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Tonatia carrikeri.

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Tonatia carrikeri (J. A. Allen, 1910)

Allen's Round-eared Bat

Chrotopterus carrikeri J. A. Allen, 1910:147. Type locality "Río Mocho," Bolivar, Venezuela.

Tonatia carrikeri Goodwin, 1942:207. First use of current name combination.

CONTEXT AND CONTENT. Order Chiroptera, Suborder Microchiroptera, Family Phyllostomidae, Subfamily Phyllostominae. The genus *Tonatia* contains six extant species if the small *Tonatia* are recognized as conspecific (Honacki et al., 1982). *Tonatia carrikeri* is monotypic.

DIAGNOSIS. Externally, this medium-sized *Tonatia* is easily distinguished from all other species in the genus by the presence of an all white venter (Fig. 1) bordered laterally by the darker color of the flanks and shoulders (McCarthy et al., 1983). Based on comparable measurements from Suriname (Genoways and Williams, 1984), *T. carrikeri* (forearm length, 45.8, 46.7; greatest length of skull, 25.0, 26.0) is smaller than *T. silvicola* (forearm length, 52.1–59.3; greatest length of skull, 27.3–29.8) and *T. bidens* (forearm length, 52.7–56.9; greatest length of skull, 27.0–28.2), but larger than *T. brasiliensis* (forearm length, 34.5–35.5; greatest length of skull, 19.5–20.2). *T. schulzi* approaches *T. carrikeri* in overall size (forearm length, 42.0–44.0; greatest length of skull, 23.0–23.8), but has underparts that are uniformly drab gray, although the bases of the hairs are whitish. The small dermal, wart-like granulations found on the dorsal surfaces of the forearms, digits, hind legs, ears, and nose leaf in *T. schulzi* are absent on *T. carrikeri*. While *T. carrikeri* approximates *T. evotis* in size, the latter is known only from southern Mexico and northern Central America.

GENERAL CHARACTERS. The color of the holotype was described (Allen, 1910) as dark seal brown dorsally with the basal portion of the hairs buff and the tips whitish, which imparts a light grayish wash to the surface. Goodwin (1942) referred to this color as mummy brown with the base of the fur white and the area of the nose, chin, and a band below the base of the ears as blackish-brown. The median throat, chest, and abdomen are white, while the flanks, shoulders, and anal region are grayish-brown. Wing membranes are dark brown or black and the ears pale brown with a narrow whitish margin. The underside of the forearm is flesh-colored with short grayish-brown hairs covering the proximal third. Grayish-brown hairs also clothe the humerus; these hairs are longer and paler on the adjacent membranes. The undersurface of the hind limbs is flesh-colored and, along with the adjacent membranes, sparsely haired. The nose leaf is blackish-brown, V-shaped, broad at the base, and acutely pointed. The tail is short and enclosed in the interfemoral membrane (Allen, 1910). The coloration of a fresh specimen from Belém, Pará, Brazil was described as: face including lips, nose leaf, and ears were dark gray-brown; tragus was orange-red, edged with gray-brown; wings were blackish, paler distally between digits II and III; interfemoral membrane, legs, fingers, forearm, and feet were dark grayish-brown; claws were horn-colored; and iris was blackish (Handley, pers. observ.). Specimens of *T. evotis* from Middle America are darker in coloration, both above and below, and larger in size than those of *T. carrikeri* from Venezuela (Davis and Carter, 1978).

Selected external measurements (in mm) of *T. carrikeri* from Venezuela are (Allen, 1910; Goodwin, 1942, 1953): total length, 80–99; length of tail, 9–14; wing span, 332–356; length of forearm, 46.0–47.5; length of metacarpal III, 39.0–39.5; length of metacarpal IV, 40.5–41.0; length of metacarpal V, 42.8–47.0; length of first phalanx III, 16.0–16.3; length of second phalanx III, 19.0–19.2; length of first phalanx IV, 15.0–15.3; length of second phalanx IV, 14.6; length of first phalanx V, 16.2–16.4; length of second phalanx V, 12.4–12.7; length of tibia, 23.0; length of hind foot, 14.5–15.0; length of ear from notch, 24.0–25.9; length of tragus (dry), 7.5; and height of nose leaf (dry), 5.0. External length measurements (mm, fresh) for an adult female from Brazil are (Gribel and Taddei, 1989): length of metacarpal III, 41.4; length of metacarpal IV, 41.7; length of metacarpal V, 44.0; length of first phalanx III, 15.3; length of second phalanx III, 19.1; length of first phalanx IV, 15.9; length of first phalanx V, 15.4; length of tibia, 21.7; length of hind foot, 13.2; length of calcar, 16.0; length of ear, 27.1; length of tragus, 10.0. Additional measurements of length of forearm are from Perú (46.4, 47.6; Gardner, 1976), Colombia (43.0–50.0; 1983), Venezuela (44.7, 47.1; Gardner, 1988; Ochoa et al., 1988*a*), Suriname (45.8, 46.3; Genoways et al., 1981; Williams and Genoways, 1980), and Brazil (46.0; Gribel and Taddei, 1989). Wing structure in *Tonatia* has the lowest aspect ratio for a relatively short wing among the phyllostomines (Smith and Starrett, 1979). Mass (in g) for two non-reproductive females from Perú (Gardner, 1976) and one from Suriname (Williams and Genoways, 1980) are 17.0, 20.0, and 18.0, respectively. A lactating female from Brazil weighed 21.5 g (Gribel and Taddei, 1989). An adult male from southern Venezuela weighed 23.0 g (Gardner, 1988).

Males were significantly larger than females ($P < 0.05$) in 9 of 12 cranial measurements (McCarthy et al., 1983). Ranges of cranial measurements (in mm) for males and females are: greatest length of skull, 23.7–28.5, 22.6–26.0; zygomatic breadth, 10.8–12.2, 10.3–11.6; mastoidal breadth, 11.4–12.8, 10.8–12.3; postorbital constriction, 3.6–4.2, 3.3–4.0; braincase breadth, 9.3–10.4, 9.2–10.0; depth of braincase, 9.3–11.8, 8.5–11.1; canine breadth, 4.0–4.8, 4.0–4.5; postpalatal length, 7.1–8.6, 7.4–8.2; breadth across upper molars, 7.1–8.0, 6.8–8.1; length of maxillary toothrow, 7.8–8.3, 7.1–8.3; mandibular length, 14.5–15.6, 14.0–15.3 (Al-

FIG. 1. Allen's round-eared bat, *Tonatia carrikeri* from Venezuela. Photograph by M. D. Tuttle.

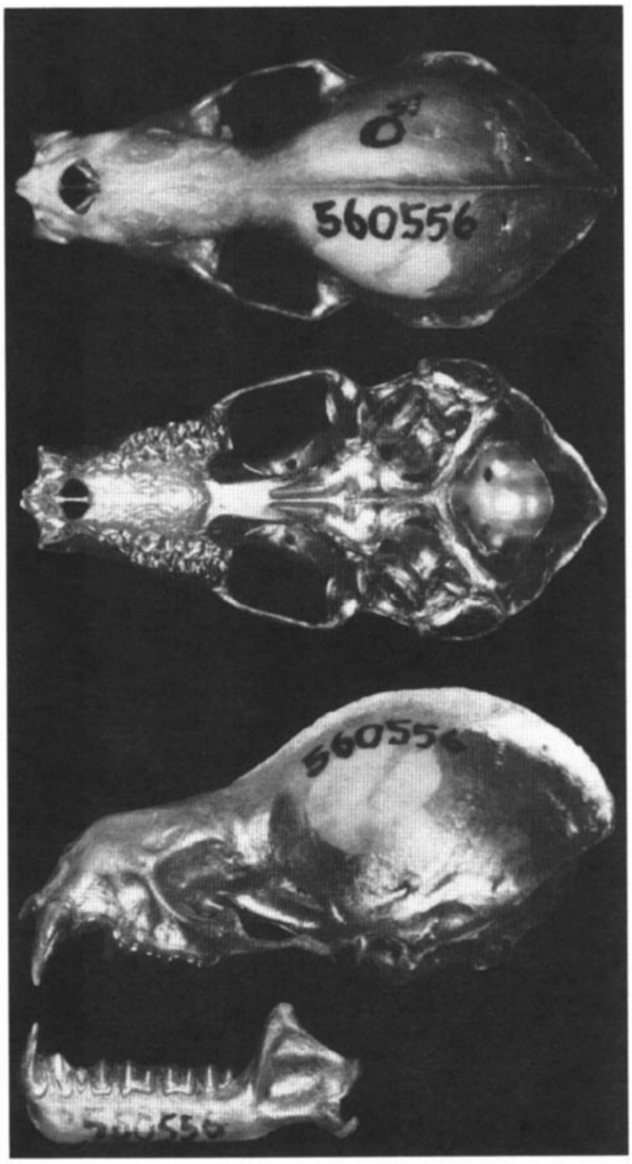

FIG. 2. Dorsal, ventral, and lateral views of skull, and lateral view of mandible of *Tonatia carrikeri* from Parque Nacional Serranía de la Neblina, Territorio Federal Amazonas, Venezuela (male, United States National Museum, 560556). Greatest length of skull is 25.6 mm.

len, 1910; Gardner, 1976, 1988; Genoways and Williams, 1980, 1984; Gribel and Taddei, 1989; McCarthy and Handley, 1987; Ochoa et al., 1988*a*; Vizotto et al., 1980).

The skull (Fig. 2) is constricted postorbitally; palate is short, with posterior margin aligned with the second molars (Fig. 3). The skull profile is evenly elevated above the nasals and only slightly concave or flattened in the orbital region. The second lower premolars are relatively large and aligned in the toothrow (Fig. 3; Goodwin, 1942). The sagittal crest has been reported as not developed (Goodwin, 1942); however, the sagittal crest in the male holotype was described as highly developed, but noted as less developed in young males and females (Allen, 1910). The cranium of *T. carrikeri* falls in the middle of the size range of species of *Tonatia* from Suriname (see comparison of dorsal view of skulls in Genoways and Williams, 1980:205). The dental formula is i 2/1, c 1/1, pm 2/3, m 3/3, total 32.

DISTRIBUTION. Localities (Fig. 4) for *T. carrikeri* in South America define a lowland forest distribution in the Amazon River basin, the Orinoco-Negro drainages of Colombia and Venezuela, and the Atlantic lowlands of Suriname (Gribel and Taddei, 1989; McCarthy and Handley, 1987). A specimen from the state of Piauí, Brazil (Vizotto et al., 1980), represents the only record outside of the Guyana Highlands and Amazon basin.

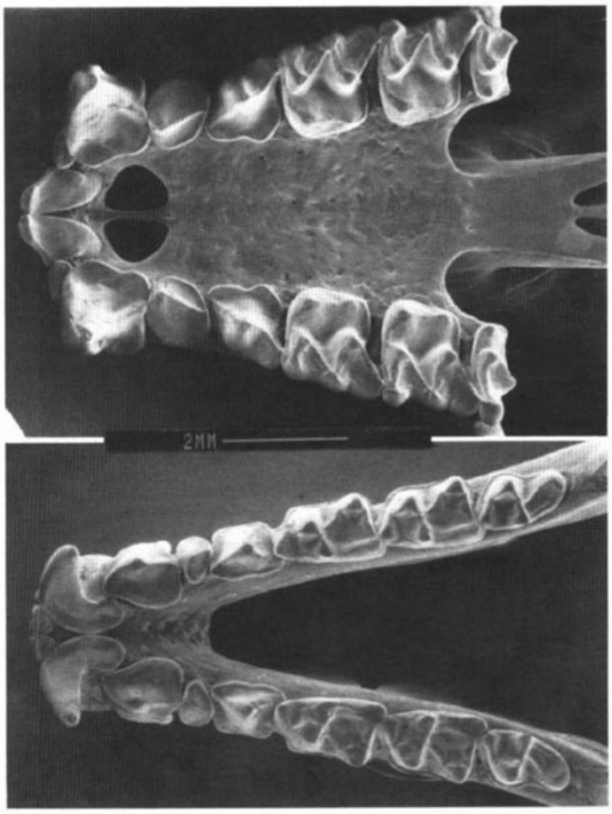

FIG. 3. Maxillary and mandibular toothrows of the *Tonatia carrikeri* illustrated in Fig. 2.

This monotypic species is known from northern Bolivia (Koopman, 1976), eastern Perú (Gardner, 1976), Colombia (McCarthy et al., 1983), southern Venezuela (Allen, 1910; Gardner, 1988; Handley, 1976; Ochoa et al., 1988*a*, 1988*b*), Suriname (Genoways and Williams, 1984; Genoways et al., 1981; Williams and Genoways, 1980), and northern Brazil (Gribel and Taddei, 1989; McCarthy and Handley, 1987; Vizotto et al., 1980). *T. carrikeri* reported from Suriname (Chabaud and Bain, 1974) and Guyana (Swanepoel and Genoways, 1979) were based on specimens of *T. schulzi* (see McCarthy and Handley, 1987). An old specimen from an unknown locality in Suriname (Husson, 1962) may actually be a *T. schulzi* (see Remarks). Fossil records remain unknown.

ECOLOGY. Allen's round-eared bat occupies forested habitats from near sea level at the mouth of the Amazon River to over 300 m at Balta, in eastern Perú, and to over 400 m at San Juan de Arama in the Colombian llanos (McCarthy and Handley, 1987; McCarthy et al., 1983). This bat appears to be associated with riparian and mesic forest habitat (McCarthy and Handley, 1987). Specimens from Colombia apparently were captured in gallery forests bordering savannah (McCarthy et al., 1983). Two of the Suriname localities were in high, undisturbed forest, while the third was a rubber plantation in secondary forest (Genoways and Williams, 1984; Genoways et al., 1981; Williams and Genoways, 1980). Allen's round-eared bats were captured in freshwater-swamp forest (Igapó) and low tidal-swamp forest (Varzea) in the Amazon River delta (McCarthy and Handley, 1987), as well as undisturbed semideciduous tropical forest with a canopy height of 25–30 m (Gribel and Taddei, 1989).

Tonatia carrikeri uses and may prefer hollowed termite nests as roosts. Seven specimens (two males, five females) were shot while roosting in "an old hollowed-out termite nest hanging from a vine in the forest at a height of about 15 ft. from the ground" at the type locality in Venezuela (Allen, 1911:267–268). A second series of 12 specimens (six males, six females) from Colombia were shot from a similar arboreal diurnal roost in a termite dome (McCarthy et al., 1983). Nine *T. silvicola* and two *Phyllostomus hastatus*

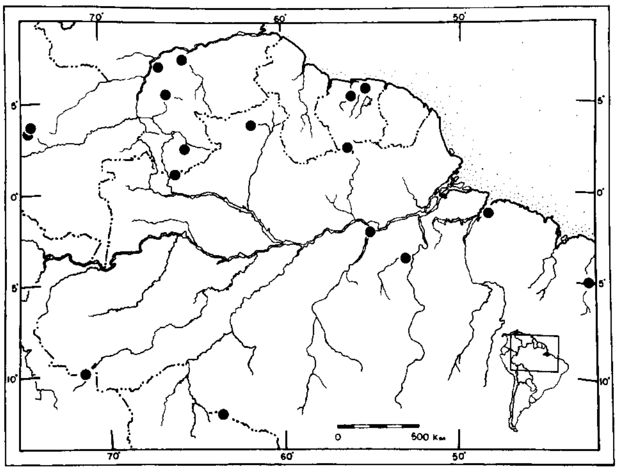

FIG. 4. Distribution of *Tonatia carrikeri* in northern South America. Solid circles represent known locality records.

shared this enclosure with the group of *T. carrikeri*. Roost sites have been erroneously listed as hollow trees and logs (Tuttle, 1976).

None of the six females from Colombia was lactating or showed macroscopic evidence of pregnancy during mid-April. Testis length for four males associated with the females averaged 9.65 mm (*SD* ± 1.7 mm). Testis length (4.2 mm) of another male not associated with the termite dome colony suggests that it was not breeding. A non-pregnant female was collected near San Martín, Meta, Colombia, on 4 November (McCarthy et al., 1983). In southern Venezuela, testis width and length for one male measured 4.0 by 6.0 mm in early April (Gardner, 1988). In Suriname, a lactating female was found on 18 May; another was neither lactating nor visibly pregnant on 28 August (Genoways et al., 1981; Williams and Genoways, 1980). Testis length for a male taken on 16 November in southern Suriname was 7.0 mm (Genoways and Williams, 1984). A female from the vicinity of Belém, Brazil, was not pregnant on 6 March; however, females at the Ilha de Maracá and from the Río Iriri were lactating on 11 and 18 October (Gribel and Taddei, 1989; McCarthy and Handley, 1987). Two females from Perú showed no signs of reproductive activity on 21 and 23 July (Gardner, 1976). Lactating females in May and October suggest a bimodal pattern of reproduction.

When distressed, a female curled its ears backward as observed in other species of *Tonatia* (Handley, pers. observ.). Other behavioral traits are unknown.

Tonatia carrikeri probably consumes a large variety of arthropods, both flying insects and those gleaned from vegetation and other substrates (Gardner, 1977*a*). Unidentified insect remains are reported from the stomach of a female (Ochoa et al., 1988*a*). No other information on diet is available.

Pseudostrebla sparsisetis (Streblidae) was described as a new species of batfly from a *T. carrikeri* from Colombia. *Strebla tonatiae* was also identified from this bat, but *T. carrikeri* was probably not the true host (Wenzel, 1976). Other streblids reported from this bat include *Tricobius* sp., *Mastoptera* sp. (*minuta* complex), and *Stizostrebla longirostris*. The spinturnicid wing mite, *Periglischrus tonatii*, was described from several hosts including *T. carrikeri* (Herrin and Tipton, 1975). A *T. schulzi* was misidentified as *T. carrikeri* as the host for the muspiceid nematode, *Lukonema lukoshusi* (Chabaud and Bain, 1974).

GENETICS. The karyotype (Fig. 5) of *T. carrikeri* has a diploid number (2n) of 26 and a fundamental number (FN) of 46 (Baker et al., 1981; Gardner, 1977*b*) based on specimens from Perú and Suriname. The autosomes consist of one pair of uniarmed and 11 pairs of biarmed chromosomes (Fig. 5; Gardner, 1977*b*; photomicrograph in Baker et al., 1981). The sex chromosomes are unknown because only females have been karyotyped.

Allozyme patterns found during an electrophoretic study of seven species demonstrated a closer relationship of *T. carrikeri* with *T. silvicola*. Because the karyotype of *T. carrikeri* was considered to be derived and that of *T. silvicola* primitive, the resulting allozyme-based phylogeny required that changes in the karyotype of *T. carrikeri* occur after divergence from the other *Tonatia* (Arnold et al., 1983). Immunological distance values for all *Tonatia* albumins, except *T. evotis*, were compared using antisera of *Phyllostomus hastatus*, *Tonatia silvicola*, and an outgroup (Honeycutt and Sarich, 1987). The resulting data support a close relationship between *T. carrikeri* and *T. schulzi*, but assessment of a direct relationship between these species was not possible because antisera to their respective albumins was not available.

FIG. 5. Karyotype of a female *Tonatia carrikeri* from Balta, Río Curanja, Ucayali, Perú.

REMARKS. The illustrations in Husson (1962) may have been based on *T. schulzi*. The published measurements of this specimen are smaller than expected for *T. carrikeri*. This account for *T. carrikeri* was based on a specimen in the Zoologisches Museum der Humboldt-Universitat, Berlin, collected by A. Kappler from an unknown locality in Suriname. We have not examined this specimen and are unable to confirm his identification. We know that the specimen from Suriname, misidentified as *T. carrikeri* by Chabaud and Bain (1974), is a *T. schulzi*.

The name *T. carrikeri* honors Melbourne A. Carriker, Jr., who collected the original specimens. Linares P. (1986) claimed that the type locality was erroneously identified as Río Mocho and should be known as Río Hacha, which is in eastern Bolívar, Venezuela. Nevertheless, as pointed out by McCarthy (1989), Río or Caño Mocho is located in the Río Caura drainage and is the correct type locality as stated by Allen (1910).

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