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MORPHOLOGICAL VARIATION IN *STENODERMA RUFUM*

For more than 100 years, the red fruit-eating bat, *Stenoderma rufum* Desmarest, 1820, was known only by a specimen of unknown geographic provenience. Anthony (1918, 1925) rediscovered *Stenoderma* in Puerto Rican cave deposits, but the first living specimens to be reported since the original description were taken on St. John in the Virgin Islands (Hall and Bee, 1960). Subsequently, Tamsitt and Valdivieso (1966) recorded living representatives from Puerto Rico—from a population later named and described as a distinctive subspecies, *Stenoderma rufum darioi*, by Hall and Tamsitt (1968). The latter authors also reported a specimen of *S. r. rufum* from St. Thomas. Choate and Birney (1968), based on their study of Recent and sub-fossil material, named and described a third subspecies, *Stenoderma rufum anthonyi*, from cave deposits in Puerto Rico. The only other recent references in the literature to *Stenoderma* are those of Tamsitt and Fox (1970), who recorded a listrophorid mite from a specimen from Puerto Rico, and two papers on electrophoretic properties of hemoglobin (Valdivieso *et al.*, 1969, and Tamsitt and Valdivieso, 1969); *S. rufum* remains one of the least known of North American phyllostomatids. In the period 17–20 July 1969, one of us (Baker) took 28 specimens, 17 males and 11 females (housed in the collections at Texas Tech University, TT 8858-84, 9830), in mist nets set near the El Verde Research Station, Laquillo National Forest, Puerto Rico. These, along with a male and female in the Museum of Natural History at The University of Kansas (KU 114009-10) from the same place that were earlier reported by Hall and Tamsitt (*op. cit.*), form the basis for the present report on variation in *S. rufum* from that island. Also, we have used in our comparisons two of the three specimens from St. John (KU 74030-31) reported by Hall and Bee (*op. cit.*) as well as the holotype of *S. r. anthonyi*.

At the El Verde Research Station, red fig-eating bats were taken in nets set in tropical broad-leaf forest and above the forest canopy. In the latter situation, a 30-foot net was stretched between two towers above the dense canopy. Two *Stenoderma*, two *Brachyphylla cavernarum*, and four *Artibeus jamaicensis* were taken in this net. Other species of bats netted within the forest along with *Stenoderma* included *Pteronotus parnellii*, *Monophyllus redmani*, *Erophylla bombifrons*, *Eptesicus fuscus*, and *Molossus molossus*. Of the adult females of *S. rufum* preserved, one of six was lactating but the others showed no gross reproductive activity. However, six females that were pregnant when captured (the embryo in each appeared near term) were banded and released. One gave birth about an hour after capture; the neonate immediately attached to a teat and was carried easily by the female when she was later released.

Secondary sexual variation is marked in our Puerto Rican samples. Males average smaller than females in every measurement analyzed (Table 1), significantly so at the .05 level in two and at the .01 level in eight (forearm and seven cranial dimensions). Choate and Birney (1968:409) suggested, on the basis of evidence from subfossil material, that sexual dimorphism occurred in *Stenoderma*, as implied also by the measurements listed by Hall and Tamsitt (1968:3). The female of *S. r. rufum* from St. John is considerably smaller than females from Puerto Rico, being even slightly smaller in some measurements (Table 1) than the male from St. John. The latter does not differ in size from Puerto Rican males. Sexual dimorphism of the magnitude seen in the Puerto Rican population has been reported also for the related Antillean genus *Ardops* (Jones and Schwartz, 1967:4).

The measurements of immature specimens (those with a grayish pelage and unfused or incompletely fused phalangeal epiphyses) are not included in Table 1 because their crania, although nearly of adult size, were significantly smaller statistically in some dimensions. Additionally, the forearms of immature males were significantly shorter than those of adults.

Color of the dorsum in our Puerto Rican series varies from tan to a dark chocolate brown. The darkest individuals appear to be those that only recently completed molt from juvenile to adult pelage. Two of our specimens are noticeably paler than others from

TABLE 1.—Selected measurements of *Stenoderma rufum*.

Measurements	Puerto Rico				St. John, Virgin Islands	
	Males		Females		Male	Female
	N	Mean (Range) ± 1SE	N	Mean (Range) ± 1SE	KU74030	KU74031
Total length	13	65.5(60.0–73.0) ± 0.92	5	67.8(66.0–70.0) ± 0.66	61.0	65.0
Length of hind foot	13	13.4(12.0–15.0) ± 0.24	5	13.8(13.0–15.0) ± 0.37	15.0	16.0
Length of ear	13	17.4(16.0–19.0) ± 0.29	5	17.8(17.0–18.0) ± 0.20	18.0	18.0
Length of forearm**	14	47.5(46.2–48.8) ± 0.26	6	49.7(48.9–51.0) ± 0.36	47.7	47.3 ¹
Greatest length of skull**	15	22.3(21.8–22.9) ± 0.08	7	22.9(22.6–23.4) ± 0.10	22.3	22.1
Zygomatic breadth**	15	14.8(14.4–15.4) ± 0.07	7	15.4(15.2–15.8) ± 0.08	14.8	14.7
Postorbital constriction*	15	5.5 (5.2–5.8) ± 0.05	7	5.7 (5.5–6.0) ± 0.06	5.6	5.7
Breadth of braincase	15	10.7(10.3–11.0) ± 0.06	7	10.8(10.5–11.3) ± 0.11	10.5	10.6
Mastoid breadth*	15	12.3(11.8–12.7) ± 0.06	7	12.7(12.4–13.5) ± 0.14	12.2	12.5
Length of maxillary tooththrow (C-M3)**	15	6.9 (6.7–7.2) ± 0.04	7	7.2 (6.9–7.4) ± 0.07	6.9	6.8
Breadth across upper molars (M2)**	15	9.7 (9.5–9.8) ± 0.03	7	10.0 (9.8–10.2) ± 0.06	9.7	9.6
Depth of braincase**	15	11.9(11.4–12.3) ± 0.06	7	12.3(12.0–12.8) ± 0.11	11.8	12.5
Length of mandible**	15	13.2(12.8–13.6) ± 0.06	7	13.9(13.6–14.1) ± 0.06	—	13.5
Height of coronoid process** ³	15	7.7 (7.4–7.8) ± 0.03	7	7.9 (7.7–8.0) ± 0.04	—	7.7

¹ Forearm measured on skeleton.² Measurement includes incisors.³ Measured from tip of coronoid process to a line parallel with the ventral surface of the ramus, in order to duplicate "height of coronoid" as used by Choate and Birney (1968:409).

TABLE 2.—Dorsal color reflectance values for adults of *Stenoderma rufum* from Puerto Rico (average, extremes, and one standard error for 19 specimens) and two specimens from St. John, the Virgin Islands. Readings were taken in the middorsal region with a Photovolt Photoelectric Reflectance Meter (Model 610).

Color	Puerto Rico	St. John
Red	16.5 (11.5–23.5) \pm 0.68	25.5, 27.5
Green	7.1 (4.5–10.5) \pm 0.32	12.5, 14.0
Blue	5.9 (4.0–10.5) \pm 0.33	9.0, 10.5

Puerto Rico and approach August-taken *S. r. rufum* in color (the latter described as Buckthorn Brown dorsally by Hall and Tamsitt, 1968:3). Reflectance readings of the dorsal color in *S. r. darioi* and *S. r. rufum* are given in Table 2; the upper readings in each instance for *darioi* are those of the palest of the two specimens mentioned above. Six Puerto Rican specimens (three males and three females) are in juvenile pelage, which is grayer than adult pelage and is fuzzy in appearance. All specimens, adults and juveniles, are noticeably darker ventrally than dorsally, and all have the characteristic white spots on the side of the neck and at the dorso-anterior base of the wing.

Of the 30 specimens studied from Puerto Rico, all but one had the complete dental complement for the genus, and none revealed dental caries or loss of teeth in life. A female (KU 114009) lacked the minute and peglike third lower molar on both sides. The describers of *S. r. anthonyi* (Choate and Birney, 1968:407–408) claimed for that subfossil race a "more or less pronounced accessory cusplet on the posteriointernal surface of the entoconid of the first lower molar," which was larger than that in any Recent specimens examined by them. Comparison of our Puerto Rican material with the holotype of *anthonyi* reveals that this cusplet is, indeed, larger in *anthonyi* than in *darioi*, but rarely proportionately so, inasmuch as the teeth of *anthonyi* are the larger overall. We also noted that the labial cingula of the first two lower molars of *anthonyi* are much better developed than in *darioi* and support more prominent lingular cusps.

All phyllostomatid bats thus far examined lack a baculum (Jones and Genoways, 1970), and it was not surprising, therefore, to find that *Stenoderma rufum* (three males examined) also lacks this bone. Chromosomes of *S. rufum* will be discussed elsewhere.

In summary, *Stenoderma rufum* is a polytypic species that is represented in Puerto Rico by *S. r. darioi*, a population characterized both by marked secondary sexual dimorphism and by darker color than in the other Recent race, *S. r. rufum* from the Virgin Islands. The subfossil *S. r. anthonyi* from Puerto Rico is much larger than *darioi* and differs from it also in several dental details.

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RECORDS OF BATS FROM HONDURAS AND NICARAGUA

Field collections in Honduras and Nicaragua in the summer of 1969 produced several significant distributional records of bats from these two countries. LaVal (1969) reviewed the literature pertinent to the chiropteran fauna of Honduras. Some important contributions to knowledge of bat distribution in Nicaragua are those of Davis *et al.* (1964), Jones (1964), and Carter *et al.* (1966).

Elevation, types of natural vegetation (for explanation see LaVal, 1969), and the major types of disturbed vegetation (in parentheses) for each Honduran locality follow: 36 km (by road) SE Choluteca, 600 m, Depto. Choluteca, tropical deciduous forest (coffee fincas); 5 km N Talanga, 750 m, Depto. Francisco Morazan, highland pine (lumbering); Lancetilla, 40 m, Depto. Atlantida, tropical lowland rain forest (banana groves, second growth forest, and botanical gardens); La Esperanza, 1660 m, Depto. Intibuca, cloud forest (pine-oak woodland maintained by grazing and burning; cleared cropland). The only locality at which collections were made in Nicaragua, 6 km N Tuma, 500 m, Depto. Matagalpa, is an area of tropical rain forest and gallery forest which has been partly cleared for grazing and cultivation of coffee. The specimens reported here are deposited in the Texas Cooperative Wildlife Collection, Department of Wildlife Science, Texas A&M University. All measurements are in millimeters and weights are in grams.

Peropteryx kappleri Peters.—HONDURAS: 5 km N Talanga, two males, 26 July. This large emballonurid has not been reported from Honduras since 1942 when it was first listed by Goodwin. It has been recorded from the adjoining countries of Guatemala and Nicaragua only by Sanborn (1937). Our specimens, along with a third individual that escaped, were roosting in a narrow crevice in the roof of a shallow cave about 30 feet inside the entrance. Measurements are within the range of those listed by Sanborn (1937). One weighed 16.8 and the other 17.2

Miconycteris hirsuta (Peters).—NICARAGUA: 6 km N Tuma, two males, 19 and 23 July. This species has not been reported from Nicaragua, although it is represented by seven specimens from Honduras and Costa Rica (see LaVal, 1969, and Gardner *et al.*, 1970). The specimens were netted in banana groves shaded by tall, second growth forest.