG. 1. Adult female of *Tympanoctomys barrerae* (Mendoza Province, Argentina). Photograph by Daniel Rosales.

FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral views of mandible of *Tympanoctomys barrerae* (Colección IADIZA Mastozoología, CM 3000). Greatest length of cranium is 39.4 mm.

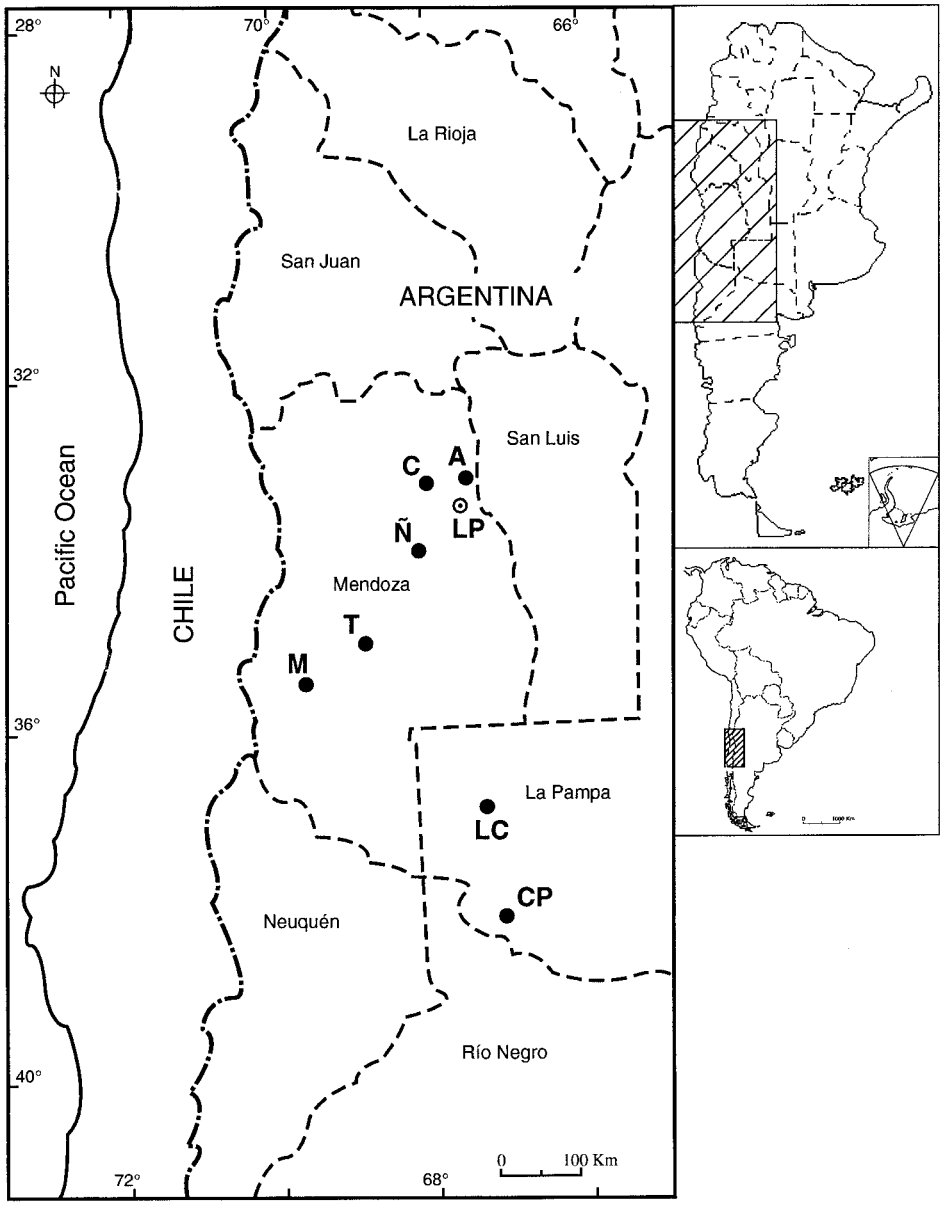

FIG. 3. Localities where *Tympanoctomys barrerae* has been recorded: M, Malargüe; T, Trintrica; Ñ, Ñacuñán; C, Las Catitas; LP, La Paz (type locality); A, Arroyito; LC, Lihue Calel; CP, Casa de Piedra.

isthodont incisors (Yepes, 1942) and euhipsodont molars. Molariform teeth are figure 8–shaped, as in *Octomys* (De Santis et al., 1991). Cranial measurements (in mm) for six adult specimens (male and female combined) average (± *SD*): greatest length of skull, 39.35 ± 0.68 (n = 4); condylobasal length, 35.93 ± 1.29; least interorbital breadth, 7.83 ± 0.29; zygomatic breadth, 19.28 ± 0.30 (n = 4); length of maxillary toothrow, 5.38 ± 0.25; length of mandibular toothrow, 5.57 ± 0.32; bullar width, 11.10 ± 0.66; bullar length, 18.23 ± 0.73; greatest length of mandible, 21.60 ± 1.16; and length of diastema, 8.53 ± 0.31.

DISTRIBUTION. *Tympanoctomys barrerae* is endemic to arid regions of central-western Argentina, within the Monte and Patagonian desert biomes (Fig. 3). Geographic range of the red vizcacha rat is reduced and patchy. *T. barrerae* is known from only eight localities that correspond to salt basin ("salares"), sand dune, and open scrubland habitats in provinces of Mendoza and La Pampa (Justo et al., 1985; Ojeda et al., 1996). Elevation ranges from 300 to 1,400 m. No fossils of *T. barrerae* are known.

FORM AND FUNCTION. Basal metabolic rate and thermal conductance of one adult *T. barrerae* are lower than expected for its body mass (Bozinovic and Contreras, 1990). Basal metabolic rate was 0.90 ml O_2 g^{-1} h^{-1}; thermal conductance was 0.080 ml O_2 g^{-1} h^{-1} $°C^{-1}$; and lower critical temperature was 24.5°C for a body mass of 91 g. Body temperature in an ambient temperature range of 10–33°C was 35.4°C.

Tympanoctomys barrerae is able to concentrate urine. Maximum urine concentration of *T. barrerae* is 7,080 mosm/l, similar to other desert rodents that forage on halophytes (e.g., *Dipodomys microps, Psammomys obesus*—Diaz and Ojeda, 1999; Ojeda et al., 1999). This special physiological ability is also evident at the level of the renal morphology. The red vizcacha rat shows an elongated renal papilla, and high renal indices: relative medullary thickness, 9.41; ratio of medulla to cortex, 8.01; ratio of inner medulla to cortex, 5.0; and relative medullary area, 1.73 (Diaz and Ojeda, 1999).

ONTOGENY AND REPRODUCTION. Four litters of red vizcacha rats were born in captivity from pregnant females captured from Nihuil (Mendoza Province) in February. Neonates had eyes closed and weighed 4 g at birth. At 5 days of age, neonates weighed 8 g and eyes opened after 6 days. Juveniles start to consume plants at 10 days of age, although weaning is not complete. Juveniles scrape *Atriplex* leaves like their mothers do (S. M. Giannoni, in litt.).

ECOLOGY AND BEHAVIOR. *Tympanoctomys barrerae* inhabits salt basins and sand dunes in lowland habitats. The red vizcacha rat is nocturnal and solitary (Mares et al., 1997*a*). It lives in a complex burrow system built in soft soil mounds (Mares et al., 1997*a*; Ojeda et al., 1996). These mounds average 13.59 m in length, 8.71 m in width, and 1.25 m in height. In the Arroyito locality (Mendoza Province) average number of holes per mound was 22.7. Each burrow system is composed of several holes, food chambers, dead tunnels, and up to three gallery levels. Items found in food chambers include *Alternanthera nodifera, Atriplex argentina,* and *Heterostachys ritteriana.* Density of active mounds was 0.007 per ha in Arroyito and 7.31 per ha in Trintrica. Average distance between mounds was 470.4 m in Arroyito and 19.2 m in Trintrica (Ojeda et al., 1996). Each major mound of Nihuil has several satellite mounds that are small and less complex than the main mound (Mares et al., 1997*a*). Population density measured within preferred habitat is 0.8 animals/ha (Mares et al., 1997*a*).

In the Biosphere Reserve of Ñacuñán, Mendoza Province, *T. barrerae* was captured in a habitat dominated by desert shrubs such as *Atriplex lampa, Larrea cuneifolia,* and *L. divaricata* and grasses such as *Chloris, Pappophorum,* and *Plantago.* Mean percent of plant coverage was 85% (Ojeda et al., 1989).

The red vizcacha rat is strictly herbivorous and specializes on halophytic vegetation, particularly on chenopod species such as *Atriplex, Allenrolfea vaginata, Heterostachys ritteriana,* and *Suaeda divaricata* (Ojeda et al., 1996; Torres-Mura et al., 1989). In Arroyito (Mendoza Province), a significantly higher proportion of *S. divaricata* (Chenopodiaceae) occurred in the diet of *T. barrerae,* whereas in Trintrica (Mendoza Province) the red vizcacha rat preferred the salt bush *A. lampa.* Other food items are *A. nodifera, A. argentina, H. ritteriana,* and *S. divaricata.* When present, *A. nodifera* and *S. divaricata* are significantly preferred by *T. barrerae.* The chenopods *Atriplex* and *H. ritteriana* are consumed in the same proportion as they are found in each mound. Low proportions of Gramineae are detected in the diet and are eaten in lower proportions than available. Other plant species do not show a clear pattern of use relative to availability (Ojeda et al., 1996).

Leaves of the salt bush *Atriplex* contain up to ca. 40% ash and are covered with a layer of salt. *T. barrerae* scrapes the surface of *Atriplex* leaves with its lower incisors and bristle brush of stiff hairs before consumption and thus greatly reduces its electrolyte intake (Mares et al., 1997*b*). Scraping away the epidermal vesicles of *A. lampa* leaves with bucal bristles takes 5 s. (S. M. Giannoni, in litt.).

In arid lands of central Argentina, the red vizcacha rat coexists with an assemblage of small and medium-sized mammals, such as *Thylamys pusilla, Graomys griseoflavus, Eligmodontia typus, Calomys musculinus, Akodon molinae, Galea musteloides, Microcavia australis, Dolichotis patagonum, Lagostomus maximus,* and *Ctenomys mendocinus* (Mares et al., 1997*a*; Ojeda et al., 1989; Torres-Mura et al., 1989). Aspects of interspecific competition are unknown.

Skulls of *T. barrerae* were reported in pellets of the barn owl, *Tyto alba,* in two sites of open scrublands in La Pampa Province (Justo et al., 1985). Other predators in the Monte desert may include snakes (*Bothrops newiedii, Bothrops ammodytoides*), owls (*Bubo virginianus, Athene cunicularia*), cats, foxes (*Lynchailurus pajeros, Lycalopex gymnocercus*), and mustelids (*Lyncodon patagonicus, Galictis cuja*).

Ectoparasites such as the Siphonaptera *Hectopsylla coniger* and *Parapsyllus barrerai* have been found in association with *T. barrerae* and its nests (De la Barrera, 1940). Two species of *Parapsyllus* were exclusive parasites of *T. barrerae* (De la Barrera, 1940).

GENETICS. Recent genetic data indicate that *T. barrerae* is the first tetraploid mammal (Gallardo et al., 1999). *T. barrerae* has a genome size of 16.8 pg DNA, which is double that of its closest relatives and of most mammals (Gallardo et al., 1999). As expected in polyploid organisms, significantly larger spermatozoa (14.1 × 13.4 μm) with 9.2 pg DNA have been recorded (Gallardo et al., 1999). The completely biarmed karyotype (2n = 102, FN = 200) is the largest of any mammal and includes 36 pairs of metacentric to submetacentric chromosomes, 14 pairs of subtelocentric autosomes, and an XY sex chromosome system (Contreras et al., 1990). All chromosomes have discrete blocks of centromeric heterochromatin (Gallardo et al., 1999).

Electrophoretic data from 19 presumptive genes assayed in 19 specimens from Arroyito and Nihuil indicate low levels of genetic variation, as is characteristic of other hystricognaths. Genetic distance values (Nei, 1978) were also low, and fluctuated from zero among samples from Nihuil, to 0.059 among those from Nihuil-El Tapón (Köhler et al., in press). A high bootstrap value supports the allozymic association between *T. barrerae* and *O. mimax* (Köhler et al., in press) and suggests they share a common genome (Gallardo, 1997).

CONSERVATION STATUS. The red vizcacha rat has been classified as a threatened species according to different methods (International Union for the Conservation of Nature, 1996; Ojeda and Diaz, 1997; Reca et al., 1996). According to the classification of rarity proposed by Rabinowitz et al. (1986), the red vizcacha rat occupies the most vulnerable category, involving species with restricted geographical distributions, habitat specialists (dunes and salt flats), and low population densities. From the perspective of conservation biology, *T. barrerae* is a patch resource specialist with low population sizes and presumably low colonization rates (Ojeda et al., 1996).

REMARKS. The generic name *Tympanoctomys* is derived from the Greek words *tympa* meaning 'drum,' in reference to the large tympanic bullae, and *octomys,* a 'mouse with 8-shaped molars.' The species name *barrerae* is used in memory of the parasitologist J. M. de la Barrera. Other vernacular names include rata vizcacha colorada (Spanish).

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