MAMMALIAN SPECIES No. 755, pp. 1–3, 3 figs.

Sturnira mordax.

By John O. Matson and Timothy J. McCarthy

Published 15 December 2004 by the American Society of Mammalogists

Sturnira mordax (Goodwin, 1938)

Talamancan Yellow-shouldered Bat

Sturnirops mordax Goodwin, 1938:1. Type locality "El Sauce Peralta, a farm on the Atlantic railroad, less than halfway from San Jose to Limon, probably about 1000 feet elevation," Cartago Province, Costa Rica.

Sturnira mordax: Davis et al., 1964:381. First use of current name combination.

CONTEXT AND CONTENT. Order Chiroptera, suborder Microchiroptera, family Phyllostomidae, subfamily Stenodermatinae, tribe Sturnirini, genus *Sturnira*, subgenus *Sturnira*. Twelve species of *Sturnira* were listed by Koopman (1993). *S. mordax* is monotypic.

DIAGNOSIS. Relative to sympatric *S. ludovici*, with which it may be mistaken, *S. mordax* (Fig. 1) is larger in most external and cranial measurements (McCarthy et al., in press; T. J. McCarthy, in litt.). For example, average length of forearm (McCarthy et al., in press) is 46.0 and 46.8 mm for 55 female and 44 male *S. mordax*, respectively, compared with 43.1 and 43.8 mm for 25 female and 26 male *S. ludovici*, respectively. Greatest length of skull for the same individuals is 23.6 and 24.3 mm for female and male *S. mordax* compared with 22.1 and 22.9 mm for female and male *S. ludovici*. Thirteen of 17 cranial measurements are significantly larger in *S. mordax* than in *S. ludovici*. Only mastoid breadth, depth of braincase, postpalatal length, and height of coronoid process do not differ significantly between the 2 species (McCarthy et al., in press). Skull of *S. mordax* is long and narrow (Fig. 2) compared to that of *S. lilium or S. ludovici*. Compared to *S. ludovici*, canines of *S. mordax* are large and massive, whereas upper molars are narrow and small. Fur of dorsum and venter is the same color in *S. mordax* (McCarthy et al., in press), whereas dorsum is darker than venter in *S. ludovici*.

GENERAL CHARACTERS. *Sturnira mordax* is a relatively dark-colored, medium-sized member of *Sturnira*. Hind feet are sparsely haired. Forearm is well haired for one-third its length (Goodwin 1938). Tip of tragus is bifid or notched in >80% of individuals (McCarthy et al., in press). Hair is banded, with lighter color in middle (Goodwin 1938). Upper medial incisors are enlarged and bifid. Interorbital region is relatively parallel, converging only slightly anteriorly (Davis et al. 1964; Goodwin 1938).

Selected measurements (in mm) of holotype are: length of head and body, 60; length of hind foot with claw, 16; length of ear, 18; greatest length of skull, 24.6; condylobasal length, 22.5; greatest breadth of skull, 12.25; least interorbital breadth, 5.2; greatest width outside upper molars, 7.7; palatal length, 10; length of maxillary toothrow, 6.2; length of molariform series, 5.3; length of upper molar series, 3.2 (Goodwin 1938, 1946).

Average (range, *n*) of external and cranial measurements (in mm) for females and males, respectively, from Costa Rica and western Panama are (McCarthy et al., in press; T. J. McCarthy, in litt.): length of forearm, 46.2 (43.6–48.9, 73), 46.7 (43.0–49.2, 52); length of 3rd metacarpal, 45.7 (42.2–47.9, 46), 45.9 (42.5–48.6, 28); length of 4th metacarpal, 45.4 (41.6–47.9, 46), 45.5 (42.6–48.0, 28); length of 5th metacarpal, 46.9 (43.2–49.6, 46), 47.2 (43.5–49.5, 28); 1st phalanx of 3rd digit, 17.9 (16.5–19.6, 46), 18.1 (16.4–20.0, 28); 1st phalanx of 4th digit, 14.6 (13.5–15.9, 46), 14.9 (13.7–16.1, 28); 1st phalanx of 5th digit, 11.0 (9.9–12.6, 46), 11.4 (10.2–12.3, 28); tibial length, 20.0 (16.8–21.9, 46), 20.3 (18.0–22.2, 28); greatest length of skull, 23.61 (22.25–25.25, 55), 24.29 (22.80–25.85, 44); condylobasal length, 21.19 (20.00–22.90, 53), 21.96 (20.35–23.45, 44); zygomatic breadth, 12.66 (12.10–13.45, 53), 13.14 (12.30–13.90, 44); zygomatic length, 9.72 (9.10–10.65, 55), 10.07 (8.90–10.90, 44); postorbital constriction, 5.79 (5.45–6.10, 55), 5.94 (5.55–6.35, 44); interorbital constriction, 5.52 (5.25–5.90, 55), 5.69 (5.20–6.25, 44); greatest postorbital breadth, 5.99 (5.75–6.35, 55), 6.20 (5.90–6.45, 44); mastoid breadth, 11.71 (11.10–12.50, 52), 12.09 (11.25–12.80, 42); breadth of braincase, 10.50 (10.00–10.90, 54), 10.65 (9.40–11.15, 44); depth of braincase, 9.01 (8.40–10.00, 52), 9.34 (8.30–10.50, 44); alveolar length of maxillary, 6.28 (5.90–6.90, 55), 6.40 (5.90–6.85, 44); palatal length, 9.64 (8.80–10.70, 54), 10.13 (9.20–10.95, 44); postpalatal length, 8.65 (7.80–9.55, 53), 9.03 (8.10–9.80, 43); breadth across upper molars, 7.14 (6.70–7.65, 55), 7.33 (6.75–7.80, 44); breadth across upper canines, 5.58 (5.20–6.05, 55), 5.86 (5.40–6.30, 44);

FIG. 1. Adult male *Sturnira mordax* (Carnegie Museum of Natural History 92486) collected at 4.2 km SE Cariblanco, Alajuela, Costa Rica, on 12 February 1983, original number TJMc 6783. Photograph by T. J. McCarthy.

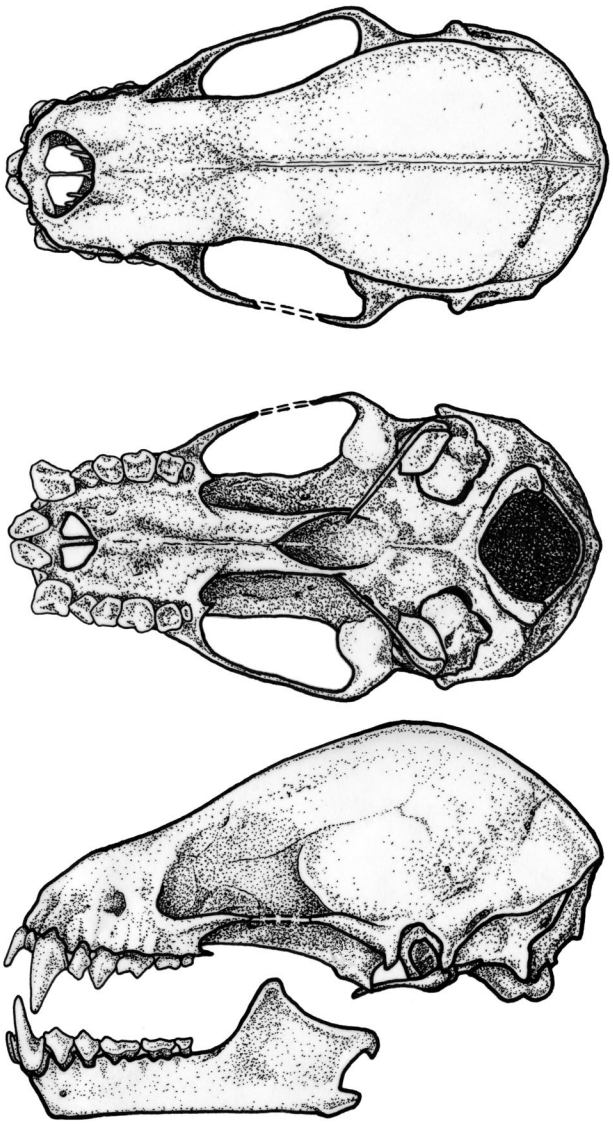

FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of an adult *Sturnira mordax* (Carnegie Museum of Natural History 92486) collected at 4.2 km SE Cariblanco, Alajuela, Costa Rica, on 12 February 1983, original number TJMc 6783. Greatest length of skull is 24.8 mm.

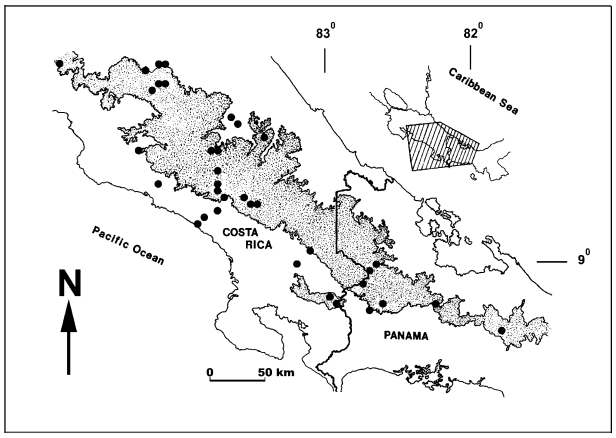

FIG. 3. Distribution of *Sturnira mordax* in Costa Rica and Panama; modified from McCarthy et al. (in press). Dots represent 44 localities from which *S. mordax* has been recorded; some dots encompass >1 locality. Stippling indicates areas >1,000 m in elevation.

length of upper canines, 2.61 (2.15–3.15, 53), 3.08 (2.80–3.30, 42); mandibular length, 15.46 (14.65–16.85, 55), 15.95 (14.75–17.00, 44); alveolar length of mandible, 6.96 (6.50–7.50, 55), 7.26 (6.75–7.70, 44); height of coronoid, 5.21 (4.80–5.75, 55), 5.43 (4.90–5.90, 44); breadth across lower canines, 3.32 (3.00–3.70, 54), 3.56 (3.00–3.90, 43); length of lower canines, 2.39 (2.15–2.90, 54), 2.99 (2.60–3.25, 43). Additional body and cranial measurements were reported by Davis et al. (1964), Gardner et al. (1970), Olmos and de Sousa (1989), and Swanepoel and Genoways (1979). Males are significantly larger in all cranial measurements and length of 1st phalanx of 5th digit. Sexes do not differ in forearm length, wing measurements other than length of 1st phalanx of 5th digit, or tibial length (McCarthy et al., in press).

Average body mass of 8 individuals from Monte Verde, Costa Rica, was 26 g (LaVal and Fitch 1977). Body mass for individuals from the Talamanca Mountains, Chiriquí Province, Panama, ranges from 20.3 to 23.9 g for females and from 27.2 to 28.0 g for males (Olmos and de Sousa 1989).

DISTRIBUTION. *Sturnira mordax* is endemic to Central America (Fig. 3; Koopman 1976; McCarthy et al., in press). Originally known only from Costa Rica (Davis et al. 1964; Goodwin 1938), Talamancan yellow-shouldered bats were subsequently recorded in northwestern Panama (Olmos and de Sousa 1989). *S. mordax* is known from ca. 175 specimens from 44 localities in Costa Rica and Panama. Specimens from 3 localities in Colombia (Alberico 1994; Alberico et al. 2000) are not *S. mordax* (McCarthy et al., in press). Specimens reported by Sánchez-Hernández and Romero-Almarez (2002) from Ecuador are *S. ludovici* (T. J. McCarthy, in litt.). *S. mordax* occurs from sea level to 3,000 m (McCarthy et al., in press). No fossils are known.

FORM AND FUNCTION. Dental formula is i 2/2, c 1/1, p 2/2, m 3/3, total 32 (Goodwin 1938). Brains of *S. mordax*, *S. lilium*, and *S. ludovici* are very similar (McDaniel 1976). Cerebellum is simple and has a medial crest. Cerebral hemispheres are deep and smooth. Pseudocentral sulci are poorly developed relative to other stenodermine bats. *S. mordax* differs from *S. lilium* and *S. ludovici* by having dorsal portions of inferior colliculi exposed (McDaniel 1976).

Based on a single specimen (Forman et al. 1979; Rouk 1973), the stomach of *S. mordax* is simpler in gross morphology than in other *Sturnira*. Cecum of the stomach is poorly developed in *S. mordax* but has a large cardiac vestibule. Cardiac gland of *S. mordax* is weakly reactive or nonreactive to procedures that demonstrate presence of acid mucopolysaccharides, but the mucous neck of the fundic gland tubules has a strong reaction, indicating presence of acid mucopolysaccharides.

Compared to other stenodermatines, *S. mordax* tends to be relatively small in lengths of forearm, 5th metacarpal, and 2nd phalanx of digit V (Findley et al. 1972; Smith and Starrett 1979). However, 3rd metacarpal and 2nd and 3rd phalanges of digit III are relatively long.

ONTOGENY AND REPRODUCTION. Pregnant females occur in February, April, and August (Armstrong 1969; Gardner et al. 1970; Timm et al. 1989), suggesting that *S. mordax* may be polyestrus (Wilson 1979). Lactating individuals have been reported in May (Gardner et al. 1970; LaVal 1977). One embryo was taken in February with a crown–rump length of 24 mm (Armstrong 1969).

ECOLOGY. Most specimens of *S. mordax* have been taken in moist tropical forests at mid-elevations, averaging 1,257 to 3,000 m (McCarthy et al., in press). Although Talamancan yellow-shouldered bats are still regularly taken at high elevations near Monteverde, Costa Rica, the species is not as abundant at lower elevations as in the past (LaVal 2004).

Sturnira mordax is frugivorous (Gardner 1977). Stomach contents of 10 *S. mordax* contained fruits of *Anthurium* (Araceae), *Centropogon* (Campanulaceae), *Cecropia* (Moraceae), and *Musa* (Musaceae—Howell and Burch 1974).

Two species of trombiculid mites, *Microtrombicula carmenae* and *M. sturnirae* (Webb and Loomis 1971, 1977), and 2 genera of bat flies (undescribed species), *Megistopoda* and *Trichobius* (Timm et al. 1989), occur on *S. mordax*.

GENETICS. Diploid number is 30 and fundamental number is 56 (Baker 1973, 1979). The karyotype of *S. mordax* is shown in Baker (1979:plate 46).

REMARKS. The generic name *Sturnira* derives from the Latin *sturnus* for starling and was given to honor H.M.S. *Starling* on its voyage to Brazil, where the type specimen was collected (Jones and Genoways 1975). The specific name *mordax* is from the Latin *mordicus* meaning biting (Gardner 1977). Another common name for *S. mordax* is Talamancan epaulette bat. de la Torre (1961) examined the holotype and suspected it was an immature *S. ludovici*.

We thank Carl Dick and an anonymous reviewer for comments and suggestions concerning the manuscript.

LITERATURE CITED

ALBERICO, M. 1994. First record of *Sturnira mordax* from Colombia with range extensions for other bat species. Trianea 5: 335–341.

ALBERICO, M., A. CADENA, J, HERNÁNDEZ-CAMACHO, AND Y. MUÑOZ-SABA. 2000. Mamíferos (Synapsida: Theria) de Colombia. Cespedesia 3:31–40.

ARMSTRONG, D. M. 1969. Noteworthy records of bats from Costa Rica. Journal of Mammalogy 50:808–810.

BAKER, R. J. 1973. Comparative cytogenetics of the New World leaf-nosed bats (Phyllostomatidae). Periodicum Biologorum 75:37–45.

BAKER, R. J. 1979. Karyology. Pp. 107–155 in Biology of bats of the New World family Phyllostomatidae. Part III (R. J. Baker, J. K. Jones, Jr., and D. C. Carter, eds.). Special Publication 16, The Museum, Texas Tech University.

DAVIS, W. B., D. C. CARTER, AND R. H. PINE. 1964. Noteworthy records of Mexican and Central American bats. Journal of Mammalogy 45:375–387.

DE LA TORRE, L. 1961. The evolution, variation, and systematics of the Neotropical bats of the genus *Sturnira*. Ph.D. dissertation, University of Illinois, Urbana, 146 pp.

FINDLEY, J. S., E. H. STUDIER, AND D. E. WILSON. 1972. Morphometric properties of bat wings. Journal of Mammalogy 53: 429–444.

FORMAN, G. L., C. J. PHILLIPS, AND C. S. ROUK. 1979. Alimentary tract. Pp. 205–227 in Biology of bats of the New World family Phyllostomatidae. Part III (R. J. Baker, J. K. Jones, Jr., and D. C. Carter, eds.). Special Publication 16, The Museum, Texas Tech University.

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.). Special Publication 13, The Museum, Texas Tech University.

GARDNER, A. L., R. K. LAVAL, AND D. E. WILSON. 1970. The distributional status of some Costa Rican bats. Journal of Mammalogy 51:712–729.

GOODWIN, G. G. 1938. A new genus of bat from Costa Rica. American Museum Novitates 976:1–2.

GOODWIN, G. G. 1946. Mammals of Costa Rica. Bulletin of the American Museum of Natural History 87:271–471.

HOWELL, D. J., AND D. BURCH. 1974. Food habits of some Costa Rican bats. Revista de Biología Tropical 21:281–294.

JONES, J. K., JR., AND H. H. GENOWAYS. 1975. *Sturnira thomasi*. Mammalian Species 68:1–2.

KOOPMAN, K. F. 1976. Zoogeography. Pp. 39–47 in Biology of bats of the New World family Phyllostomatidae. Part I (R. J. Baker, J. K. Jones, Jr., and D. C. Carter, eds.). Special Publication 10, The Museum, Texas Tech University.

KOOPMAN, K. F. 1993. Order Chiroptera. Pp. 137–241 in Mammal species of the world: a taxonomic and geographic reference (D. E. Wilson and D. M. Reeder, eds.). Second edition. Smithsonian Institution Press, Washington, D.C.

LAVAL, R. K. 1977. Notes on some Costa Rican bats. Brenesia 10/11:77–83.

LAVAL, R. K. 2004. Impact of global warming and locally changing climate on tropical cloud forest bats. Journal of Mammalogy 85:237–244.

LAVAL, R. K., AND H. S. FITCH. 1977. Structure, movement, and reproduction in three Costa Rican bat communities. Occasional Papers, Museum of Natural History, University of Kansas 69:1–28.

MCCARTHY, T. J., J. O. MATSON, B. RODRÍGUEZ H., AND C. O. HANDLEY, JR. In press. Distribution, morphometrics, and identification of the Talamancan epaulette bat (*Sturnira mordax*) of Costa Rica and Panama. Contribuciones mastozoológicas en homenaje de Bernardo Villa (V. Sánchez-Cordero and R. Medellín, eds.). Publicaciones Especiales, Asociación Mexicana de Mastozoología, México, D.F.

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.). Special Publication 10, The Museum, Texas Tech University.

OLMOS, M., AND F. DE SOUSA. 1989. *Sturnira mordax* (Goodwin, 1938) Chiroptera primer reporte para Panamá. Scientia (Panamá) 4:77–86.

OWEN, R. D. 1987. Phylogenetic analyses of the bat subfamily Stenodermatinae (Mammalia: Chiroptera). Special Publication 26, The Museum, Texas Tech University.

ROUK, C. S. 1973. Gastric morphology and adaptive radiation in the Phyllostomatidae. Ph.D. dissertation, Texas Tech University, Lubbock, 85 pp.

SÁNCHEZ-HERNÁNDEZ, C., AND M. L. ROMERO-ALMAREZ. 2002. *Sturnira mordax* (Chiroptera, Phyllostomidae), in Ecuador. Mammalia 66:439–441.

SMITH, J. D., AND A. STARRETT. 1979. Morphometric analysis of chiroptera wings. Pp. 229–316 in Biology of bats of the New World family Phyllostomatidae. Part III (R. J. Baker, J. K. Jones, Jr., and D. C. Carter, eds.). Special Publication 16, The Museum, Texas Tech University.

SWANEPOEL, P., AND H. H. GENOWAYS. 1979. Morphometrics. Pp. 13–106 in Biology of bats of the New World family Phyllostomatidae. Part III (R. J. Baker, J. K. Jones, Jr., and D. C. Carter, eds.). Special Publication 16, The Museum, Texas Tech University.

TIMM, R. M., D. E. WILSON, B. L. CLAUSON, R. K. LAVAL, AND C. S. VAUGHAN. 1989. Mammals of the La Selva–Braulio Carrillo Complex, Costa Rica. North American Fauna 75:1–162.

WEBB, J. P., AND R. B. LOOMIS. 1971. Trombiculid mites of the genus Microtrombicula (Acarina) from Costa Rica. Contributions in Science, Los Angeles County Museum of Natural History 207:1–15.

WEBB, J. P., 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.). Special Publication 13, The Museum, Texas Tech University.

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.). Special Publication 16, The Museum, Texas Tech University.

Associate editors of this account were GAIL MICHENER and PAMELA OWEN. Editor was VIRGINIA HAYSSEN.

J. O. MATSON, DEPARTMENT OF BIOLOGICAL SCIENCES, SAN JOSE STATE UNIVERSITY, SAN JOSE, CALIFORNIA 95192, UNITED STATES. T. J. MCCARTHY, SECTION OF MAMMALS, CARNEGIE MUSEUM OF NATURAL HISTORY, 5800 BAUM BOULEVARD, PITTSBURGH, PENNSYLVANIA 15206, UNITED STATES.