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Balantiopteryx plicata.

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Balantiopteryx Peters, 1867

Least Sac-winged Bats

Balantiopteryx Peters, 1867:476. Type species *Balantiopteryx plicata* Peters, by monotypy.

CONTEXT AND CONTENT. Order Chiroptera, Suborder Microchiroptera, Family Emballonuridae, Subfamily Emballonurinae. Three species are recognized in the genus, which is known to occur from northwestern México south to Costa Rica, and in northwestern South America. Key to species follows:

1 Margin of alar membrane white; forearm 38 to 46 mm; length of maxillary toothrow ≥ 5 mm; inner margin of ear conch straight ..... *Balantiopteryx plicata*
No white on margin of alar membrane; forearm 35 to 41 mm; length of maxillary toothrow < 5 mm; inner margin of ear conch concave 2
2 Rostrum inflated both anteriorly and posteriorly; known only from northwestern South America ..... *Balantiopteryx infusca*
Rostrum inflated only anteriorly; occurring in southern México, Belize, and Guatemala ..... *Balantiopteryx io*

DIAGNOSIS. *Balantiopteryx* is one of four New World emballonurid genera possessing a sac in the antebrachial membrane; it differs from the others in that the sac is located in the middle of the membrane, its opening directed proximally. Rostrum greatly inflated terminally on each side, causing a distinct concavity in the cranium (anterior to the braincase) best seen in lateral view; premaxillae slender and rudimentary; basisphenoidal pits divided or not by median septum; P1 small and peglike, and in space between the canine and P2 that is relatively greater than in related genera; p1 small, barely filling gap between canine and p2 (Miller, 1907; Phillips and Jones, 1969; Sanborn, 1937).

Balantiopteryx plicata Peters, 1867

Peters' Sac-winged Bat

Balantiopteryx plicata Peters, 1867:476. Type locality Puntarenas, Costa Rica.
Balantiopteryx ochoterenai Martínez and Villa, 1938:339. Type locality Cuautla, Morelos.

CONTEXT AND CONTENT. Context as given above for the genus *Balantiopteryx*. Two subspecies currently are recognized:

B. p. plicata Peters, 1867:476, see above (*ochoterenai* a synonym).
B. p. pallida Burt, 1948:1. Type locality San Bernardo, Rio Mayo, Sonora.

DIAGNOSIS. Size small for an emballonurid (Fig. 1), but largest species in genus *Balantiopteryx*; forearm ≥ 38 mm, greatest length of skull usually ≥ 13.0 mm, length of maxillary toothrow ≥ 5.0 mm. Color usually pale gray to rich brown, not dark brown; white border on wing membrane from calcar to fourth digit; inner margin of ear straight, not concave; interfemoral membrane thinly furred dorsally to about point of exsertion of tail; interpterygoid fossa narrow, V-shaped.

GENERAL CHARACTERS. External nares directed slightly outward, no dorsal furrow between them; ear slightly rounded distally, outer margin straight or slightly convex (slightly concave opposite base of tragus), terminating at level with angle of mouth; tragus rounded distally, outer margin slightly convex with a "tooth" projecting near the base, inner margin straight. Wing slender, attached at ankle; border of interfemoral membrane somewhat concave between tibia and calcar; tip of tail projecting about 6 mm from midpoint of uropatagium; legs relatively long, feet delicate; thumb long (about 5 mm) and slender; second phalanx of third finger terminal and cartilaginous.

Pelage varies from dull gray to brownish dorsally, slightly paler below (hairs lightly tipped with buff on flanks and venter). There is no dorsal stripe. Wing membranes brownish except for whitish border; pelage extending on to membrane dorsally as far as line from middle of humerus to distal third of tibia; uropatagium almost naked ventrally.

Males have a conspicuous glandular sac (Fig. 2) in the middle of the anterbrachial membrane that opens proximally; in adults the interior is white and moist (Bradbury and Vehrencamp, 1976), but López-Forment (1981) reported that the gland varies in color, size, and texture with age and season. The sac is rudimentary in females. Average external measurements (in mm, extremes in parentheses) of a series of 13 *B. p. plicata* (11 males, two females) from Oaxaca in the collection of Texas Tech University are: total length, 66.6 (63 to 70); length of tail, 16.2 (12 to 21); length of hind foot, 8.3 (6 to 9); length of ear, 14.7 (12 to 16); length of forearm, 41.2 (39.2 to 42.6).

Extremes in cranial measurements (Jones et al., 1972) of 22 *B. p. plicata* from southern Sinaloa (10 males, 12 females), followed by those of 17 of the smaller *B. p. pallida* from northern Sinaloa (seven males, 10 females) are: greatest length of skull, 13.8 to 14.8, 13.0 to 13.8; zygomatic breadth, 8.8 to 9.4, 8.3 to 8.9; postorbital constriction, 3.1 to 3.5, 2.9 to 3.5; breadth of braincase, 6.7 to 7.3, 6.5 to 7.0; mastoid breadth, 8.0 to 8.6, 7.5 to 8.0; length of maxillary toothrow, 5.3 to 5.6, 5.0 to 5.4.

Mean weight for 32 males from Costa Rica was 6.1 g; 24 nonpregnant females from there were significantly larger ($P < 0.001$), averaging 7.1 g (Bradbury and Vehrencamp, 1976).

Skull light and compact (Fig. 3); rostrum short and broad (broader than braincase), inflated terminally, concave anterior to braincase; faint sagittal crest and slender postorbital processes present. The dental formula, as in other American emballonurids, is i 1/3, c 1/1, p 2/2, m 3/3, total 32. Upper incisors small, unicuspid, convergent distally; diastema between incisors and canines. Lower incisors trilobed and seated compactly between canines. Both upper and lower canines delicate, those above slightly the larger; both have a distinct cingulum, with an anterointernal cusp on the upper teeth and a posterointernal cusp on lower pair. Upper premolars small, the first separated by evident gap from canine; p2 twice the height of p1, almost as high as canine, which p1 abuts. Molars with W-shaped crowns. Except where specifically cited, the above descriptive material is mostly from Dobson (1878) and Martínez and Villa (1938).

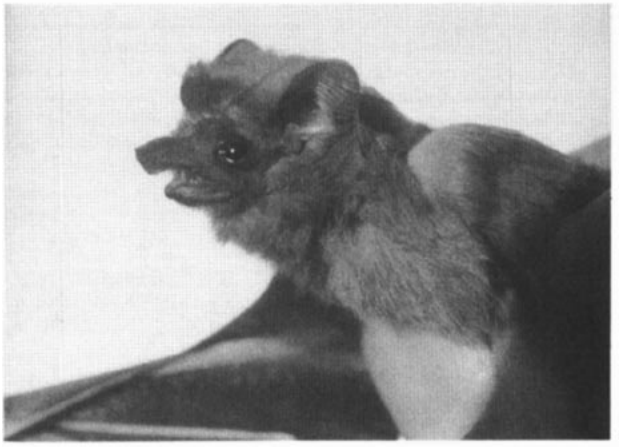

FIG. 1. Live specimen of *Balantiopteryx plicata* from Jalisco (photograph courtesy of Robert J. Baker).

FIG. 2. Diagrammatic illustration of wing sac of *Balantiopteryx plicata* (after Sanborn, 1937).

DISTRIBUTION. *Balantiopteryx plicata* occurs from western México (southern parts of Sonora and Baja California) southward through most of central and southern México and along the Pacific versant to Costa Rica (Hall, 1981, and Fig. 4). The known altitudinal range is from sea level to 1,500 m (López-Forment, 1981). We know of no fossil record for this species.

FORM AND FUNCTION. Phillips and Jones (1969) examined 170 specimens of *B. plicata* for dental abnormalities and found the following: one specimen lacked both upper incisors, one retained deciduous upper incisors in addition to the permanent pair, two had a single supernumerary lower premolar, and two each lacked a premolar, one a p1 and the other a P1. Additionally, 13 individuals had lost one or more teeth in life, one a lower canine and the others incisors or premolars.

The baculum is extremely small in both *B. plicata* and *B. io* and may be variable in size and shape (Brown et al., 1971). Two examined of each species were flat basally and rounded distally. The two *B. plicata* bacula measured 0.03 and 0.10 mm in length, and 0.03 and 0.08 in greatest breadth at base, respectively.

Females have a long, simple vagina, and a bicornuate uterus with a common corpus. Both ovaries are functional and are encased completely by the ovarian bursa (López-Forment, 1981).

Flight is relatively slow in this species, which is known to forage over open areas. Kennedy et al. (1977) measured flight speed of four males and 16 females as averaging 9.76 and 9.14 km/h, respectively. They postulated that *B. plicata* has a low aspect ratio for an emballonurid (Findley et al., 1972).

Novick (1962) found pulses emitted by an individual *B. plicata* in flight varied from 2.6 to 4.2 msec (average 3.2). Sounds had two components initially (21 and 42 khz) and three terminally (18, 36, and 54 khz); in no instance did a harmonic component, once present, disappear before the end of the pulse. Two bats "gently agitated in a net bag" produced pulses of 1.8 to 2.8 msec. Roosting bats had a fundamental frequency of 17 to 21 khz at the beginning of each pulse, dropping to 14 to 17 khz at the end; initially there were three measurable components of about 20, 40, and 60 khz, and sometimes a fourth harmonic as well. All pulses of *Balantiopteryx* are audible to the human ear and are emitted orally.

ONTOGENY AND REPRODUCTION. Peters' sac-winged bat has a single breeding period annually that usually is highly synchronous (Bradbury and Vehrencamp, 1976). In Guerrero, for example, López-Forment (1981) reported mating from late January to mid-February (by March, males had reduced numbers of spermatozoa); females gave birth to a single young from late June to mid-July. The gestation period of about 4.5 months generally is coincident with the dry season, although pregnant females have been recorded from throughout the range of the species from March, May, June, and July (Cockrum, 1955; Davis, 1944; Davis and Russell, 1954; Gaviño de la Torre et al., 1981; Jones et al., 1972; López-Forment, 1981; Ramírez-Pulido et al., 1977). Villa-R. (1967) and Watkins et al. (1972) reported lactating females in September.

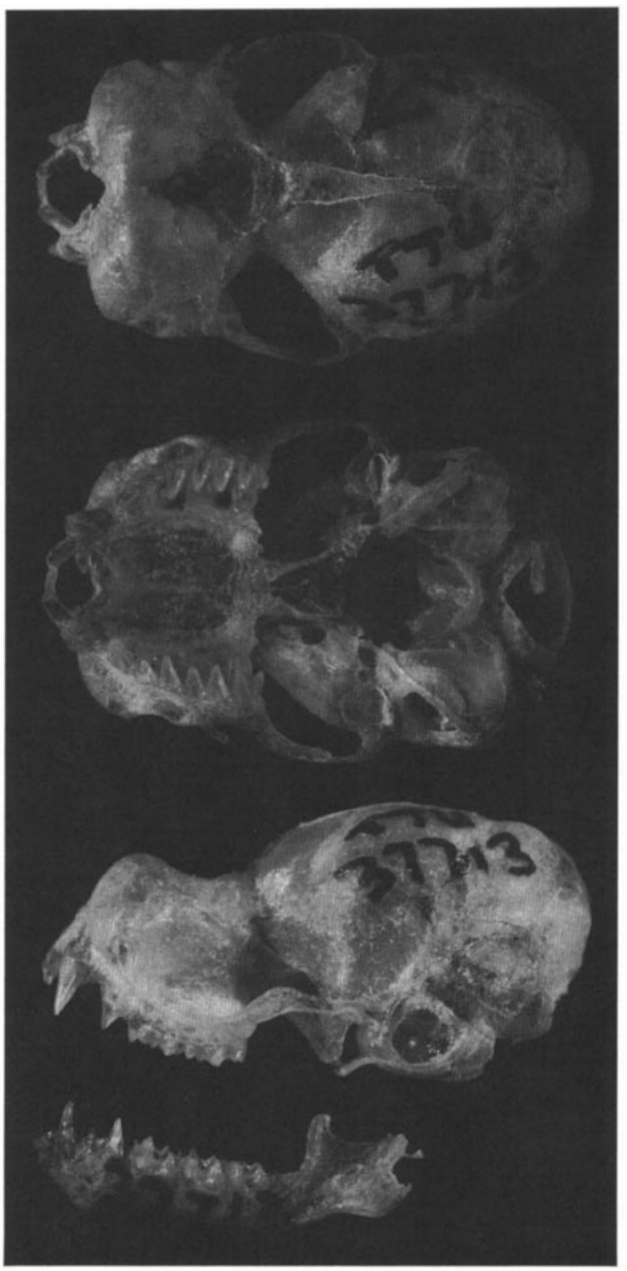

FIG. 3. Dorsal, ventral, and lateral views of cranium and lateral view of lower jaw of *Balantiopteryx plicata* (TTU 37713, male). Greatest length of skull is 14.6 mm.

This species is monotocous and monestrus (López-Forment, 1981; Ramírez-Pulido et al., 1977), not polyestrus as previously supposed (Carter, 1970). Spermatozoa can be found in males at any time, but their numbers gradually increase toward the end of the year as the breeding season approaches (López-Forment, 1981).

Young are relatively precocial at birth and first fly at about 2 weeks of age; they are fully weaned when about 9 weeks old (López-Forment, 1981). Eight pregnant females taken in June in Sinaloa (Jones et al., 1972) carried fetuses measuring 11 to 15 mm in crown–rump length. At birth, young weigh about 2 g, nearly a third of the mass of an adult female (a high ratio according to Davis, 1944). For about the first week, young are carried by their mothers on foraging flights, but thereafter are left at the roost or deposited in communal night roosts; dispersal of young takes place at 2 to 3 months of age; young females do not breed in their first year (Bradbury and Vehrencamp, 1976, 1977*b*; López-Forment, 1981).

Reproduction is said to be biased toward juvenile survival at the expense of parental survival in that breeding is timed to minimize risk to the offspring and also because females continue gestation (rather than abort) even under food stress. This led Bradbury and Vehrencamp (1977*b*) to conclude that *B. plicata* had the highest "parental effort" among emballonurids they studied. They found survival rates of adult females to be as low as 54%. The mating system employed by *B. plicata* is not understood clearly, but Bradbury and Vehrencamp (1977*a*) thought aggregations or "swarms" of mating males most likely.

López-Forment (1981) observed parturition behavior of a female and birth of a neonate in Guerrero. The female was apart from a roosting group in the early afternoon and evidenced regular contractions. As these grew stronger, she attempted to lick her vulvar area. The young bat was born suddenly, completely encased in fetal membranes that the female immediately began to lick, bite, and pull at with her wings, leaving the neonate hanging by the umbilical cord. Presently, the young one partially grasped the venter of the female upside down, being partly held in place by her wings. The whole sequence lasted 10 to 12 min. The female licked the new born until sunset, when observation ceased.

ECOLOGY AND BEHAVIOR. *Balantiopteryx plicata* evidently occupies mostly arid and semiarid areas with marked seasonality, habitats ranging from thorny scrub (Dolan and Carter, 1979; Ramírez-Pulido et al., 1977; Uribe-P. et al., 1981) and scrub forest with cacti (Winkelmann, 1962), to tropical deciduous forest (Gaviño de la Torre et al., 1981; López-Forment, 1981; Webb and Baker, 1969) and deciduous woodlands (Bradbury and Vehrencamp, 1976). López-Forment (1981) reported that all sites where he studied this species in Guerrero underwent strong seasonal changes in rainfall but not in temperature.

These sac-winged bats roost by day in colonies consisting of from a few individuals to as many as 2,000; López-Forment (1981) found mean colony size to be 25 in Guerrero, whereas Bradbury and Vehrencamp (1976) reported colonies ranging from 50 to 200 bats in Costa Rica. Colonies are of mixed sexes and spacing of about 20 cm normally is maintained between individuals (except when young are present), the whole group facing the same direction (López-Forment, 1981). Roosts are in caves, mines, crevices, sea cliffs, tree hollows, culverts, buildings, under bridges, and even under boulders (Alvarez, 1968; Davis, 1944; López-Forment, 1981; Ramírez-Pulido et al., 1977; Starrett and Casebeer, 1968), often near lakes, rivers, or other sources of free water. Roosts must have a minimum relative humidity of 25% or they are abandoned; other characteristics of them are that they are well lighted, often with more than one exit, and usually well removed from human habitation (López-Forment, 1981).

Size of colonies varies seasonally as does the ratio of males to females according to López-Forment (1981). Bradbury and Vehrencamp (1976) found only 23% females among 285 bats taken in Costa Rica, and López-Forment (1981) also noted that males generally outnumbered females in the colonies he studied. However, the latter author also found that there was a higher percentage of males in roosts in Guerrero at the beginning of the year (early dry season), when breeding takes place, and that the percentage of males dropped during the year, being lowest at the end of the rainy season (when greater numbers of males were netted some distance from colonial roosts). López-Forment's (1981) interpretation of these data was that many females remain at the same roosts year-round, whereas males move into otherwise dry, harsh habitats as the rainy season progresses. Populations reach their highest numbers at certain localities in the dry season—López-Forment (1981) estimated 10,000 bats/ha in one area in Guerrero.

As a genus, *Balantiopteryx* has been defined as a specialized aerial insectivore (Wilson, 1973). López-Forment (1981) found *B. plicata* to be an opportunistic feeder, taking a variety of insects to a size up to 8 to 9 mm in length that are well masticated; insects eaten were from the orders Hymenoptera, Coleoptera, and Hemiptera. Bradbury and Vehrencamp (1976) described three foraging patterns: 1) single foraging territories that are defended against conspecifics; 2) dispersed but coordinated groups, with considerable overlapping of flight paths; and 3) concentrated groups that move from site to site as a flock.

Peters' sac-winged bats frequently fly in long, unbroken bursts at 10 to 25 m above the ground or forest canopy (Bradbury and Vehrencamp, 1976), foraging at distances as much as 11 km from

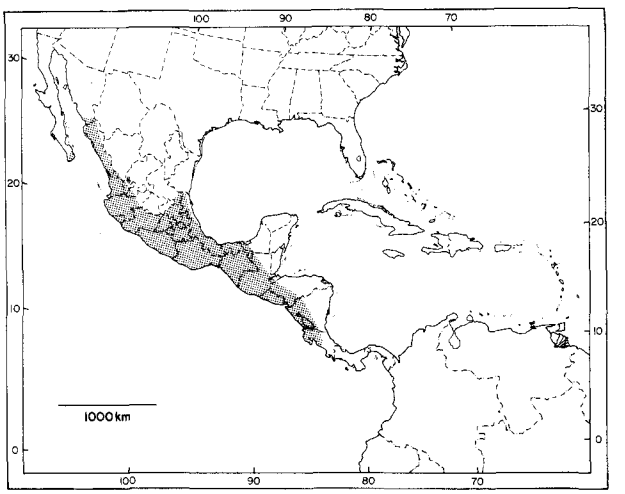

FIG. 4. Distribution in Middle America of *Balantiopteryx plicata* (after Hall, 1981).

home roosts (López-Forment, 1981). Other species of bats reported as sharing roosts with *B. plicata* include *Peropteryx macrotis, Pteronotus parnellii, Macrotus waterhousii, Micronycteris mexicanus, M. sylvestris, Glossophaga soricina, Anoura geoffroyi, Choeronycteris mexicana, Leptonycteris sanborni, Carollia subrufa, Artibeus hirsutus, A. jamaicensis,* and *Desmodus rotundus* (Davis, 1944; Hall and Dalquest, 1963; López-Forment, 1981; Watkins et al., 1972).

In Guerrero, López-Forment (1981) found that barn owls, *Tyto alba,* and spotted skunks, *Spilogale pygmaea,* preyed on *B. plicata*; he also suggested that hawks, coatis (*Nasua narica*), and domestic cats may be predators on this species. Mones (1968) and Ramírez-Pulido and Sánchez-H. (1972) reported remains of this bat from barn owl pellets from Oaxaca and Guerrero, respectively. López-Forment (1981) reported that ants, cockroaches, dermestid larvae, and the rock crab (*Grapsus grapsus*) feed on the guano, and the crab probably on dead bats as well. He also noted that a wasp, *Polystes* sp., may cause *B. plicata* temporarily to abandon roost sites.

Cain and Studier (1974) found no endoparasites in 10 specimens from Sonora. However, López-Forment (1981) found trematodes, cestodes, and nematodes in specimens from Guerrero, and mites of the families Trombiculidae (*Microtrombicula* sp., *Tomatlana* sp.) and Argasidae and batflies of the family Strebliidae as ectoparasites. Males had fewer mites than females, and young were more heavily parasitized than adults. Mites were found in ears, and on wing and tail membranes.

Flores Crespo et al. (1974) found that rabies in vampire bats (*Desmodus rotundus*) seemingly had no effect on populations of other bats, including *B. plicata,* inhabiting the same roosts.

GENETICS. A diploid chromosome number of 32 and a fundamental number of 60 first was reported for *B. plicata* by Baker (1970), based on specimens from Sonora. Hood and Baker (1986) confirmed these numbers, and reported that the X-chromosome is submetacentric and the Y is acrocentric (specimens from Jalisco). The latter authors also conducted G- and C-banding studies, and reported that *B. plicata* incorporated large amounts of heterochromatin in its autosomal complement.

ETYMOLOGY. *Balantiopteryx* is a combination of two Greek words meaning "pouch wing." The specific name is from the Latin *plicatus* (folded).

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