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Rhogeessa parvula.

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Rhogeessa H. Allen, 1866

Rhogeëssa H. Allen, 1866:285. Type species *Rhogeessa tumida* H. Allen, 1866:286, by subsequent designation (Miller 1897).
Rhogöessa Marschall, 1873:11. Incorrect subsequent spelling of *Rhogeëssa* H. Allen, 1866:285.
Baeodon Miller, 1906:85. Type species *Rhogeessa alleni* Thomas, 1892:477, by original designation.
Baedon Alvarez and Aviña, 1965. Incorrect subsequent spelling of *Baeodon* Miller, 1906:85.

CONTEXT AND CONTENT. Order Chiroptera, family Vespertilionidae, subfamily Vespertilioninae, tribe Nycticeiini. *Rhogeessa* contains 2 subgenera, *Rhogeessa* and *Baeodon*, and 10 species (Genoways and Baker 1996). The following key to the subgenera and species of *Rhogeessa* is derived from characters described in Audet et al. (1993), Baker (1984), Bickham and Baker (1977), Genoways and Baker (1996), LaVal (1973; characters 1–4), and Ruedas and Bickham (1992).

1. Greatest length of skull > 14.5 mm; i3 unicuspid, one-sixth to one-eighth cross-sectional area of i2; ratio of length of 3rd metacarpal to length of 1st phalanx of 3rd digit = 2.2:1 ..... subgenus *Baeodon*; *R. alleni*
   Greatest length of skull < 14.5 mm; i3 often bicuspid, > one-sixth cross-sectional area of i2; ratio of length of 3rd metacarpal to length of 1st phalanx of 3rd digit > 2.2:1 ..... subgenus *Rhogeessa*; 2
2. Length of ear ≥ 18 mm; hairs of dorsal fur 3-banded, darker at bases ..... *R. gracilis*
   Length of ear ≤ 15 mm; hairs of dorsal fur 2-banded, paler at bases 3
3. Greatest length of skull = 11.4 mm; lingual cingulum of C1 smooth, lacking cusps ..... *R. mira*
   Greatest length of skull 11.9–13.5 mm; lingual cingulum of C1 not smooth, usually with cusps 4
4. Uropatagium sparsely to heavily furred from base to point halfway between knees and feet; i3 usually much smaller than i2 ..... *R. parvula*
   Uropatagium furred only at base; i3 usually only slightly smaller than i2 5
5. Color pale; length of forearm usually < 27.6 mm; distribution along northern coast of South American in Venezuela and Colombia ..... *R. minutilla*
   Color dark; length of forearm usually > 27.6 mm 6
6. Karyotype: 2n = 52, FN = 52 ..... *R. hussoni*
   Karyotype: 2n < 52 7
7. Karyotype: 2n = 42; distribution Pacific versant of Chiapas, Mexico ..... *R. genowaysi*
   Karyotype: 2n < 42, or distribution other than Chiapas, Mexico 8
8. Karyotype: 2n = 34 ..... *R. tumida*
   Karyotype: 2n < 34 9
9. Karyotype: 2n = 32; distribution in Belize, northern Guatemala, or throughout Yucatan Peninsula ..... *R. aeneus*
   Karyotype: 2n = 30 or 32; distribution from central Nicaragua throughout northern South America ..... *R. io*

Rhogeessa parvula Allen, 1866

Little Yellow Bat

R[hogeëssa] parvula H. Allen, 1866:285. Type locality "Tres Marias, Mexico."
Vesperugo parvulus: Thomas, 1881:203. Name combination.
Rhogeëssa parvula parvula: Hall, 1952:231. Name combination.
Rhogeëssa tumida major Goodwin, 1958:4. Type locality "San Bartolo Yautepec, Oaxaca, Mexico, 800 m."

CONTEXT AND CONTENT. Context as above. *R. parvula* belongs to the *R. tumida* complex (Genoways and Baker 1996), which includes 6 other species: *aeneus* (Goodwin 1958), *genowaysi* (Baker 1984), *hussoni* (Genoways and Baker 1996), *io* (Thomas 1913), *minutilla* (Miller 1897), and *tumida* (Allen 1866). Two subspecies currently are recognized (Wilson 1991):

R. p. major Goodwin, 1958:4; see above.
R. p. parvula H. Allen, 1866:285; see above.

DIAGNOSIS. *Rhogeessa parvula* (Fig. 1) is distinct from other species in the genus in the following ways: uropatagium sparsely to heavily furred from base to point halfway between knees and feet; i3 usually much smaller than i2 (Fig. 2; LaVal 1973).

In *R. parvula*, the cingulum of canines is almost straight on the labial side, whereas in *R. tumida* it is convex. Further, from an internal lateral view, the cingulum in *R. tumida* exhibits 2 well-developed lobes, but in *R. parvula* this area has no conspicuous topographic features. Two other differences are: the upper profile of the skull in *R. tumida* slopes slowly from the anterior border of the nasals to the occiput, without any clear horizontal portion, whereas in *R. parvula* the profile slopes more or less abruptly in the frontal area, and is horizontal on top of the braincase. In *R. tumida*, the ears are darker and contrast more sharply with the dorsal coloration than in *R. parvula* (Alvarez and Aviña 1965).

LaVal (1973) noted extensive morphological variation in *R. tumida*, but found no correspondence to chromosomal and genic grouping. Additionally, Baker (1984) did not identify any cranial measurements distinguishing the chromosomal groupings. No other characters have been found to consistently distinguish *R. parvula*, *R. tumida*, and *R. genowaysi* (Baker et al. 1985; LaVal 1973).

GENERAL CHARACTERS. *Rhogeessa parvula* was described by Allen (1866) as follows: ear subacute at tip; lips whiskered; eyes very small, each with a wart above; and a wart beneath chin. Fur above silky, not thick, of a light grayish brown for basal one-third, fawn/chestnut/brown for apical two-thirds; fur of head same color, and covering the ears for one-half their length. Beneath, basal one-third of fur length inclined to grayish and apical two-

FIG. 1. Photograph of a live specimen of *Rhogeessa parvula* from the tropical dry forest of the Chamela–Cuixmala Biosphere Reserve. Photograph by Gerardo Ceballos, reprinted with permission from *Los Mamíferos Silvestres de México* (Ceballos and Oliva 2005).

FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of an adult male *Rhogeessa parvula* (TTU 6074 [The Museum, Texas Tech University mammal collection]) from 9 km west of Rio Piaxtla, on Highway 15, at highway marker 1289, Sinaloa, Mexico. Greatest length of skull was 12.1 mm. Used with permission of photographer Hugo Mantilla-Meluk.

thirds to grayish fawn. Membranes almost black and naked, except basal one-fourth of interfemoral membrane behind, which has a small, short patch of glistening fur. The pelage coloration noted by Alvarez and Aviña (1965) was yellowish, and the ears with less contrast with the dorsal coloration than occurs in *R. tumida*.

The upper side of the uropatagium is well furred to about midtibia (Wilson 1991). The skull is tiny, with an unusually narrow postorbital region (Wilson 1991). Skulls are consistently narrower in individuals from Tres Marias Islands, Nayarit, Mexico, especially in the area of the mastoid, at which point no island skulls measure >6.5 mm and no mainland specimens measure <6.5 mm (Wilson 1991).

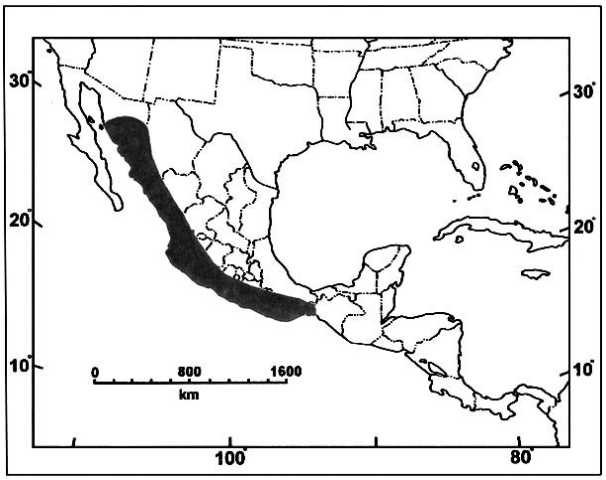

FIG. 3. Geographic distribution (shaded area) of *Rhogeessa parvula*. Map redrawn from Genoways and Baker (1996) and Medellín et al. (1997).

Standard measurements (in mm) for specimens of *R. parvula* are: total length, 68.8–79.0; length of tail, 26.1–32.0; length of hind foot, 4.4–7.0; length of ear, 11.9–14.0; length of forearm, 27.7–29.8; greatest length of skull, 11.9–12.7; zygomatic breadth, 7.5–8.4; and length of maxillary toothrow, 4.2–4.6 (Wilson 1991).

Adults of *R. parvula* typically weigh ca. 5 g (Baker et al. 1985), but range from 3 to 8 g (LaVal 1973). Two males from Sinaloa, Mexico, and 1 nonpregnant female weighed 3.3, 3.2, and 3.1 g, respectively (Jones et al. 1972). One pregnant female collected in Sinaloa weighed 4.7 g (Jones et al. 1972). No seasonal trends in body mass have been detected (LaVal 1973).

Size variation in *R. parvula* has been described as clinal with bats increasing in size from north to south. Length of forearm supports this claim (26.0 mm in north, to 30.9 mm in the south—LaVal 1973). However, reexamination of LaVal's data revealed that the smallest bats occurred in Nayarit, Mexico, with size increasing both to the north and to the south (Wilson 1991).

Dimensions (mean with range, in mm) of bacula from 28 individuals are: length, 0.63 (0.48–0.76); depth, 0.13 (0.08–0.20); and width, 0.34 (0.22–0.42—LaVal 1973). Bacula have a long, slender, curved shaft, roughly elliptical in cross section, with short proximal knobs extending at 45° angles to the sagittal planes of the bacula, and separated proximally by indentations, and curving ventrally around the urethra (LaVal 1973). The baculum of 1 specimen of *R. parvula* from Sinaloa, Mexico, was described by Brown et al. (1971) as having a greatest length of 0.73 mm and its greatest width at the base. Additionally, the central rib of the baculum was a rounded rod, bowed ventrad, with lateral flanges that arise near the base and curve ventrad. In dorsal aspect, the base appears concave and the sharp-tipped flanges taper rapidly toward the central rib.

DISTRIBUTION. *Rhogeessa parvula* is distributed on the Pacific versant of mainland Mexico from central Sonora southward to the western edge of Oaxaca (Fig. 3). *R. parvula* has been caught at elevations as low as ca. 125 m (Alvarez and Aviña 1965). *R. p. parvula* occurs in the lowlands of western Mexico at least as far north as southern Sinaloa (Jones 1964). No fossils are known.

FORM AND FUNCTION. *Rhogeessa parvula* is a very small bat with no external specializations. Ears are small and round, and flight membranes are relatively thick and strong. Tail extends the full length of a broad, naked interfemoral membrane (Goodwin and Greenhall 1961). The dental formula is i 1/3, c 1/1, m 4/5, total 30 (Fig. 2; Allen 1866).

ONTOGENY AND REPRODUCTION. Pregnant female *R. parvula* were collected in Tres Marias Islands from the end of February to early June, and lactating females were captured from 27 April to 3 July (LaVal 1973). At least 8 females from Sinaloa and Sonora, Mexico, contained 2 embryos, but 2 bats from Guerrero, Mexico, and 1 from Sonora contained only 1 embryo each (LaVal 1973). Four females collected in May in Sinaloa each contained 2 embryos (mean crown–rump length, in mm, for pairs of

embryos: 6, 10, 10, 10), and 2 of 7 females caught in June were gravid (mean crown–rump length, in mm, for pairs of embryos: 10, 13). The other 5 had enlarged mammae (Jones et al. 1972). One female captured in July also had enlarged mammae (Jones et al. 1972). Flying juveniles were taken on 14 June, 18 July, and 9 and 18 September (exact location not specified—LaVal 1973). The presence of flying young and embryos in Guerrero in June and February–March, respectively, suggests that parturition occurs earlier in the southern portion of the range of *R. parvula* (LaVal 1973). One molting female from Tres Marias Islands was recorded 4 July, presumably just after weaning her young (LaVal 1973). One subadult and 1 adult female were taken 23 June 1970 in a mango orchard at Santa Rosa, Mexico (Matson and Patten 1975). One male *R. p. parvula* captured on 30 October had testes 6 mm in length (Jones et al. 1972).

ECOLOGY. From 1950 to 1968 in Sinaloa, Mexico, *R. parvula parvula* was captured mainly over ponds or streams. Collection elevations ranged from 3 to 549 m (Jones et al. 1972). However, 2 specimens were collected in Santa Rosa at 1,219 m (Matson and Baker 1986).

On 12 June 1962, 1 male *R. parvula* was netted over the Rio Elota at 396 m elevation in Durango, Mexico, with *Nyctinomops femorosaccus* (= *Tadarida femorosacca*) and 3 unspecified *Artibeus* (Jones 1964). The region of the Rio Elota is notable because it was where subtropical vegetation occurred. A fairly narrow belt of this vegetation occupies moderate elevations on the western slope of the Sierra Madre Occidental at the latitude of Durango in western Mexico, and dendritic extensions of this type of habitat occur eastward along the valleys of most of the larger rivers that flow from the mountains to the Gulf of California or the Pacific Ocean (Jones 1964).

Ten *R. parvula* were mistnetted on 25 and 27 March 1964 in an area of cactus–mesquite vegetation at the base of a low cliff over water 7 km north of El Infiernillo, Michoacan, Mexico (18°17′N, 101°50′W), at an elevation of ca. 125 m with the following species: *Balantiopteryx p. plicata*, *Macrotus waterhousii mexicanus*, *Micronycteris megalotis mexicana*, *Rhogeessa alleni*, and *R. tumida* (Alvarez and Aviña 1965; LaVal 1973). Daytime temperatures were 35–40°C and nighttime temperature was only slightly cooler (Alvarez and Aviña 1965).

At Maria Madre in Tres Marías Islands, *R. parvula* was captured with *Bauerus dubiaquercus* (= *Antrozous dubiaquercus*), *Artibeus lituratus*, *Glossophaga soricina*, *Lasiurus borealis*, and *M. waterhousii* (Bogan 1978). All were mistnetted between February and March 1976, over small trickling pools in arroyos.

Two *R. parvula* were collected in 1976 in Tres Marias Islands in brilliant morning sunshine (Wilson 1991). *R. parvula* is common on all islands in this group and usually tends to fly early in the afternoon, well before dusk in many cases (Wilson 1991).

GENETICS. Within the genus *Rhogeessa*, the 2n = 44, FN = 50 karyotype is unique to *R. parvula*, with no reported intraspecific chromosomal variation (Bickham and Baker 1977; LaVal 1973). This karyotype is further distinguished from the other species in the genus by the 4 biarmed autosomes. However, the 2n = 44, FN = 50 cytotype occurs in 2 other genera of Vespertilionidae, *Myotis* and *Pipistrellus* (Baker 1970). *R. parvula* possesses an autosomal complement containing 1 large, 1 medium, and 1 small pair of metacentrics; 1 pair of medium subtelocentrics; and 17 pairs of acrocentrics grading in size from medium to small. The X chromosome is a medium submetacentric; the Y is a small submetacentric (Baker and Patton 1967). Two specimens of 2n = 44, FN = 50 were initially identified by Baker and Patton (1967) as *R. gracilis*, but were later placed among *R. parvula* (LaVal 1973).

Relative to the standard karyotype (Bickham 1979; Volleth 1985) proposed for vespertilionid bats, the 4 biarmed chromosomes consist of the 16/17 fusion element that is primitive for *Myotis*, *Eptesicus*, and the genus *Rhogeessa*; a fusion of the 20/18 elements, which is shared by all *Rhogeessa*; and the fusion of the 3/1 and the 25/5, which are unique to *R. parvula*. In middle America alone, 2n = 44 appears to represent a reproductively isolated lineage (Baker et al. 1985).

Twenty-one presumptive loci coding for enzymes and serum proteins were assayed using enzyme staining and electrophoretic techniques (Baker et al. 1985). These included malate dehydrogenase-1,2 (*Mdh-1,2*), lactate dehydrogenase-1,2 (*Ldh-1,2*), isocitrate dehydrogenase-1,2 (*Idh-1,2*), general protein-4 (*GP-4*), 6-phosphogluconate dehydrogenase (*6-Pgd*), mannose-6-phosphate (*Mpi*), phosphoglucose isomerase-1,2 (*Pgi-1,2*), phosphoglucomutase-1,2 (*Pgm-1,2*), peptidase-1 (*Pep-1*, substrate = glycyl-L-leucine), peptidase-2 (*Pep-2*, substrate = leucylglycylglycine), leucine aminopeptidase (*Lap*), esterase-1,2 (*Est-1,2*), alcohol dehydrogenase (*Adh*), glutamate oxalate transaminase-1 (*Got-1*), and α-glycerophosphate dehydrogenase (α-*Gpd*). The allele at the *Mdh-1* locus is shared with the outgroup *Eptesicus fuscus* (Baker et al. 1985). The isozyme alleles at the following loci are also distinctive from that of all other *Rhogeessa*: *Mpi*; *Pgi-1,2*; *Pgm-2*; *Pep-2*; *Est-1*; *Adh*; *Got-1*; α-*Gpd* (Baker et al. 1985). Nei's genetic identity (Nei 1972) is 0.42 for *R. parvula*, 0.36 for *R. genowaysi* and *R. aeneus*, and 0.41 for *R. io* and *R. hussoni* (Baker et al. 1985).

CONSERVATION STATUS. *Rhogeessa parvula* is listed as lower risk, near threatened (International Union for Conservation of Nature and Natural Resources; www.iucnredlist.org). Arroyo-Cabrales and Baker (2005) indicated that this species is common at isolated localities but recommended that habitat should be protected at these localities because the number of localities at which this species has been collected is low given the geographic range of the species.

REMARKS. In the 1960s, what today is recognized as the *R. tumida* complex consisted of the 3 smallest bats in the genus *Rhogeessa*: *parvula*, *tumida*, and *minutilla*. *R. parvula* and *R. tumida* were distributed from Mexico to Trinidad (excluding Tobago) and thought to be sympatric. Ultimately, *R. parvula* was restricted to the western coast of Mexico, whereas *R. tumida* occupied the remainder of the range (northern and western South America and Central America). *R. parvula* was distinguished from *R. tumida* primarily by chromosomal differences (Baker 1984). Additional chromosomal differences (Baker et al. 1985) defined other geographically restricted units. The Latin derivation of *parvula* means little. The etymology for *Rhogeessa* remains elusive.

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