

Diphylla ecaudata. By Arthur M. Greenhall, Uwe Schmidt, and Gerhard Joermann

Published 14 November 1984 by The American Society of Mammalogists

***Diphylla* Spix, 1823**

Diphylla Spix, 1823:68. Type species *Diphylla ecaudata* Spix (1823).

Haematomycteris H. Allen, 1896:777 (name based on a probably abnormal specimen of *Diphylla ecaudata*; Miller, 1907).

CONTEXT AND CONTENT. Order Chiroptera, Family Phyllostomidae, Subfamily Desmodontinae. The genus *Diphylla* includes a single species, *D. ecaudata*.

***Diphylla ecaudata* Spix, 1823**

Hairy-legged Vampire Bat

Diphylla ecaudata Spix, 1823:68. Type locality restricted to Río San Francisco, Bahía, Brazil by Cabrera (1958:94).

Diphylla centralis Thomas, 1903:378. Type locality Boquete, Chiriquí, Panamá.

CONTEXT AND CONTENT. Context as noted above. Two subspecies are recognized (Jones and Carter, 1976; Ojasti and Linares, 1971):

D. e. centralis Thomas, 1903:378, see above.

D. e. ecaudata Spix, 1823:68, see above.

The subspecies are indistinguishable according to Burt and Stirton (1961) and Hall (1981).

DIAGNOSIS. *Diphylla* resembles *Desmodus* externally but is recognizable by its short, broad ears, short thumb without pad, minute calcar, and large, shiny eyes. The uropatagium is extremely narrow and well furred; no tail is present. The most striking characters are the form of the mandible, the dental formula, and the structure of the lower incisors. Compared with that of *Desmodus*, the posterior segment of the mandible is weak and has a low coronoid process. The dental formula is $i\ 2/2, c\ 1/1, p\ 1/2, m\ 2/2$, total 26. First upper incisors knife-like, pointed, with sharp edges, but smaller than in *Desmodus*; second upper incisors minute, barely piercing gum. Lower incisors larger than in *Desmodus*, forming a continuous convex row, separated from canines by distinct spaces; first lower incisors four-lobed, second lower incisors seven-lobed, forming comblike structures (Miller, 1907; Schmidt, 1978; Villa-R., 1967).

GENERAL CHARACTERS. Dorsal pelage dark brown, ventral pelage somewhat paler; fur long and soft; interfemoral membrane, arms, and legs closely furred. Nose-leaf reduced to a mere rounded bulge (Figs. 1 and 2); lower lip cleft. Measurements in mm are: length of head and body, 75 to 93; length of forearm, 50 to 56; greatest length of skull, 21 to 24; males and females are similar in size (Bhatnagar, 1978; Reddell, 1968; Ruschi, 1951; Villa-R., 1967); body mass ranges from 24 g (Nowak and Paradiso, 1983) to 43 g (Ruschi, 1951). The skull (Fig. 3) is characterized by a high, broad interorbital region and nearly parallel-sided interpterygoid space (Miller, 1907).

DISTRIBUTION. *Diphylla ecaudata* occurs (Fig. 4) from southern Texas southward through eastern Mexico and most of Central America to South America at least as far as Peru and southern Brazil (Jones and Carter, 1976; McNab, 1969; Sanborn, 1949). The elevational range is from sea level to at least 1,200 m in Mexico (Dalquest and Hall, 1947) and 1,400 m in Guatemala and Venezuela (Jones, 1966; Ojasti and Linares, 1971). *D. e. ecaudata* occurs from South America to eastern Panama and *D. e. centralis* occurs from western Panama to Texas.

In May 1967, a female *Diphylla* was found in an abandoned railroad tunnel 19 km W of Comstock, Val Verde Co., Texas. This



FIGURE 1. Head of *Diphylla ecaudata* (photo by U. Schmidt).

is the only recent record of a vampire bat from the United States and represents an extension of the known range of about 700 km northward (Reddell, 1968). There is no fossil record of *Diphylla*.

FORM. The pelage of *Diphylla* is longer and finer than in the other two desmodontine species. Individual hairs lack a prominent basal bulb; melanin granules are dispersed through the filament. No differentiation of over- and underhair is found (Benedict, 1957). Allen (1896) compared the skeletal system of *Diphylla* with that of *Desmodus*. The superficial part of the M. temporalis is very



FIGURE 2. Profile of *Diphylla ecaudata* (photo by R. Lord).

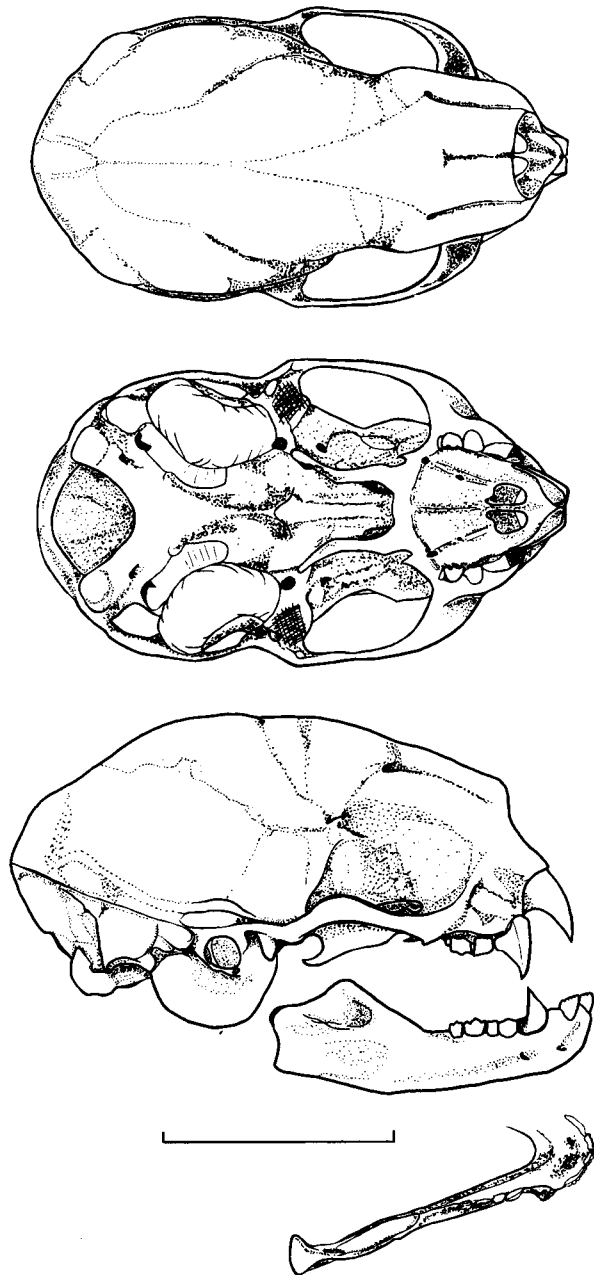


FIGURE 3. Dorsal view, ventral view, and lateral view of cranium, and lateral and occlusal views of lower jaw of *Diphylla ecaudata*. Scale represents 10 mm.

small, the *M. masseter* has simple tip-like structured tendons, and the articulation of the mandible is elevated above the plane of mastication (Storch, 1968).

The gastrointestinal system is similar to that of *Desmodus* (Schultz, 1965). The stomach differs in having a small, rounded pyloric part separated from the duodenum and cardiac caecum by valve-like folds. The caecum is only half as long (3 cm) as in *Desmodus*; the distal part shows irregular bulges.

The degree of encephalization is less than in *Desmodus* (Stephan, 1977); the brain attains a mass only two-thirds of that of the common vampire bat and it has shorter hemispheres. Spermatozoa of *Diphylla* are similar to those of other phyllostomids, differing only in a more lateral attachment of the midpiece to the head (Forman et al., 1968).

FUNCTION. The thermoregulatory ability of *D. ecaudata* was studied by McNab (1969, 1973). The basal rate of metabolism is $1.4 \text{ ml O}_2 \text{ g}^{-1} \text{ h}^{-1}$ in postabsorptive state. After feeding, oxygen

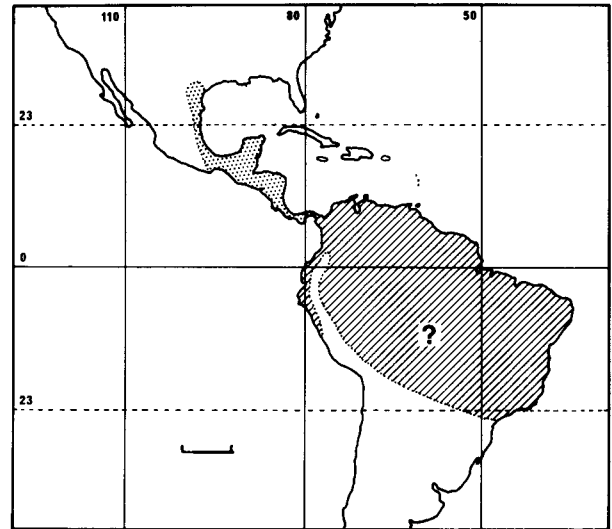


FIGURE 4. Distribution of *D. e. centralis* (stippled), and *D. e. ecaudata* (hatched). Scale represents 1,000 km.

consumption at thermoneutral temperature is increased by about 50%. Along with this, the mean body temperature (32.4°C) is increased by 2°C (McNab, 1969, 1973).

REPRODUCTION. Dalquest (1955) considered *Diphylla* to have a well-defined breeding season in eastern Mexico, but the scattered information in the literature indicates rather an aseasonal polyestry (Bhatnagar, 1978; Hoyt and Altenbach, 1981; Wilson, 1979). Usually one young is born; breech presentation was reported (Bhatnagar, 1978). The eyes are open at birth, and deciduous teeth are present (Birney and Timm, 1975); the deciduous dentition formula is $i \ 2/2, c \ 1/1, p \ 2/2$, total 20.

ECOLOGY. The hairy-legged vampire bat is restricted to tropical and subtropical regions. It is found almost exclusively in caves and mines, rarely in hollow trees (Dalquest and Hall, 1947; Felten, 1956; Hall and Dalquest, 1963; Ruschi, 1951; Villa-R., 1967). *Diphylla* is solitary and does not congregate in large groups even when there are many individuals in a cave. When disturbed, individuals fly to other perches in the roost but do not crawl into narrow crevices as *Desmodus* does (Dalquest, 1955). The same roosts often are inhabited by *Desmodus* and a variety of other leaf-nosed bats (Felten, 1956).

Bat flies of the genera *Strebla* and *Trichobius* were reported by Webb and Loomis (1977).

Hoyt and Altenbach (1981) succeeded in maintaining *D. ecaudata* in captivity. The animals were kept in an air-conditioned room at $23\text{--}24^\circ\text{C}$ and were permitted to feed on live chickens.

BEHAVIOR. *Diphylla* seems to have the most specialized food habits of the three vampire species. Reliable reports indicate that avian blood is the only source of nourishment (Koopman, 1956; Moojen, 1939; Villa-R., 1967; Villa-R. et al., 1969). This was confirmed by Hoyt and Altenbach (1981), whose captive *Diphylla* fed solely on chickens and refused to feed on live laboratory rats, rabbits, and defibrinated beef blood. Ruschi (1953) stated that *D. ecaudata* usually fed on avian species, but claimed also that they fed on pigs, cattle, equines, and humans.

Chickens usually are bitten in the anal region or on the lower part of the leg (Dalquest, 1953; Ruschi, 1951). When attacking a chicken, a bat lands on the back of its prey, quickly moves into a head-down position in the area of the cloaca, and grasps the tail feathers with its hindfeet and thumbs. Chickens seem to be disturbed mildly by the presence of the bats and occasionally remove the vampires by pecking at them (Hoyt and Altenbach, 1981).

GENETICS. The karyotype has a diploid number of 28 and a fundamental number of 52; the X-chromosome is submetacentric, the Y-chromosome acrocentric (Baker, 1973).

Phylogenetic relationships between the three desmodontine species still are unclear. Chromosomal data from G- and C-banding

studies indicate that *Diphylla* and *Desmodus* form a clade separate from *Diaemus* (Bass, 1978). Electrophoretic and albumin immunological data, however, show a closer phylogenetic association between *Desmodus* and *Diaemus* (Honeycutt et al., 1981). Results of immunological studies are in agreement with relationships based on morphological features (Miller, 1907).

LITERATURE CITED

- ALLEN, H. 1896. Notes on the vampire bat (*Diphylla ecaudata*), with special reference to its relationships with *Desmodus rufus*. Proc. U.S. Natl. Mus., 1099:769-777.
- BAKER, R. J. 1973. Comparative cytogenetics of the New World leaf-nosed bats (Phyllostomatidae). Period. Biol., 75:37-45.
- BASS, R. 1978. Systematics of the Desmodontinae and Phyllonycterinae (Chiroptera: Phyllostomatidae) based on G-band chromosomal homologies. Unpubl. M.S. thesis, Texas Tech. Univ., Lubbock, 53 pp.
- BENEDICT, F. A. 1957. Hair structure as a generic character in bats. Univ. California Publ. Zool., 59:285-548.
- BHATNAGAR, K. P. 1978. Breach presentation in the hairy-legged vampire, *Diphylla ecaudata*. J. Mamm., 59:864-866.
- BIRNEY, E. C., AND R. M. TIMM. 1975. Dental ontogeny and adaptation in *Diphylla ecaudata*. J. Mamm., 56:204-207.
- BURT, W. H., AND R. A. STIRTON. 1961. The mammals of El Salvador. Misc. Publ. Mus. Zool., Univ. Michigan, 117:1-69.
- CABRERA, A. 1957. [1958]. Catálogo de los mamíferos de América del Sur. Rev. Mus. Argentino "Bernardino Rivadavia," Cienc. Nat., Buenos Aires, 4(1):1-307.
- DALQUEST, W. W. 1953. Mammals of the Mexican state of San Luis Potosi. Louisiana State Univ. Press, Biol. Sci. Ser., 1:1-229.
- . 1955. Natural history of the vampire bats of eastern Mexico. Amer. Midland Nat., 53:79-87.
- DALQUEST, W. W., AND E. R. HALL. 1947. Geographic range of the hairy-legged vampire in eastern Mexico. Trans. Kansas Acad. Sci., 50:315-317.
- FELTEN, H. 1956. Fledermäuse (Mammalia, Chiroptera) aus El Salvador, Teil IV. Senckenberg. Biol., 37:341-367.
- FORMAN, G. L., R. J. BAKER, AND J. D. GERBER. 1968. Comments on the systematic status of vampire bats (family Desmodontidae). Syst. Zool., 17:417-425.
- HALL, E. R. 1981. The mammals of North America. Second ed. John Wiley and Sons, New York, 1:1-600+90.
- HALL, E. R., AND W. W. DALQUEST. 1963. The mammals of Veracruz. Univ. Kansas Publ., Mus. Nat. Hist., 14:165-362.
- HONEYCUTT, R. L., I. F. GREENBAUM, R. J. BAKER, AND V. M. SARICH. 1981. Molecular evolution of vampire bats. J. Mamm., 62:811-814.
- HOYT, R. A., AND J. S. ALTENBACH. 1981. Observations on *Diphylla ecaudata* in captivity. J. Mamm., 62:215-216.
- JONES, J. K., JR. 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.
- KOOPMAN, K. F. 1956. Bats from San Luis Potosi with a new record for *Balantiopteryx plicata*. J. Mamm., 37:547-548.
- M McNAB, B. K. 1969. The economics of temperature regulation in neotropical bats. Comp. Biochem. Physiol., 31:227-268.
- . 1973. Energetics and the distribution of vampires. J. Mamm., 54:131-144.
- MILLER, G. S., JR. 1907. The families and genera of bats. Bull. U.S. Natl. Mus., 57:1-282.
- MOOJEN, J. 1939. Sanguivorismo de *Diphylla ecaudata* Spix en *Gallus gallus domesticus* (L.). O Campo, Rio de Janeiro, 114:7.
- NOWAK, R. M., AND J. L. PARADISO. 1983. Walker's mammals of the world. Fourth ed. The Johns Hopkins Univ. Press, Baltimore, 1:1-568.
- OJASTI, J., AND O. J. LINARES. 1971. Adiciones a la fauna de los murciélagos de Venezuela con notas sobre las especies del genero *Diclidurus* (Chiroptera). Acta Biol. Venezuela, 7:421-441.
- REDELL, J. R. 1968. The hairy-legged vampire, *Diphylla ecaudata*, in Texas. J. Mamm., 49:769.
- RUSCHI, A. 1951. Morcegos do estado do Espirito Santo. Descrição de *Diphylla ecaudata* Spix e algumas observações a seu respeito. Bol. Mus. Biol. "Prof. Mello-Leitão" (S. Teresa, Brasil), 3:1-7.
- . 1953. Dois casos de sanguivorismo de *Desmodus rotundus rotundus* (E. Geoffroy) e *Diphylla ecaudata* Spix, no homem, e outras observações sobre os quirópteros hematófagos e acidentalmente hematófagos. Bol. Mus. Biol. "Prof. Mello-Leitão" (S. Teresa, Brasil) 13:1-8.
- SANBORN, C. C. 1949. Mammals from the Rio Ucayali, Peru. J. Mamm., 30:277-288.
- SCHMIDT, U. 1978. Vampirfledermäuse. Neue Brehm-Bücherei. Ziemsen Verlag, Wittenberg Lutherstadt, 99 pp.
- SCHULTZ, W. 1965. Studien über den Magen-Darm-Kanal der Chiropteren. Ein Beitrag zum Problem der Homologisierung von Abschnitten des Säugetierdarms. Z. Wiss. Zool. Univ. Kiel, 171:240-391.
- SPIX, J. DE. 1823. Simiarum et Vespertilionum brasiliensium species novae. Monachii, 72 pp.
- STEPHAN, H. 1977. Encephalisationsgrad südamerikanischer Fledermäuse und Makromorphologie ihrer Gehirne. Gegenbaurs morph. Jahrb., Leipzig, 123:151-179.
- STORCH, G. 1968. Funktionsmorphologische Untersuchungen an der Kaumuskulatur und an korrelierten Schädelstrukturen der Chiropteren. Abh. Senckenberg. Nat. Ges., 517:1-92.
- THOMAS, O. 1903. New mammals from Chiriqui. Ann. Mag. Nat. Hist., ser. 7, 11:376-382.
- VILLA-R., B. 1967. Los murciélagos de México. Inst. Biol. Univ. Nac. Autón. México, 491 pp.
- VILLA-R., B., N. MORAES DA SILVA, AND B. VILLA CORNEJO. 1969. Estudio del contenido estomacal de los murciélagos hematófagos *Desmodus rotundus rotundus* (Geoffroy) y *Diphylla ecaudata ecaudata* Spix (Phyllostomatidae, Desmodinae). An. Inst. Biol., Univ. Nac. Autón. México, Ser. Zool., 40:291-298.
- 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.
- 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 SYDNEY ANDERSON and B. J. VERTS. Managing editor was TIMOTHY E. LAWLOR.

A. M. GREENHALL, U.S. FISH AND WILDLIFE SERVICE, OFFICE OF SCIENTIFIC AUTHORITY, WASHINGTON, D.C. 20240; U. SCHMIDT AND G. JOERMANN, ZOOLOGISCHES INSTITUT DER UNIVERSITÄT, POPPELSDORFER SCHLOß, D-5300 BONN, WEST GERMANY.