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Erophylla sezekorni.

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Erophylla Miller, 1906

Erophylla Miller, 1906:84. Type species *Phyllonycteris bombifrons.*

CONTEXT AND CONTENT. Order Chiroptera, Family Phyllostomatidae, Subfamily Brachyphyllinae (see Baker, 1978). The genus *Erophylla* is monotypic, containing only *Erophylla sezekorni.*

Erophylla sezekorni (Gundlach, 1861)

Brown Flower Bat

Phyllonycteris sezekorni Gundlach, 1861:818. Type locality Cuba.
Phyllonycteris planiforns Miller, 1899:34. Type locality Nassau, Bahamas.
Phyllonycteris bombifrons Miller, 1899:36. Type locality cave near Bayamon, Puerto Rico.
Phyllonycteris santacristobalensis Elliot, 1905:236. Type locality San Cristobal, Dominican Republic.
Erophylla sezekorni syops Allen, 1917:167. Type locality Montego Bay, Jamaica.
Erophylla planifrons mariguanensis Shamel, 1931:252. Type locality Mariguana Island, Bahamas.

CONTEXT AND CONTENT. Context noted in generic summary. Two subspecies are recognized as follows (Buden, 1976):

E. s. sezekorni Gundlach, see above (*mariguanensis, planifrons,* and *syops* are synonyms).
E. s. bombiforns Miller, see above (*santacristobalensis* a synonym).

DIAGNOSIS. The following diagnosis is taken primarily from Anthony (1918); size medium; ears simple, about as long as broad; nose-leaf rudimentary but always present, represented by a low, pointed, median projection upon a naked, tumid, nasal pad (figure 1); lower lip with median split; tail short, terminal half free; interfemoral membrane narrow; calcar present but vestigial; skull moderately narrow (figure 2); zygomatic arch complete; lower molars with a distinct cutting edge. For additional information see Anthony (1918), Hall and Kelson (1959), and Buden (1976).

In the field, the main identification problem is distinguishing specimens of *Erophylla* from those of *Phyllonycteris.* The most reliable character is the presence of a calcar in *Erophylla* (absent in *Phyllonycteris*). The next best character is the degree of development of the nose-leaf, which is always present in *Erophylla* but never as well developed as in other sympatric genera of phyllostomatids such as *Monophyllus.* In *Phyllonycteris,* the nose-leaf is reduced or absent. This character is of doubtful use to the novice as it is a relative condition that is not extremely obvious even when live specimens of both genera are in hand (observations based on specimens of *Erophylla s. sezekorni* and *Phyllonycteris aphylla*). The two genera are easily distinguished by cranial features. *Erophylla* has a well developed zygomatic arch and the second and third lower molars are distinctly cuspidate, whereas *Phyllonycteris* has no zygomatic arch and the second and third lower molars are not distinctly cuspidate.

GENERAL CHARACTERS. External characteristics of adult *Erophylla sezekorni* (figure 1) include: tragus with notched edges; dorsal hairs distinctly bicolored, white for more than half the basal portion, the distal portion tipped with chestnut brown (from shoulders posteriorly the color is darker than anteriorly where the white of the basal portions shows through); paler on head and face, the hairs shorter and unicolored; uniform wood-brown ventrally, the bases of hairs whitish. The skull (figure 2) is characterized by a long rostum with a marked concavity in the region of the nasal termination; braincase rising abruptly from the rostral plane; zygomatic arch complete; basisphenoid pits present; ramus long and straight, coronoid low, condyle in plane of toothrow, angular process well developed; upper incisors of inner pair not meeting at midline, crowns expanded laterally, slightly bifid; upper outer incisors smaller than those of inner pair; canines large; second premolar larger than first, both with wide anteroposterior crown; first upper molar nearly twice as long as wide, outer border forming nearly flat cutting edge; second upper molar subtriangular across crown, cutting edge indented medially; third molar small, triangular, with straight cutting edge; molar series low crowned. Dental formula is: i 2/2, c 1/1, p 2/2, m 3/3, total 32. The above description is taken from Anthony (1918).

Means and extremes of measurements (table 1) for specimens of *Erophylla* were given by Buden (1976).

Specimens of *E. s. sezekorni* are generally larger than specimens of *E. s. bombifrons* and the two subspecies are also distinguished by the shape of the rostrum. *E. s. sezekorni* has a more gently sloping rostrum than does *E. s. bombifrons.* The magnitude of these differences is illustrated in Figure 3.

DISTRIBUTION. Specimens of *E. s. sezekorni* have been reported from the following localities: Cuba (type locality, Gundlach, 1861); Bahama Islands (including Great Abaco, New Providence, Andros, Eleuthera, Cat Island, Great Exuma, Little Exuma, Long Island, San Salvador, Crooked Island, Acklins Island, Mayaguana, and Great Inagua); from the Caicos Bank (on Providencialies, Middle Caicos, North Caicos, and East Caicos); Jamaica; and the Cayman Islands (including Isle of Pines, Grand Cayman, and Cayman Brac). See Figure 4.

E. s. bombifrons has been reported from localities on the island of Puerto Rico—Bayamon (type locality, Miller, 1899); Cueva de Fari, near San Juan; Cueva Cathedral, Morovis; 8.8 km NE Utuado; Corozal; El Verde Experimental Area, Luquillo National Forest—and on the island of Hispaniola from Haiti near the town of Lebrun (Klingener *et al.*, 1978) and from the Dominican Republic from near San Cristobal.

FOSSIL RECORD. All fossil records of *E. sezekorni* are from late Pleistocene to Recent. Fossil specimens have been reported from Jamaica (Williams, 1952), Cuba (Arredondo, 1970; Silva-Taboada, 1974; Koopman and Ruibal, 1955), and Hispaniola (Miller, 1929).

FORM. Benedict (1957) described the hair structure of four specimens of *E. s. bombifrons.* All descriptions refer to the body hair. The overhair length is 8 mm with a maximum diameter (distally on shaft) of 25.5 μ. The underhair

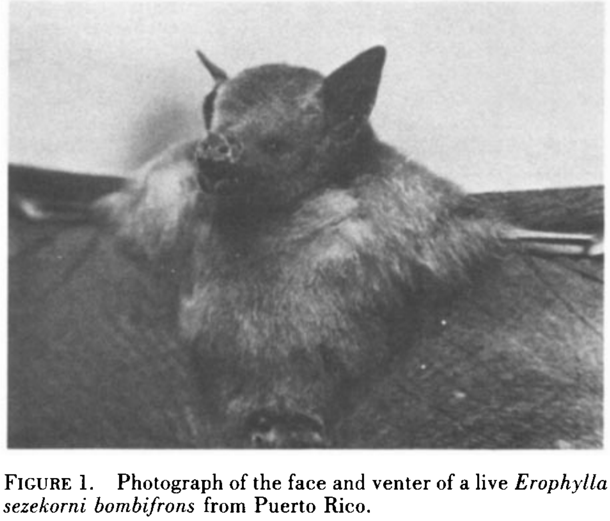

FIGURE 1. Photograph of the face and venter of a live *Erophylla sezekorni bombifrons* from Puerto Rico.

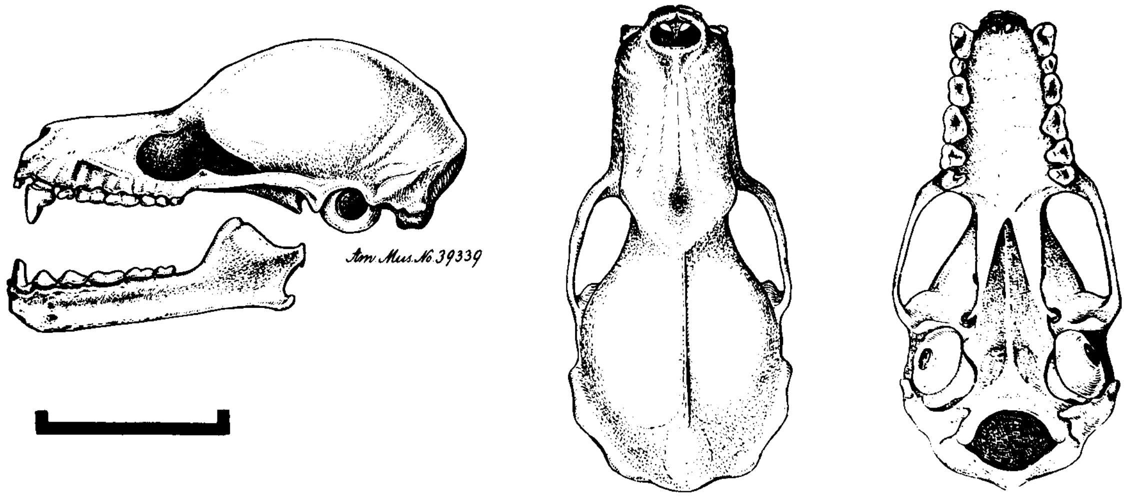

FIGURE 2. Lateral, dorsal, and ventral views of cranium of *Erophylla sezekorni bombifrons* from Morovis, Puerto Rico (after Anthony, 1918; 258). Bar represents 10 millimeters.

length is 8 mm with a maximum diameter (midshaft) of 25.5 μ. Melanin granules are confined to the distal third of the filament where they are evenly dispersed. The medulla is absent. Scale structure of the overhairs is described as follows: midshaft—long appressed, entirely coronal with a length of 28.9 μ and width 17.0 μ; maximum diameter of shaft—medium, appressed, sinuate to erose coronal with a length of 17.0 μ and width of 25.5 μ. Scalation of both the midshaft and maximum diameter portion of the underhairs is long, slightly divergent, entirely coronal alternating with short, hastate coronal. Underhair scale length is 23.8 μ and width 25.5 μ. Overhair scales are annular in arrangement and underhair scales are annular and alternate in arrangement.

McDaniel (1976) described the internal and external features of the brain of *Erophylla*. He concluded that the brain of *Erophylla* resembles that of *Macrotus* more than the brain of *Brachyphylla*. See also Phillips *et al.* (1977) for description of dentition.

FUNCTION. Hematological data for two gravid females of *E. s. bombifrons* were given by Valdivieso and Tamsitt (1971). They found 18.9 (17.3 to 19.9) grams of hemoglobin per 100 milliliters (18.9 g/100 cm^3) of blood. A white blood cell differential count revealed 59.0% (55 to 63) neutrophils, 32.5% (29 to 36) lymphocytes, 2.5% (1 to 4) eosinophils, 1.0% basophils, and 5.0% (4 to 6) monocytes. Valdivieso and Tamsitt (1971) noted that this count may be atypical for the species in that the pregnant females studied had a higher leukocyte count than did nongravid females or adult males. Erythrocyte diameters averaged 5.7 (4.1 to 7.7) μ. A marked polychromatophilia was noted in 50% of the samples.

ECOLOGY. Buden (1976) observed roosts of *E. s. sezekorni* both in dark interior portions of caves and on exposed surfaces where much daylight penetrated. Koopman *et al.* (1957) reported roosts only in deep, dark portions of caves on several islands in the Bahamas. Relative to associated bat genera examined, *E. s. sezekorni* preferred cave areas with minor climatic variation and left roosting sites later in the evening, approximately 53 to 100 minutes after sunset (Silva-Taboada and Pine, 1969). The above authors also reported that, unlike members of the genera *Phyllonycteris* and *Brachyphylla*, *E. s. sezekorni* would not feed under direct light. All three genera feed on fruit, pollen, nectar, and insects (Gardner, 1977).

Live specimens of *Erophylla sezekorni bombifrons* have been taken from Puerto Rico and Hispaniola. Individuals were taken from low to medium elevations on Puerto Rico, but none has been reported from the higher elevations such as El Yunque peak (1492 meters). One of us (RJB) netted bats on two different nights, at elevations above 1200 meters, and no *E. s. bombifrons* were collected. One site (Luquillo National Forest) where *E. s. bombifrons* has been obtained was described in detail (Odum and Pigeon, 1971); however, little is known concerning the role *E. s. bombifrons* plays in this ecosystem. At lower elevations where *Erophylla* has been collected, the human impact is great and much of the native vegetation has been removed. In fact, a photograph (in Anthony, 1918, plate 57, fig. 1) reveals that the lowlands around Corozal were cleared and used for banana production prior to 1918. Mist-netting in the foreground area depicted in Anthony's figure in July 1969 and August 1974 produced several specimens of *E. s. bombifrons* on each occasion. In August 1974, the density and height of secondary growth vegetation around the cave was greater than that shown in Anthony (1918) and no banana orchard was near the entrance to the cave.

Other species of bats collected on Puerto Rico in association with *E. s. bombifrons* were *Artibeus jamaicensis*, *Brachyphylla*

TABLE 1. Selected measurements from six samples of *Erophylla*, as given in Buden (1976). Each set of numbers includes mean and sample size (row 1), range (row 2), and standard deviation and coefficient of variation (row 3).

	E. s. sezekorni				*E. s. bombifrons*	
	New Providence	Mayaguana	Cuba	Jamaica	Hispaniola	Puerto Rico
Length of skull	24.5 (18)	25.2 (6)	24.3 (31)	24.7 (29)	24.1 (18)	24.3 (18)
	23.7–25.4	24.6–26.1	23.6–25.1	23.7–25.7	23.4–25.0	23.3–24.9
	0.52 2.12	0.54 2.16	0.38 1.58	0.38 1.58	0.49 2.00	0.44 1.79
Cranial height	8.4 (19)	8.5 (6)	8.3 (44)	8.4 (29)	9.0 (21)	9.1 (18)
	8.1–8.8	8.3–8.8	7.9–8.8	8.0–8.9	8.4–9.6	8.6–9.6
	— —	0.23 2.72	0.19 2.30	0.25 2.93	0.31 3.45	0.26 2.85
Length of forearm	46.0 (50)	46.6 (35)	45.4 (88)	46.5 (66)	46.7 (49)	47.7 (47)
	43.2–47.6	44.5–49.2	41.6–48.2	44.7–49.3	45.1–48.9	45.7–50.0
	0.99 2.16	0.96 2.06	1.29 2.83	1.07 2.31	0.97 2.08	0.94 1.98
Length of ear	19.7 (33)	19.8 (29)	19.3 (41)	19.3 (43)	16.9 (39)	17.3 (30)
	19.0–21.0	19.0–21.0	18.0–20.0	17.0–21.0	15.0–18.0	15.0–19.0
	0.59 2.97	0.58 2.92	0.79 4.08	0.85 4.40	0.83 4.94	0.84 4.84

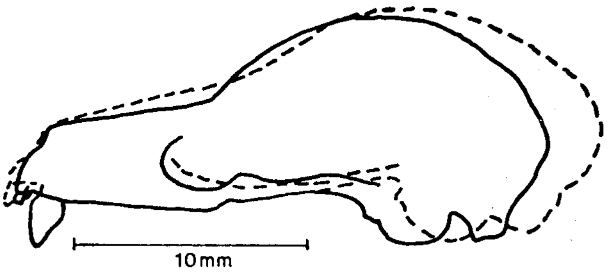

FIGURE 3. After Buden (1976). Superimposed profiles of skulls of *E. s. sezekorni* (dashed line) and *E. s. bombifrons* (solid line).

cavernarum, *Stenoderma rufum*, *Monophyllus redmani*, *Eptesicus fuscus*, *Pteronotus parnellii*, and *Molossus molossus*.

Specimens of *E. s. bombifrons* taken from Miragoane, Haiti, were netted in dry washes from sea level to 100 meters elevation (Klingener *et al.*, 1978). These washes were bounded by steep rocky cliffs. Vegetation was sparse to the extent that collectors had a difficult time finding branches of suitable height to use as mist-net poles (from the field notes of John Bickham and John Patton, 1974).

Other species of bats collected on Hispaniola in association with *E. s. bombifrons* were *Monophyllus redmani*, *Brachyphylla pumila*, *Phyllops haitiensis*, *Phyllonycteris obtusa*, *Artibeus jamaicensis*, *Macrotus waterhousii*, *Mormoops blainvillii*, and *Pteronotus parnellii* (Klingener *et al.*, 1978).

Nine species of ectoparasites are known to occur on *Erophylla* (Tamsitt and Fox, 1970; Webb and Loomis, 1977). Species, family in parentheses, and geographic locality of sample is *Ornithodoros viguerasi* (Argasidae), Puerto Rico; *Loomisia desmodus* (Trombiculidae), Bahamas; *Microtrombicula boneti* (Trombiculidae), Bahamas; *Perates anophthalma* (Trombiculidae), Bahamas; *Periglischrus eubanus* (Spinturnicidae), Cuba; *Trichobius frequens* (Streblidae), Cuba; *Trichobius intermedius* (Streblidae), Cuba; *Trichobius robynae* (Streblidae), Puerto Rico; *Trichobius truncatus* (Streblidae), Puerto Rico; and *Whartonia querrerensis* (Trombiculidae), Bahamas. No endoparasites are known for *Erophylla* (Ubelaker *et al.*, 1977).

REPRODUCTION AND ONTOGENY. Valdivieso and Tamsitt (1971) reported collecting two pregnant females of *E. s. bombifrons* in June or July near the entrance of a large cave near Corozal in Puerto Rico.

Small embryos were found in eleven (of approximately 20) females (*E. s. sezekorni*) taken in eastern Cuba on February 26 and 28 (Anthony, 1919). Buden (1976) summarized the reproduction and lactation of this species (based on 91 gravid or lactating females) as follows: "Most prenatal development takes place during the first part of the year and parturition probably occurs in early summer." Females bearing small embryos were taken in early and late February. Individuals with well developed fetuses were obtained in April and May. Lactating females were collected in June and many immature individuals were taken in July; immature individuals approaching adult size were found in August. From these data it appears likely that *Erophylla sezekorni* is a seasonal breeder, possibly bearing a single offspring a year.

Anthony (1918) described the young as having dorsal hairs white basally and clove brown at the tips, and coloration uniform over the whole upper surface (white not showing through on neck as in the adults); ventral coloration scarcely paler than above.

GENETICS. Published karyotypic data from *Erophylla sezekorni* consist of 12 female *E. s. bombifrons* (Baker and Lopez, 1970). A karyotype of a male *E. s. bombifrons* from Puerto Rico is shown in Figure 5. All autosomes are biarmed and most are metacentric or submetacentric in nature. The smallest pair of autosomes have a secondary construction on the long arm. The X appears to be the largest element in the karyotype and the Y is a small dot. We have compared the karyotypes of specimens of *E. s. bombifrons* with the karyotype of specimens of *E. s. sezekorni* and no differences were noted. Additional karyotyped specimens reported here consist of two males and two females of *E. s. bombifrons* from Puerto Rico, two females from Haiti, and a male and a female from Jamaica. Data show that the G- and C-band patterns of *Erophylla* are indistinguishable from those of *Glossophaga soricina*, *Monophyllus redmani*, *Phyllonycteris aphylla* and *Brachyphylla cavernarum* (Baker and Bass, 1979).

Monophyllus, *Erophylla*, *Phyllonycteris*, and *Brachphylla* are all nectar feeders (at least at times—see Silva-Taboada and Pine, 1969; Gardner, 1977) and it has been suggested (Baker and Lopez, 1970) that the genera endemic to the Antillean chain represent a small degree of adapative radiation after a common ancestor reached the islands. This explanation is no longer tenable to us and we presently believe that the members of the Brachyphyllinae (*Erophylla*, *Phyllonycteris*, and *Brachyphylla*) represent an earlier invasion than the one that established *Monophyllus* on the islands.

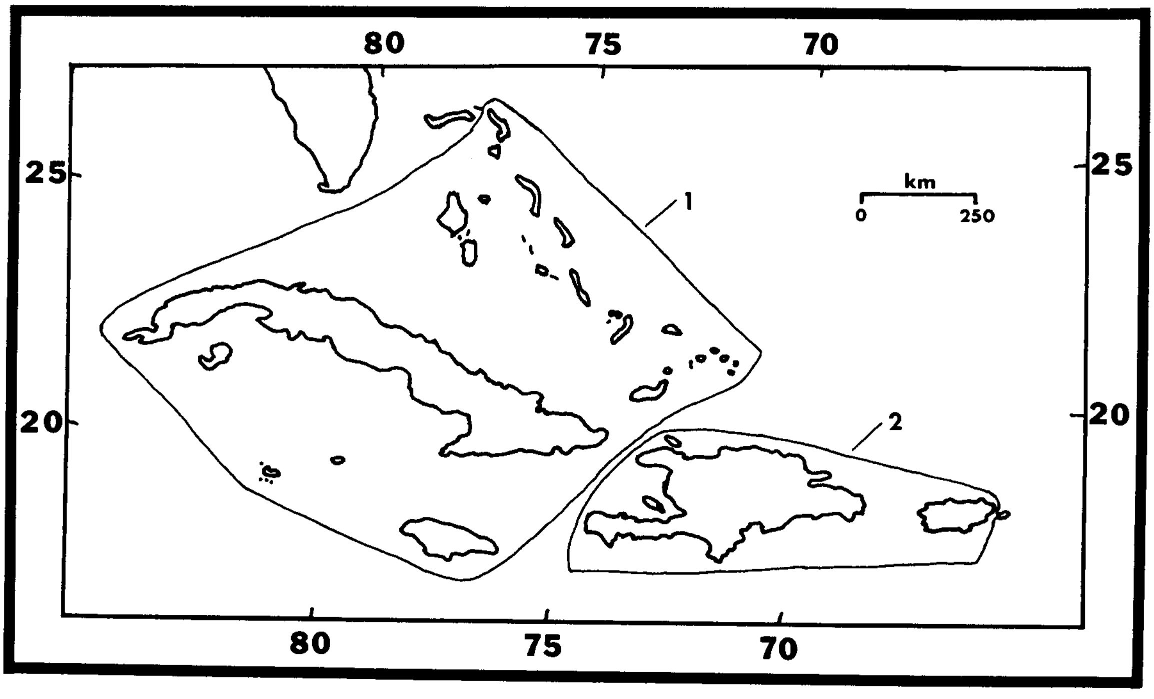

FIGURE 4. Geographic distribution of *Erophylla sezekorni* in the Greater Antilles and associated islands. Area "1" represents *E. s. sezekorni* and area "2" represents *E. s. bombifrons*.

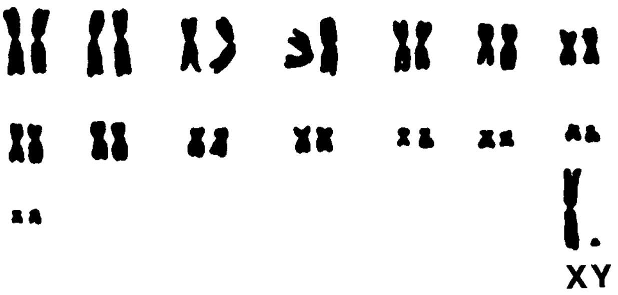

FIGURE 5. Representative karyotype of a male *E. s. bombifrons* (TTU 22429) from Corozal, Puerto Rico.

The electrophoretic mobility patterns of serum proteins of six specimens of *E. s. bombifrons* were compared to those of 17 other bat species (Valdivieso and Tamsitt, 1974), including representatives of the families Vespertilionidae, Molossidae, and Mormoopidae. Within the 18 species no variation was detected in the mobility of the gamma globulin fraction. In relative mobility of albumins, none migrated anodal to the Normal Human Serum (NHS) control. *Artibeus* cf. *jamaicensis*, *A. lituratus*, *A. phaeotis*, *Stenoderma rufum*, *Carollia perspicillata*, and *Desmodus rotundus* had albumins with the same mobility as the NHS control. *Glossophaga soricina*, *Monophyllus redmani*, *Sturnira lilium*, *Brachyphylla cavernarum*, *Artibeus jamaicensis*, *Erophylla sezekorni*, *Eptesicus fuscus*, *Molossus molossus*, and *M. fortis* possessed albumins with similar mobilities that were cathodal to the NHS control. *Phyllostomus hastatus*, *P. discolor*, and *Pteronotus parnellii* had albumins with a mobility cathodal to that of the *Erophylla* specimens.

Another conclusion of Valdivieso and Tamsitt (1974) was that the serum protein pattern of *Brachyphylla* is surprisingly unlike that of *E. sezekorni* and more closely resembled that of the vespertilionid, *Eptesicus fuscus*.

The electrophoretic properties of hemoglobins of *E. s. bombifrons* were compared with those of *Pteronotus parnellii*, *Monophyllus redmani*, *Artibeus jamaicensis*, *Stenoderma rufum*, *Eptesicus fuscus*, and *Molossus molossus* (Valdivieso *et al.*, 1969). *Erophylla* hemoglobin electrophoretic migration was indistinguishable from that of *Monophyllus*, *Artibeus*, and *Stenoderma* (all phyllostomatids). *Eptesicus* had a double hemoglobin and *Pteronotus* had a hemoglobin that was slightly slower migrating than those of the phyllostomatids.

Lactate dehydrogenase (LDH) electrophoretic patterns of specimens of *Erophylla* have been compared to those of *Artibeus jamaicensis* and *Molossus molossus* (Valdivieso *et al.*, 1969). Heart and liver extracts of these bats had similar LDH isozyme profiles. Skeletal muscle LDH patterns of *A. jamaicensis* and *E. sezekorni* shared common features, but those of *Molossus* differed considerably from those of the two species of phyllostomatids studied.

ETYMOLOGY. The word *Erophylla* is from the Greek word, *Eros*, referring to the Greek god of love, and from *phyllon* (Greek) meaning leaf. Conisbee (1953) indicated that *Eros* was combined with *phylla* because the leaf-nose projection of this genus is the shape of the love dart of *Eros*.

The specific epithet *sezekorni* was assigned by Gundlach (1861) after the person of Geheimerath Sezekorn, who obtained the holotype.

The subspecific epithet *bombifrons* comes from *bombus* (Latin) meaning boomer and *frons* (Latin) meaning forepart. This epithet was chosen to describe the inflated braincase of *Erophylla*.

REMARKS. As is the case with most species of bats that are endemic to the Antilles, relatively little is known about *Erophylla sezekorni*. The situation stems from the paucity of research that has been conducted on bats on these islands. Mist nets seem to be reasonably effective in obtaining specimens of *Erophylla*. However, much of the bat work in the Antilles has been by collecting in caves without the aid of nets.

Buden (1976) reduced the number of species in the genus from two to one and the number of subspecies from six to two. In our opinion, the conspecific status of *E. s. sezekorni* and *E. s. bombifrons* is open to question. Although the magnitude of difference that separates the two subspecies falls within the range of that found in some species of phyllostomatids, the magnitude also is as great as that characteristic of distinct species of some bats (in *Myotis*, for example). Given the allopatric nature of the taxa, it will be difficult to determine the specific status of the two and we have followed Buden's decision to recognize only one species.

Questions such as the ecological distribution of the species on each island and the effect of man's activities on the survival of *Erophylla* need to be evaluated before proper decisions can be made concerning means by which these populations can be preserved.

Erophylla and *Phyllonycteris* form a unique group of Brachyphyllinae. They (along with *Brachyphylla*) are probably descendants from an early invasion of the Antilles by a primitive stock of the Phyllostomatidae (Baker and Genoways, 1978). Such taxa form an important component of our natural heritage and perhaps will reveal significant answers relative to understanding the evolution of the New World leaf-nosed bats. In this light, we encourage the governments and agencies involved to carefully evaluate decisions that affect the future of these bats.

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