

Artibeus toltecus. By Wm. David Webster and J. Knox Jones, Jr.

Published 18 June 1982 by The American Society of Mammalogists

Artibeus toltecus (Saussure, 1860)

Toltec Fruit-eating Bat

Stenoderma tolteca Saussure, 1860:427. Type locality restricted to Mirador, Veracruz, by Hershkovitz (1949:449).

Artibeus toltecus Andersen, 1908:296, first use of current name combination.

Dermanura rava Miller, 1902:404. Type locality San Javier (Cachabí, Prov. Esmeraldas), Ecuador.

CONTEXT AND CONTENT. Order Chiroptera, Family Phyllostomidae, Subfamily Stenodermatinae, Tribe Stenodermatini. The genus *Artibeus* contains approximately 13 extant species. Three subspecies of *A. toltecus* currently are recognized (Davis, 1969):

A. t. hesperus Davis, 1969:15. Type locality Agua del Obispo, 3,300 ft, Guerrero.

A. t. ravus (Miller, 1902:404), see above.

A. t. toltecus (Saussure, 1860:427), see above.

DIAGNOSIS. *Artibeus toltecus* differs from the larger, related, and partially sympatric *A. aztecus* primarily in size and altitudinal distribution. According to Davis (1969), the greatest length of skull in *toltecus* rarely exceeds 21.0 mm, the length of the maxillary toothrow seldom reaches 7.0, the length of the forearm usually does not exceed 42.0, and the weight usually is 16 g or less. The same measurements in *aztecus* are, respectively, greater than 21.0, rarely less than 7.0, seldom less than 42.0, and usually 18 g or more. In addition, *toltecus* occurs in the "mid-altitude woodlands" whereas *aztecus* occupies "highlands," although both have been taken sympatrically at several Mexican and Central American localities (Davis, 1969). See also account of *A. aztecus* (Webster and Jones, 1982).

GENERAL CHARACTERS. The Toltec fruit-eating bat exhibits a north-to-south darkening in pelage coloration in Mexico and Central America, from wood brown in Tamaulipas and Sinaloa to intense blackish in Costa Rica, but becomes paler again in northern South America; in Middle America paler individuals are associated with xeric conditions and darker individuals with humid conditions (Davis, 1969).

The skull and dentition of *A. toltecus* (Fig. 1) were described by Miller (1907). The dental formula is $i\ 2/2, c\ 1/1, p\ 2/2, m\ 2/2$, total 28; however, Andersen (1908) examined one young *A. t. ravus* in which a third lower molar was present on the right side.

Artibeus toltecus toltecus differs from *A. t. hesperus* and *A. t. ravus* in being larger and somewhat darker in coloration, whereas *A. t. ravus* is distinguishable from Middle American populations in possessing more pronounced supraorbital stripes and whitish ear edgings (Andersen, 1908). Selected average external and cranial measurements (Davis, 1969) of nine *A. t. toltecus* from Tamaulipas and San Luis Potosí, followed by those of 14 specimens from Guatemala, are (mm, extremes in parentheses): length of forearm, 40.19 (38.5 to 42.3), 39.74 (37.6 to 41.5); greatest length of skull, 20.67 (19.9 to 21.2), 20.59 (20.0 to 21.2); zygomatic breadth, 12.22 (11.7 to 12.5), 12.15 (11.5 to 13.0); length of maxillary toothrow, 6.75 (6.6 to 6.9), 6.72 (6.4 to 7.0). The same measurements of 14 *A. t. hesperus* from Sinaloa and Nayarit, followed by those of 18 individuals from Guatemala, are (Davis, 1969): 39.26 (36.5 to 42.5), 38.89 (37.0 to 41.2); 19.92 (19.4 to 20.5), 19.90 (19.0 to 21.0); 11.86 (11.5 to 12.4), 11.73 (11.1 to 12.2); 6.42 (6.1 to 6.7), 6.52 (6.1 to 6.9).

DISTRIBUTION. *Artibeus toltecus* (Fig. 2) is known from western (Sinaloa and Durango) and eastern (Nuevo León and Tamaulipas) México southeastward through Central America and into northwestern South America as far as northern Ecuador (Jiménez-G., 1971; Jones and Carter, 1976). The nominate subspecies occurs along the Caribbean versant between 300 and 1,750 m in elevation; *A. t. hesperus* occurs below 2,130 m along the

Pacific versant as far south as Isla de Ometepe, Nicaragua (Jones et al., 1971); and *A. t. ravus* occurs at low elevations in western Colombia and northwestern Ecuador (Aellen, 1970; Miller, 1902). No fossils are known.

FORM. The dactylopatagium minus, the membrane between digits two and three, is similar to that of other frugivorous phyllostomids (*Sturnira*, *Chiroderma*, and *Centurio*) in being broad, slightly pigmented, and permanently open—features common in bats adapted to slow flight according to Vaughan (1970). Furthermore, such bats frequently roost in trees and may use the dactylopatagium minus to partially shield the eyes.

Brain morphology of *A. toltecus* is intermediate between that of *A. aztecus* and the morphology of *A. phaeotis* (McDaniel, 1976). The cerebral hemispheres are deep, the ventral pseudotemporal lobes project posterodistally, the dorsal surface of the inferior colliculi is predominantly obscured by the cerebral hemispheres, the cerebellum has a medial crest, and the vermiform body has small secondary foliations on the lateral borders. The pseudo-central sulci and the sulci anterior to them are shallow.

The spermatozoa of the Toltec fruit-eating bat, figured and described by Forman and Genoways (1979), are similar to those of *Ardops*, *Ariteus*, and other congeners, particularly *A. lituratus*. The head is longer than in other stenodermatines and narrow; the nucleus is ovoid with a narrow apex and base; the symmetrical acrosome is pointed at its apex and extends posteriorly to midway along the nucleus; the neck is short and connects to the head away from center; and the midpiece is short, narrow, and tapers posteriorly.

Forman et al. (1979) found the digestive systems of seven species of *Artibeus* (including *toltecus*) and *Centurio* to be similar.



FIGURE 1. Dorsal, ventral, and lateral views of skull and lateral view of lower jaw of *Artibeus toltecus toltecus* (δ , TTU 12927) from Cariblanco, Costa Rica. Greatest length of skull is 20.2 mm.

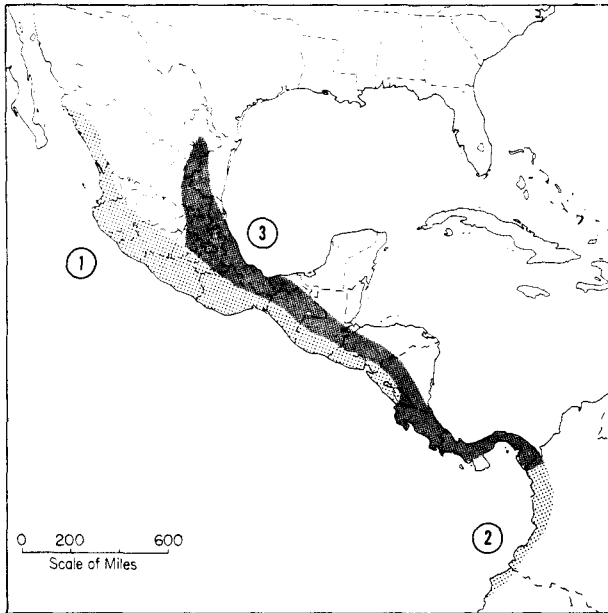


FIGURE 2. Distribution of *Artibeus toltecus* in Middle and South America. Subspecies are: 1, *A. t. hesperus*; 2, *A. t. ravus*; 3, *A. t. toltecus*.

All have greatly enlarged cardiac vestibules, a narrow zone of transition between the fundic and pyloric mucosa composed of highly convoluted gastric rugae, a symmetrical pyloric sphincter, and long intestines (relative to body length). These characters are related to the obligate frugivorous diet.

See de la Torre (1955) for remarks concerning two individuals from Jalisco with cranial and dental anomalies.

REPRODUCTION. Pregnant females have been captured in each month from January to August and in October; lactating females are known from January, May, and June through September (Wilson, 1979). Volant young have been taken in August and September (Watkins et al., 1972).

ECOLOGY. The Toltec fruit-eating bat has been collected from caves and buildings (Jones, 1966), and under banana leaves (Davis, 1944). This bat also has been captured in mist nets in subtropical and tropical evergreen forests, particularly over water or in the vicinity of fruit groves, including the "semi-arid parts of the interior of Mexico . . ." (Lukens and Davis, 1957). Fruits are the major dietary item, especially figs and *Cecropia* (Gardner, 1977).

Reports of other bat species being taken at the same locality with *Artibeus toltecus* are numerous (see, for example, Alvarez and Ramirez-Pulido, 1972; Baker and Lopez, 1968; de la Torre, 1955; Gardner et al., 1970; Genoways and Jones, 1968; Jones, 1964, 1966; Jones et al., 1962; LaVal, 1972; Matson and Patten, 1975; Schaldach, 1965). Species cited include *Pteronotus davyi*, *P. parnellii*, *Micronycteris megalotis*, *Glossophaga soricina*, *Anoura cultrata*, *A. geoffroyi*, *Leptonycteris sanborni*, *Hylonycteris underwoodi*, *Choeronycteris mexicana*, *Carollia perspicillata*, *C. subrufa*, *Sturnira lilium*, *S. ludovici*, *S. mordax*, *Vampyrops vittatus*, *V. helleri*, *Chiroderma salvini*, *Artibeus aztecus*, *A. jamaicensis*, *A. lituratus*, *A. hirsutus*, *Enchisthenes hartii*, *Desmodus rotundus*, *Natalus stramineus*, *Myotis nigricans*, *Eptesicus fuscus*, *E. furinalis*, *Lasiurus borealis*, *L. ega*, *Tadarida brasiliensis*, and *Molossus ater*.

Davis (1969) opined that, along the Caribbean versant from Veracruz southeastward throughout Central America, competition between *A. toltecus* and *A. watsoni* has resulted in the former occurring at mid-elevations whereas the latter, along with *A. phaeotis*, occupies lowlands. Davis further noted that both *toltecus* and *phaeotis* are known from the lowlands along the Pacific versant where *watsoni* evidently does not occur.

Ectoparasites reported from the Toltec fruit-eating bat (Webb and Loomis, 1977) include macronyssid mites (*Macronyssoides kochi* and *Parichoronyssus* sp.), spinturicid mites (*Periglischrus iheringi* and *P. ojasti*), trombiculid mites (*Lepto-*

trombidium hamaxiaium, *Loomisia desmodus*, and *Microtrombicula boneti*), sarcoptid mites (*Chirnyssoides caparti*), and streblid batflies (*Paratrichobius* sp.). Endoparasites include the roundworm, *Cheiropteronema globocephala* (Ubelaker et al., 1977).

GENETICS. The Toltec fruit-eating bat has a diploid number of 30 (females) or 31 (males) and 56 autosomal arms. The X chromosome is subtelocentric and the two Y chromosomes are acrocentric (Baker, 1967). The autosomes consist of 10 pairs of metacentrics and submetacentrics and four pairs of subtelocentric chromosomes (Hsu et al., 1968).

REMARKS. Dalquest (1953a, 1953b) considered specimens from El Salto, San Luis Potosí, to be intergrades between *A. toltecus* and *A. aztecus*, but Davis (1958) later assigned these individuals to the former species.

LITERATURE CITED

- Aellen, V. 1970. Catalogue raisonné des chiroptères de la Colombie. Rev. Suisse Zool., 77:1-37.
- Alvarez, T., and J. Ramirez-Pulido. 1972. Notas acerca de murciélagos Mexicanos. An. Esc. Nac. Cienc. Biol., México, 19:167-178.
- Andersen, K. 1908. A monograph of the chiropteran genera *Uroderma*, *Enchisthenes*, and *Artibeus*. Proc. Zool. Soc. London, pp. 204-319.
- Baker, R. J. 1967. Karyotypes of bats of the family Phyllostomidae and their taxonomic implications. Southwestern Nat., 12:407-428.
- Baker, R. J., and G. Lopez. 1968. Notes on some bats of Tamaulipas. Southwestern Nat., 13:361-362.
- Dalquest, W. W. 1953a. Mexican bats of the genus *Artibeus*. Proc. Biol. Soc. Washington, 66:61-65.
- 1953b. Mammals of the Mexican state of San Luis Potosí. Louisiana State Univ. Studies, Biol. Ser., 1:1-229.
- Davis, W. B. 1944. Notes on Mexican mammals. J. Mamm., 25:370-403.
- 1958. Review of the Mexican bats of the *Artibeus* "cinereus" complex. Proc. Biol. Soc. Washington, 71:163-166.
- 1969. A review of the small fruit bats (genus *Artibeus*) of Middle America. Part I. Southwestern Nat., 14:15-29.
- de la Torre, L. 1955. Bats from Guerrero, Jalisco and Oaxaca, Mexico. Fieldiana Zool., 37:695-701.
- Forman, G. L., and H. H. Genoways. 1979. Sperm morphology. Pp. 177-204, in Biology of bats of the New World family Phyllostomatidae. Part III (R. J. Baker, J. K. Jones, Jr., and D. C. Carter, eds.). Spec. Publ. Mus., Texas Tech Univ., 16:1-441.
- Forman, G. L., C. J. Phillips, and C. S. Rouk. 1979. Alimentary tract. Pp. 205-227, in Biology of the New World family Phyllostomatidae. Part III (R. J. Baker, J. K. Jones, Jr., and D. C. Carter, eds.). Spec. Publ. Mus., Texas Tech Univ., 16:1-441.
- Gardner, A. L. 1977. Feeding habits. Pp. 293-350, in Biology of bats of the New World family Phyllostomatidae. Part II (R. J. Baker, J. K. Jones, Jr., and D. C. Carter, eds.). Spec. Publ. Mus., Texas Tech Univ., 13:1-364.
- Gardner, A. L., R. K. LaVal, and D. E. Wilson. 1970. The distributional status of some Costa Rican bats. J. Mamm., 51:712-729.
- Genoways, H. H., and J. K. Jones, Jr. 1968. Notes on bats from the Mexican state of Zacatecas. J. Mamm., 49:743-745.
- Hershkovitz, P. 1949. Mammals of northern Colombia, preliminary report no. 5: Bats (Chiroptera). Proc. U.S. Natl. Mus., 99:429-454.
- Hsu, T. C., R. J. Baker, and T. Utakoji. 1968. The multiple sex chromosome system of American leaf-nosed bats (Chiroptera, Phyllostomidae). Cytogenetics, 7:27-38.
- Jiménez-G., A. 1971. Nuevas registros de murciélagos para Nuevo León, México. Anal. Inst. Biol., Univ. Nac. Autó. México, 39:133-144.
- Jones, J. K., Jr. 1964. Bats from western and southern Mexico. Trans. Kansas Acad. Sci., 67:509-516.
- 1966. Bats from Guatemala. Univ. Kansas Publ., Mus. Nat. Hist., 16:439-472.
- Jones, J. K., Jr., and D. C. Carter. 1976. Annotated checklist, with keys to subfamilies and genera. Pp. 7-38, in Biology of bats of the New World family Phyllostomatidae. Part I (R. J. Baker, J. K. Jones, Jr., and D. C. Carter, eds.). Spec. Publ. Mus., Texas Tech Univ., 10:1-218.

- Jones, J. K., Jr., T. Alvarez, and M. R. Lee. 1962. Noteworthy mammals from Sinaloa, Mexico. *Univ. Kansas Publ., Mus. Nat. Hist.*, 14:145-159.
- Jones, J. K., Jr., J. D. Smith, and R. W. Turner. 1971. Noteworthy records of bats from Nicaragua, with a checklist of the chiropteran fauna of the country. *Occas. Papers Mus. Nat. Hist., Univ. Kansas*, 2:1-35.
- LaVal, R. K. 1972. Distributional records and band recoveries of bats from Puebla, Mexico. *Southwestern Nat.*, 16:449-451.
- Lukens, P. W., and W. B. Davis. 1957. Bats of the Mexican state of Guerrero. *J. Mamm.*, 38:1-14.
- Matson, J. O., and D. R. Patten. 1975. Notes on some bats from the state of Zacatecas, Mexico. *Los Angeles Co. Mus., Contrib. Sci.*, 263:1-12.
- McDaniel, V. R. 1976. Brain anatomy. Pp. 147-200, *in* Biology of bats of the New World family Phyllostomatidae. Part I (R. J. Baker, J. K. Jones, Jr., and D. C. Carter, eds.). *Spec. Publ. Mus., Texas Tech Univ.*, 10:1-218.
- Miller, G. S., Jr. 1902. Twenty new American bats. *Proc. Acad. Nat. Sci. Philadelphia*, pp. 389-412.
- 1907. The families and genera of bats. *Bull. U.S. Natl. Mus.*, 57:xvii + 1-282.
- Saussure, H. 1860. Note sur quelques mammifères du Mexique. *Rev. et Mag. Zool., Ser. 2*, 12:428-431.
- Schaldach, W. J., Jr. 1965. Notas breves sobre algunos mamíferos del sur de México. *Anal. Inst. Biol., Univ. Nac. Autó. México*, 35:129-137.
- Ubelaker, J. E., R. D. Specian, and D. W. Duszynski. 1977. Endoparasites. Pp. 7-56, *in* Biology of bats of the New World family Phyllostomatidae. Part II (R. J. Baker, J. K. Jones, Jr., and D. C. Carter, eds.). *Spec. Publ. Mus., Texas Tech Univ.*, 13:1-364.
- Vaughan, T. A. 1970. The transparent dactylopatagium minus in phyllostomatid bats. *J. Mamm.*, 51:142-145.
- Watkins, L. C., J. K. Jones, Jr., and H. H. Genoways. 1972. Bats of Jalisco, México. *Spec. Publ. Mus., Texas Tech Univ.*, 1:1-44.
- Webb, J. P., Jr., and R. B. Loomis. 1977. Ectoparasites. Pp. 57-119, *in* Biology of bats of the New World family Phyllostomatidae. Part II (R. J. Baker, J. K. Jones, Jr., and D. C. Carter, eds.). *Spec. Publ. Mus., Texas Tech Univ.*, 13:1-364.
- Webster, W. D., and J. K. Jones, Jr. 1982. *Artibeus aztecus*. *Mammalian Species*, 177:1-3.
- Wilson, D. E. 1979. Reproductive patterns. Pp. 317-378, *in* Biology of bats of the New World family Phyllostomatidae. Part III (R. J. Baker, J. K. Jones, Jr., and D. C. Carter, eds.). *Spec. Publ. Mus., Texas Tech Univ.*, 16:1-441.

Editors of this account were DANIEL F. WILLIAMS and SYDNEY ANDERSON. Managing Editor was TIMOTHY E. LAWLOR.

W. D. WEBSTER and J. K. JONES, JR., THE MUSEUM AND DEPARTMENT OF BIOLOGICAL SCIENCES, TEXAS TECH UNIVERSITY, LUBBOCK 79409.