

OCCASIONAL PAPERS

THE MUSEUM

TEXAS TECH UNIVERSITY

NUMBER 20

28 FEBRUARY 1974

A NEW VESPERTILIONINE BAT FROM THE BARSTOVIAN DEPOSITS OF MONTANA

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During the 1972 field season, a small collection of micromammals was obtained from the Anceney Local Fauna located 13 miles west of Bozeman, Gallatin County, Montana. The fauna is Barstovian in age (Upper Miocene) and is preserved in an ash-filled channel deposit in the Madison Valley Formation (Dorr, 1956). A single partial jaw of a chiropteran was recovered along with numerous bones and teeth of other mammals, birds, amphibians, and reptiles. The jaw is complete from incisors back to the level of the m2. Examination of the jaw and comparisons with Recent and fossil chiropterans has convinced us that it represents a new genus and species of the subfamily Vespertilioninae.

Order Chiroptera

Family Vespertilionidae

Subfamily Vespertilioninae

Ancenycteris, new genus

Type species.—*Ancenycteris rasmusseni*, a new species described beyond.

Distribution.—Known only from Upper Miocene deposits of Gallatin County, Montana.

Diagnosis.—Vespertilionid bat with dental formula $i3, c1, p2, m3$. Incisors overlapping; canine with cingulid not reaching above level of incisors; p2 small; p4 laterally compressed; molars with open trigonid and nearly parallel cristid obliqua and entocristid (see Van Valen,

1966, for dental nomenclature); entocristid beginning lateral to entocoid and ending medial to metaconid; talonid basin long and narrow.

Etymology.—*Anceney*, for the Anceney Local Fauna, plus *nycteris* (from Greek, nykteris), bat.

***Ancenycteris rasmusseni*, new species**

Holotype.—Well-preserved left lower jaw with i1-m2, The Museum, Texas Tech University, TTU-P 4093.

Type locality.—13 mi. W Bozeman, N $\frac{1}{2}$, Sec. 13, T2S, R3E, Gallatin Co., Montana.

Age.—Barstovian (Upper Miocene).

Formation.—Madison Valley Formation, Anceney Local Fauna.

Diagnosis.—As for the genus.

Description.—The holotype is illustrated in Fig. 1A, B, D.

Incisors. Three overlapping tri- or quadritubercular incisors are present. The first incisor is spatulate and flattened, with three cusps in tandem. It is anterior to the second incisor and the external-most cuspule overlaps the internal-most cuspule of the second incisor. The first and second incisors are almost identical in morphology, except that the third cuspule of i2 is more flattened and elongate than its correspondent on i1. The third incisor differs in construction from the first two incisors. Its first cuspule is overlapped by the last cuspule of i2 and the second cuspule is about equal in size and closely appressed to the first, as in the other incisors. The third cuspule, however, is not aligned with the other two but is posteriorly oriented, lying against the anterior face of the canine. An additional cuspule is developed on a small posterior shelf of the third incisor and contacts the canine directly anterior to, and at the same level as, the lingual cingulid of the canine.

Canine. The canine is the highest tooth in the series and is antero-posteriorly compressed, with its main cusp arched posteriorly. The cingulid is weaker labially than lingually and does not extend onto the anterior face of the main cusp where the third incisor abuts against it. A posterior shelf is formed below the main cusp, but is not flattened as in p4, rather it continues to descend in a flaring fashion to the posterior margin of the tooth. The internal cingulid is strong, with no indication of a cuspule forming at its anterolingual border.

Premolars. The first premolar, whether p2 or p3 (see Miller, 1907, for numerical designations of teeth), is relatively simple and basically similar to p4 in construction, with a single anterocentral cusp and surrounding cingulid. The tooth is expanded labially and has two small cingulid cuspules, one of which is anterolingual and (along with the

rest of anterior margin of tooth) overlaps the posterior border of the canine, whereas the other (a smaller, posterolingual cuspule) abuts against the anterolingual cuspule of p4. The posterior margin of the first premolar makes broad contact with the anterior margin of p4.

The double-rooted fourth premolar is a single, large, slightly posteriorly directed cusp that is laterally compressed and not square in occlusal view. The main cusp is basically triangular in cross section, with lingual and posterior margins flattened and vertical near the base, and located anteriorly, with a posterior shelflike extension present. The cingulid surrounds the entire tooth and expands slightly over the roots on the labial side. A small anterolingual cuspule is developed and contacts a similar structure on the posterior margin of p2. A posterolingual cuspule is developed also on the cingulid and overlaps the anterior margin of the cingulid on m1.

Molars. The four-rooted first molar has a relatively open trigonid with metaconid and paraconid more widely separated from each other than either is from the protoconid. The protoconid is largest of the primary cusps and basically triangular in cross section, with lingual and posterior walls flattened and vertical. A V-shaped paracristid and protocristid join the respective paraconid and metaconid to the protoconid. The paraconid is partially damaged near its apex, and the protoconid and metaconid are broken off near what is assumed to be their midpoint. A prominent cingulid extends from the base of the paraconid continuously around the labial margin to terminate posteriorly, immediately below the hypoconulid. The entoconid is nearly equal in height to the metaconid, with its labial margin vertical in response to wear along the margins of the talonid basin. The entocristid descends sharply and joins the base of the metaconid. A small hypoconulid is located above the lingual margin of the cingulid and is twinned with laterally displaced entoconid. The entoconid and hypoconid are joined by the postcristid, which is wider than the paracristid or protocristid, but of similar construction. The cristid obliqua closes the talonid basin as it courses from hypoconid to the internal base of the protoconid and is lower than the entocristid at its point of intersection with the trigonid. The talonid basin is deep and troughlike, extending from its highest point at the postcristid to its lowest at the base of the trigonid.

The m2 is basically identical to m1, with several minor differences, and is better preserved, the protoconid and entoconid being intact. The metaconid is slightly higher than the entoconid but compressed anteroposteriorly, whereas the entoconid is laterally compressed. The talonid basin is shorter than in m1 but the entoconid and hypoconulid

are also displaced lingually. The cristid obliqua arises on the lingual margin of the hypoconid rather than on the labial margin as in m1, restricting the size of the talonid basin. The cristid obliqua also terminates much lower on the posterior margin of the trigonid, so that the talonid basin appears more open labially.

Comparisons.—One striking feature of *Ancenycteris rasmusseni* is the reduced dental formula, with p3 missing from the dental battery. Members of several families possess this dental formula, including Emballonuridae, Nycteridae, Molossidae, and Vespertilionidae (Miller, 1907). All stages of reduction of p3 are represented within Recent species of vespertilionids, from a prominent tooth to one that is extremely reduced and peglike to one that is missing. We have compared *Ancenycteris rasmusseni* to several members of each of the above mentioned families, especially to other vespertilionids. *A. rasmusseni* most closely resembles vespertilionines.

Among the emballonurids, *Saccopteryx* is easily distinguished from *Ancenycteris rasmusseni* by its small incisors and laterally compressed p2. The molars of *Saccopteryx* have a wide talonid basin, with the posteristid terminating at the hypoconulid rather than at the entocoid, which appears to be isolated on the lingual margin. *Balantiopteryx* has a small, rounded p2 and a short, square, needlelike p4. The molars are as in *Saccopteryx*. In *Taphozous*, both p2 and p4 reveal lateral compression, but the molars are of the same pattern as above.

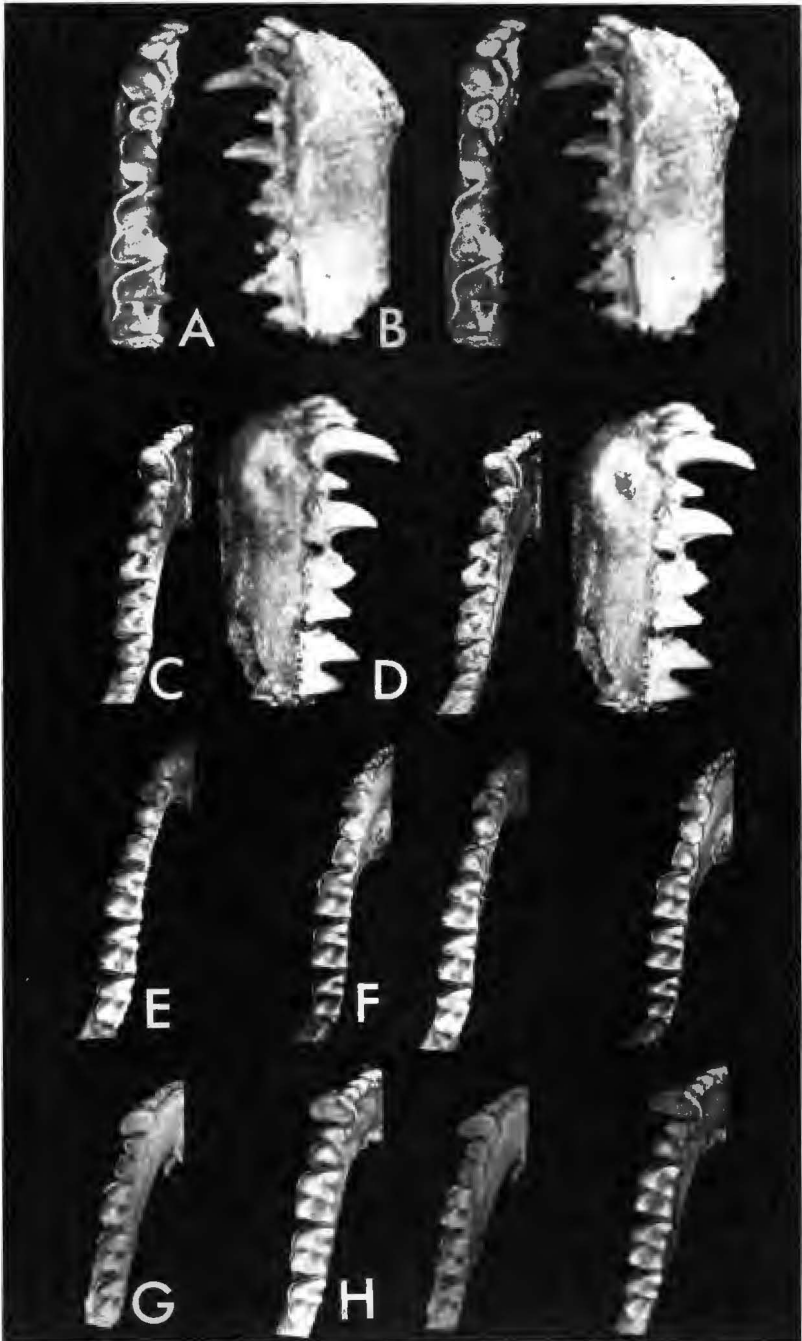
The family Nycteridae, represented by the genus *Nycteris*, is distinguishable from *Ancenycteris*, and other vespertilionids, by the enlargement of p2 and reduction of p4 to a peg.

Tadarida (family Molossidae) is distinguished from *A. rasmusseni* by the anteroposterior compression of the trigonid and an angular cristid obliqua rather than the anteroposteriorly directed cristid obliqua of *A. rasmusseni*.

The vespertilionids are very diverse and fairly old geologically. Most members of this family have the primitive dental formula for bats, i1-3, c1, p2-4, m1-3, but several members have lost p3. Among the genera having a reduced dental formula similar to that of *A. rasmusseni* are *Eptesicus*, *Vespertilio*, *Pipistrellus*, *Nycticeius*, *Lasiurus*, *Rhogeessa*, *Euderma*, and some species of *Myotis*. We have compared



Fig. 1.—Stereophotographs of vespertilionine bats: A, *Ancenycteris rasmusseni*, holotype, TTU-P 4093, $\times 7$; B, medial view, $\times 7$; C, *Eptesicus*, TTU-M 7041, $\times 4$; D, *A. rasmusseni*, lateral view of holotype, $\times 7$; E, *Myotis velifer*, TTU-M 3951, $\times 5$; F, *Myotis fortidens*, TTU-M 6121, $\times 5$; G, *Nycticeius*, TTU-M 166, $\times 5$; H, *Lasiurus*, TTU-M 7723, $\times 5$.



A. rasmusseni with all of these genera, and comparisons to those most closely resembling *Ancenycteris* follow.

A. rasmusseni most closely resembles *Eptesicus* (Fig. 1C) and *Vespertilio*, but differs from each in several features. *Eptesicus* and *Vespertilio* have an anteroposteriorly compressed p2, with lateral expansion of the cingular area to make broad contact with the canine and the squared p4. The molars also make broad contact with each other and with p4, and the talonid is always wider than the trigonid. As in all other bats examined, the cristid obliqua joins the trigonid about midway between the protoconid and paraconid rather than near the protoconid as in *A. rasmusseni*. *Lasiurus* (Fig. 1H) differs markedly in apparent shortening of the toothrow as evidenced by the position of p2 almost outside of the toothrow and the anteroposterior compression of p4. *Nycticeius* (Fig. 1G) has small nonoverlapping incisors and a square p4.

In the genus *Myotis* (*M. velifer*, Fig. 1E, is a representative species), only *Myotis fortidens* consistently lacks p3 (Fig. 1F), although, populations of *Myotis lucifugus* in the southwestern United States and northern Mexico are characterized by the absence of p3 in some individuals. *Myotis fortidens* has features similar to those of *A. rasmusseni*, but can be distinguished by the straight entocristid and slanting cristid obliqua in the molars, a less open and not so elongate trigonid, and the broad contact of the anterior margin of m1 with the posterior margin of the laterally compressed p4. In *M. lucifugus*, the characteristics of the cristid obliqua and entocristid are the same as in *M. fortidens*. Furthermore, in *M. lucifugus* the first and second incisors do not overlap, the canine is more recurved, the p4 is more squared, and the trigonid of m1 is much smaller than in *A. rasmusseni*.

Little is known of the early and mid-Cenozoic chiropteran fauna, and the known specimens many times are fragmentary. The earliest microchiropterans are considered to represent the distinct families Palaeochiropterygidae and Icaronycteridae (Russell and Sigé, 1970; Jepsen, 1970). Simpson (1945) included the earliest known representatives of Vespertilionidae in the genera *Myotis* and *Stehlinia* (see Handley, 1955, for use of this generic name). As presently understood, fossil representatives of these two genera retain a primitive dental formula and have not lost p3 (Mein, 1964; Sigé, 1968; Slaughter, 1970), although some species are known only from skulls without lower jaws. Thus, *Ancenycteris*, at least at present, appears to be unique in its dental reduction.

Measurements of holotype.—The following measurements of the holotype are in millimeters: length of canine, 0.98; width of canine,

1.0; length of p2, 0.61; width of p2, 0.55; length of p4, 1.06; width of p4, 0.73; length of m1, 1.72; trigonid width of m1, 0.96; talonid width of m1, 1.08; length of m2, 1.61; trigonid width of m2, 1.12; talonid width of m2, 1.12; length of p2-m2, 4.90.

Etymology.—The species is named for Donald Rasmussen, who has worked extensively the Miocene of Montana and has given his Anceny collections to Sutton for study.

Remarks.—*Ancenycteris rasmusseni* is a distinctive chiropteran by nature of its reduced dentition (p3 lost) and peculiar talonid structure. These features eliminate it from any close relationship with the common and cosmopolitan genus *Myotis*. Although *A. rasmusseni* does bear some resemblance to Recent species of *Myotis* in certain characteristics, we believe these are mainly retention of primitive vespertilionine characteristics in both genera. *A. rasmusseni* most closely resembles the *Eptesicus-Vespertilio* group and may be an offshoot of an early line leading to these genera. The relationship of *A. rasmusseni* and the early Pleistocene (Gazin, 1942) *Simonycteris stocki* described by Stirton (1931) from San Pedro Valley, Arizona, are not evident at present, because the former is represented only by a lower jaw and the latter by a partial cranium. However, Stirton stated that the characteristics of *Simonycteris* "appear to be closer to those of *Eptesicus* than to other genera of bats." As is usual with fossil chiropteran material, there are not enough specimens for adequate comparisons, and we must fall back on comparisons with Recent taxa.

The holotype is deposited in the paleontology collection of The Museum of Texas Tech University (TTU-P). Specimens of Recent material from The Museum are indicated as TTU-M. The authors wish to express their appreciation to Dr. Craig C. Black for his helpful suggestions and to Mr. Leonard Krishtalka for help in collecting the specimen. Support for the collecting activities was provided by the Institute of Museum Research, The Museum of Texas Tech University. Some of the photographs were taken by Lloyd Logan.

Specimens examined.—The following specimens were examined during the course of this study: *Ancenycteris* (TTU-P 4093); *Balantiopteryx* (TTU-M 6289); *Saccopteryx* (TTU-M 5228); *Taphozous* (TTU-M 19374); *Nycteris* (TTU-M 3311); *Antrozous* (TTU-M 2130); *Eptesicus* (TTU-M 7041); *Euderma* (TTU-M 10447); *Lasiurus* (TTU-M 7723); *Myotis* (TTU-M 3951, 6121, 7450); *Nycticeius* (TTU-M 166); *Pipistrellus* (TTU-M 7324); *Plecotus* (TTU-M 198); *Rhogeessa* (TTU-M 5241); *Vespertilio* (TTU-M 9009); *Tadarida* (TTU-M 231).

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