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Review of Antillean Bats of the Genus *Ariteus*

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The genus *Ariteus* as currently understood is represented by a single species *Ariteus flavescens*, which is confined to island of Jamaica in the Greater Antilles. It is surprising given the restricted distribution of the species that it was among the first of the New World bats to be described (Gray, 1831). Philip Henry Gosse (1851) was the first to publish on the natural history of this bat, but he described it under the name of two new species, which subsequently have been treated as junior synonyms of *A. flavescens*. Until the 1970s, less than 50 recent specimens of the genus were held in museum collections around the world and little additional information had been published on the species.

The genus *Ariteus* is closely related to three other Antillean genera, *Ardops*, *Phyllops*, and *Stenoderma*, which also are characterized by having a white spot on their shoulder and a greatly shortened rostrum. Some recent authors (Varona, 1974) have treated these as members of a single genus as did Dobson (1878), whereas other authors since Peters (1876) have treated them as distinct genera (see for example, Miller, 1907; Hall, 1981). It is clear that these genera are closely related and as observed by Baker and Genoways (1978) these genera "are the product of a single ancestral invader, with subsequent radiation and speciation on the islands." Representatives of the genus *Ariteus* are the most distinct member of this group, being characterized by the lack of a third upper molar and presence of a metaconid on the first lower molar. Its closest relative in the group probably is the genus *Ardops* (Miller, 1907; Jones and Schwartz, 1967).

For a species about which very little has been written, *Ariteus flavescens* has had a complicated taxonomic history. It has been placed in at least four genera of which one is a junior synonym. The species *Ariteus flavescens* has two junior synonyms. The details of this taxonomic history are discussed below and a neotype is designated for the species to prevent any further taxonomic confusion in the future.

In the late 1960s and 1970s, field parties from Texas Tech University, Lubbock, TX, Carnegie Museum of Natural History, Pittsburgh, PA, and Joseph Moore Museum, Richmond, IN (Howe, 1974), made major new collections of bats on Jamaica including long series of *Ariteus flavescens*. This new materials allow the first assessment of variation in the species. The results of these analyses are discussed below.

METHODS

All measurements are recorded in millimeters. All measurements were taken with dial calipers to the nearest 0.1 mm. All statistical tests were performed at the University of Pittsburgh Computer Center using the program UNIVAR. The program yields standard statistics (means, range, standard deviations, standard error of the mean, variance, and coefficient of variation) and employs a single classification analysis of variance (F-test, significance level $P \leq 0.05$) to test for significant differences among means (Sokal and Rohlf, 1969). When means were found to be significantly different, the Sum of Squares Simultaneous Test Procedure (SS-STP) developed by Gabriel (1964) was used to determine maximally non-significant subsets. A total of 88 specimens was used in the morphometric analyses.

TAXONOMIC HISTORY

1825.— Gray (1825), in a paper attempting to place the known genera of bats into natural groups, proposed the name *Istiophorus* as a replacement name for *Vampyrus* of Spix because this bat (now called *Trachops cirrhosus*) differed from "Geoffroy's genus of the same name..." The genus *Istiophorus* was placed in the subfamily Phyllostomina of the *Istiophori* characterized by "leaf-like appendage on their noses." This group of bats was in contrast to the Anistiophori characterized by the lack of a leaf-like appendage on their noses. The only other subfamily in the Istiophori was the Rhinolophina with all other genera being placed into three subfamilies in the Anistiophori.

1831.— Gray (1831) described a new species, *Istiophorus flavescens*, in the family Vespertilionidae (included all know species of bats). He diagnosed the genus, termed pit-nose bats, as follows: "The nose-plates extended behind into a lanceolate leaf, with a deep pit in the centre of the front part between the nostrils; tragus lanceolate, toothed; interfemoral membranes only margining the legs; tail none; rest like *Megaderma*." The species *I. flavescens*, given the common name "pale pit-nose bat," was characterized as "Pale yellowish, the hairs long, irregular and silky. Length of body and head 19 [≈40.6mm], of fore-arm bone 18 lines [≈38.5 mm], expanse 10 inches [≈256 mm]. In the collection of the British Museum."

1838.— In 1838, Gray described the genus *Ariteus* as a replacement name for *Istiophorus* Gray, 1825, which was preoccupied by *Istiophorus* Lacèpéde, 1802 (Allen, 1901; Palmer, 1904: 354; Neave, 1939a: 299, 1939b: 799), which is a fish. The description of the genus read as follows: "Nose-leaf erect, lanceolate, simple behind, rounded in front; ears lateral; separate tragus; lanceolate-toothed; interfemoral membrane only margining the legs; heel-bone moderate." The "Yellow *Ariteus*. *Ariteus flavescens* Gray" was the sole representative of the new genus name and is, therefore, fixed as the type species by monotypy. Gray indicates that the species is from an unknown location. The genus *Ariteus* was placed in the Tribe Rhinolophina of the family Vespertilionidae because Gray (1838) believed that it shared the characteristic with Old World leaf-nosed bats of having "a pit or process between the nostrils in the front."

1843.— In Gray's (1843) catalog of mammals in the British Museum, there is the following notation under *Ariteus flavescens*: "In spirits.-Old collection." This is the last record that I have been able to find of the presumed holotype of this species. During a visit to the British Museum in January 1977, I was unable to locate the specimen and John Edwards Hill, Keeper of Mammals at the museum, stated that he did not know of its disposition. Carter and Dolan (1978) in their catalog of types of Neotropical bats in European museum do not list this holotype specimen.

1851.— Gosse's (1851) report on his visit to Jamaica contains a redescription of one species and the description of three new species in the genus *Artibeus* of which three pertain to *Ariteus flavescens*. Only the new species *Artibeus carpolegus*, "Greater Naseberry Bat," is actually a representative of the genus *Artibeus*. It is a junior synonym of *Artibeus jamaicensis* Leach based upon examination of the holotype of BMNH 47.12.27.13, which is an adult male. Gosse (1851:271) states that this specimen is from Content.

Gosse (1851:270) gives a description of *Artibeus jamaicensis* Leach, "Small Naseberry Bat," based on a specimen of *A. flavescens*. However, it is clear that Gosse was only trying to redescribe *A. flavescens* because he cites Leach as the author of the name and states that the current information "is far too vague for the discrimination of species." He proceeds to give a fuller description of the species. The specimen upon which this description is based is probably BMNH 47.12.27.10, which is a male stored in alcohol with the skull removed. On one of the several labels associated with this specimen is a notation "(Type of *Artibeus jamaicensis* (Leach) Gosse)" which has been marked out and replaced with the identification *Stenoderma achradophilum* Gosse presumably by G. E. Dobson. The tags indicate that the specimen is from Content, Jamaica, which is what Dobson (1878: 528) also stated. However, a re-reading of Gosse (1851: 267-270) reveals that the first specimen that he obtained was from Vineyard, near Black River, Manchester Parish. The indication is that this specimen formed the basis of the redescription of *Artibeus jamaicensis*, although this fact is never directly stated. Because the tags currently associated with the specimen undoubtedly were written at a date subsequent to collection, the provience of this specimen must be considered to be in doubt. Measurements of this specimen are as follows: forearm, 40.8; greatest length of skull, 19.2; condylobasal length, 15.9; zygomatic breadth, 12.9; interorbital constriction, 4.8; mastoid breadth, 10.9; palatal length, 3.5; length of maxillary toothrow, 5.5; breadth across upper molars, 8.2.

On page 271, Gosse (1851) describes two species, which are now considered to be junior synonyms of *Ariteus flavescens*—*Artibeus achradophilus*, "Dusky Naseberry Bat" and *Artibeus sulphureus*, "Brimstone Naseberry Bat." These holotypes, which are both females stored in alcohol with the skulls removed, are now housed in the collections of the British Museum (BMNH 47.12.27.14, *achradaophilus*; BMNH 47.12.27.15, *sulphureus*). There is no specific locality beyond "Jamaica" noted on the specimen labels; however, according to Gosse (1851: 271-272), both of these specimens are from "Content," which is 3 miles east of Bluefield, Westmoreland Parish, on recent maps of Jamaica. Measurements of these holotypes are as follows (*achradophilus* followed by *sulphureus*): length of forearm, 42.1, 41.4; greatest length of skull, —, 20.4; condylobasal length, —, 17.3; zygomatic breadth, —, 13.9; interorbital constriction, 5.2, 5.1; postorbital constriction, 4.9, 4.9; mastoid breadth, —, 11.8; palatal length, 3.9, 4.1; length of maxillary toothrow, 5.9, 6.0; breadth across upper molars, 9.0, 8.8. It is somewhat surprising that Gosse would describe two new species based upon bats of the same species collected at the same place. However, a reading of his description of *sulphureus* indicates that his sole specimen had been "much damaged by ants, before it was examined," so that he could only distinguish it by its color, which was "very marked and peculiar."

There are two other specimens from the Gosse Collection in the British Museum (BMNH 49.5.30.11 and BMNH 49.5.30.16). These are unsexed skins with skulls that are in good condition. No specific locality is indicated on the labels for these specimens.

1866.— Gray (1866) presented a revision of the genera of the family Phyllostomidae in which he included only New World leaf-nosed bats. He included *Ariteus* in the Tribe Stenodermina along with genera *Artibeus*, *Vampyrops*, *Uroderma*, *Chiroderma*, *Pygoderma*, *Ametrida*, and *Sturnira*. He characterized the genus *Ariteus* as follows: "Front edge of the nose-leaf attached to the lip by a narrow space in the middle greater part of sides free. Lower lip with a round tubercle above and two below it, forming a triangle, and with a series of round tubercles along the outer edge of the lip; inner edge bearded. Wings from the base of toes. Lower phalange of the index finger flattened, arched. Upper cutting-teeth two-lobed. *A. flavescens*."

1876.— Peters (1876) recognized that *Artibeus achradophilus* Gosse and *Artibeus sulphureus* Gosse were the same species and he presented characteristics that separated this species from members of the genus *Artibeus*. Peters (1876) believed that the species *achradophilus* was more closely related to *Phyllops falacatus* and *Stenoderma rufum*. However, he believed that characteristics of palate of *achradophilus*, which included the lack of M3 resulting from the palate being so shortened as to not provide a space for the tooth, separated it from *Phyllops* and *Stenoderma*.

He proposed the generic name *Peltorhinus* for *achradophilus*. There is no indication that Peters was aware of Gray's (1838) earlier name, *Ariteus flavescens*, for this species. Peters (1876) presented the first figure, of which I am aware, showing the external, cranial, and dental characteristic of *Ariteus flavescens* as well as those of *Stenoderma rufum*.

1878.— Dobson's (1878) catalogue listed this species under the name *Stenoderma achradophilum*. There are several entries in this listing that are difficult to comprehend from our current vantage point. He cited the description of *Ariteus flavescens* from Gray, 1866, rather than Gray, 1831, or subsequent papers by Gray, thus giving priority to Gosse's (1851) species-group name *achradophilus*. He divided the genus Stenoderma into three subgenera and placed *S. achradophilum* in the subgenus *Peltorhinus* Peters (1876), although the genus-group name *Ariteus* would have had priority even accepting the wrong authority date of 1866.

His placement of all Antillean white-shouldered bats in the genus *Stenoderma* is understandable as it is an arrangement utilized by Miller and Rehn (1901) and more recently by Varona (1974). Dobson (1878) disagreed with Peters (1876) who placed the three known species—*S. achradophilum*, *S. rufum*, and *S. falcatum*—into separate genera as have many modern authors (Hall, 1981, for example). However, Dobson argued that the close resemblance of these species in external characters, dentition, and cranial structure outweighed their differences, including the missing upper third molar in *Ariteus*, which he noted also occurs in some species of *Artibeus*.

1907.— Miller (1907) treated *Ardops*, *Ariteus*, *Phyllops*, and *Stenoderma* as separate, but closely related genera. He characterized the genus *Ariteus* as being: "Like *Ardops*, but without the small upper molar; first lower molar with minute though evident metaconid." Miller (1907) cites as the "*Species examined.— Ariteus achradophilus* (Gosse)" probably following Dobson (1878) earlier arrangement. He does place *Peltorhinus* Peters (1876) as a junior synonym of *Ariteus*, citing *Ariteus* from Gray's (1838) description.

1912.— Miller (1912) and in subsequent publications (Miller, 1924; Miller and Kellogg, 1955) cited this species under the name *Ariteus flavescens* (Gray), listing the species *achradophilus* Gosse as a junior synonym, but no mention is given of *sulphureus* Gosse. Hall and Kelson (1959) as well as Hall (1981) do not list *Artibeus sulphureus* Gosse among the junior synonyms of *Ariteus flavescens* (Gray). It is surprising that all of these highly respected compilers of mammalian systematic synonymies would have overlooked *Artibeus sulphureus* Gosse, but that appears to be exactly what has occurred because it clearly is a junior synonymy of *Artiteus flavescens* (Gray).

Discussion.— *Ariteus flavescens* was one of the first New World bats to be described, but its taxonomic history has been quite unstable. The holotype of *Ariteus flavescens* has not been mentioned in the literature since 1843 and my search of the collections of the British Museum (Natural History) did not find a specimen that could be considered the holotype nor did the search of Carter and Dolan (1978). Gray (1831, 1838, and 1843) gave no locality for the holotype. Given this combination of facts, much more taxonomic instability of Antillean bats could occur, if the current treatment of *Ariteus flavescens* were to be changed. Therefore, it seems wise to designate a neotype and to fix the type locality to validate this current taxonomic arrangement.

Ariteus flavescens
(Gray, 1831)

Neotype.— TTU 21721, adult female, skin, skull, and karyotype; collected on 9 July 1974 by Robert J. Baker; original number RJB 2197; karyotype no. TK 8154.

Type locality.— The neotype is from Orange Valley, St. Ann Parish, Jamaica, which is hereby fixed as the type locality for the species. Orange Valley is only 4 miles southeast of Discover Bay, which was regularly visited by the British when it was known as Dry Harbour.

Measurements.— Measurements of the neotype are as follows: total length, 69; length of hind foot, 12; length of ear, 18; length of forearm, 42.7; greatest length of skull, 20.7; condylobasal length, 17.1; zygomatic breadth, 14.2; breadth of interorbital constriction, 5.2; breadth of postorbital constriction, 4.9; mastoid breadth, 11.9; palatal length, 4.0; length of maxillary toothrow, 6.0; breadth across upper molars, 9.1.

VARIATION

With a large sample of *Ariteus flavescens* available for the first time, I have taken the opportunity to investigate morphometric varition in the species. Variation at the individual, secondary sexual, and geographic levels have been analyzed with the results presented in Table 1 and discussed below.

Individual variation.— The coefficient of variation is used to compare the amount of variation at the individual level in populations having different means. Table I shows that the coefficient variation for samples of *Ariteus* males varied from a low of 1% for breadth across upper molars to 5.8% for palatal length, with a mean coefficient of variation of 2.77%. For females the coefficient of variation varied from 0.03% for length of forearm to 6.7% for interorbital constriction, with a mean coefficient of variation of 2.38%. The range of this variation is reduced if only values for Sample I, which has the largest sample size, are considered-males from 2.1% for breadth across upper molars to 4.9% for interorbital constriction, with a mean of 3.07%, and females from 1.8% for greatest length of skull and breadth across upper molars to 4.4% for interorbital constriction, with a mean of 2.73%. For all samples combined females averaged less variable in 8 of the 10 measurements, with males being less variable than females in interorbital constriction and postorbital constriction. Interorbital constriction for females and palatal length for males were the most highly variable measurements.

Secondary sexual variation.— The males and females in Sample I were compared to determine the presence and extent of secondary sexual variation in the 10 measurements. The analyses revealed that the males were significantly small at the $P \leq 0.001$ level than females in all measurements. When only considering the 40 individuals in Sample I, there is no overlap in the measurements of males and females in greatest length of skull, condylobasal length, length of maxillary toothrow, and breadth across upper molars. When all individuals available are considered, there is no overlap only in greatest length of skull with the largest male being 19.6 and the small female being 19.8. In all other measurements except length of forearm, the amount of overlap in measurements of the sexes is less than 1.0 mm.

Geographic variation.— Six samples (Fig. 1 and Specimens Examined) of *Ariteus flavescens* were established to investigate geographic variation in the species. Only five of the samples were of sufficient size to be included in the analysis, but the data from all six samples are presented in Table 1.

Only three measurements for females evinced any geographic variation-greatest length of skull, zygomatic breadth, and breadth across the upper molars. Sample I from north-central Jamaica is separated from Sample III from the southwestern coast based upon greatest length of skull. Females from far eastern Jamaica (Sample V) and north-central Jamaica (Sample I) are separated from females on the southwestern coast (Sample III) based upon zygomatic breadth. Finally, Sample I is separated from Samples III and V based upon breadth across upper molars.

Males reveal geographic variation in two other measurements—condylobasal length and length of maxillary toothrow. In these two measurements, Sample I from north-central Jamaica is separated from Sample V from the eastern end of the island; however, the patterns of variation in the two measurements are reversed. In condylobasal length, males from Sample V average the longest, whereas the males in Sample I average the shortest. In length of the maxillary toothrow, the males from Sample I average the longest, whereas males in Sample V average the shortest.

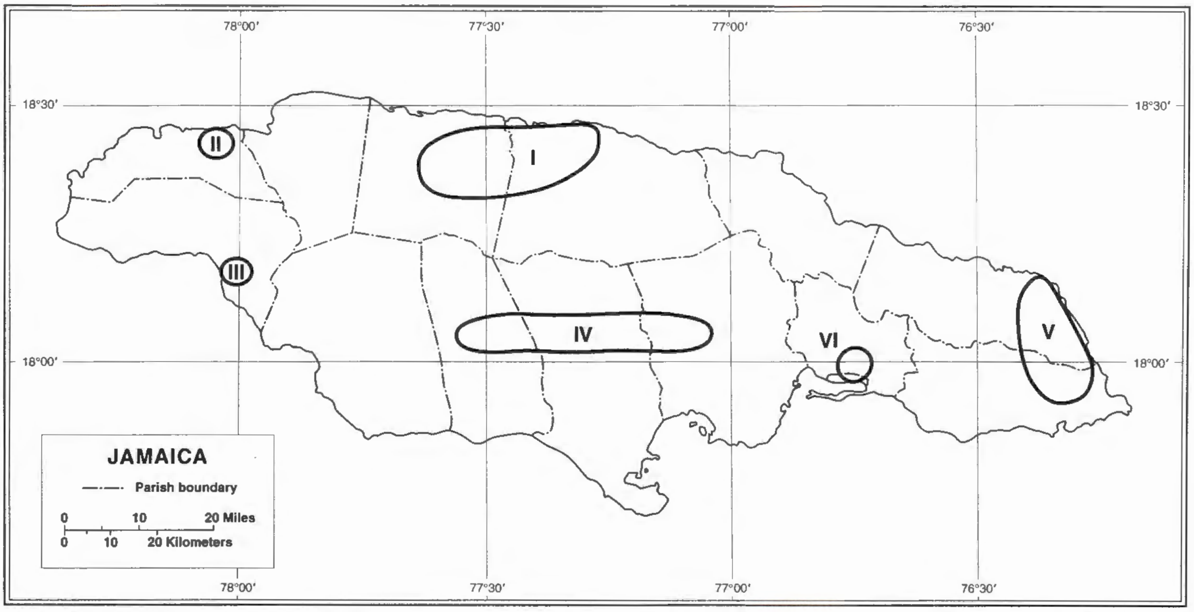

Figure 1.—Map of the island of Jamaica, Greater Antilles, showing the location of the six samples used in the analysis of geographic variation in *Ariteus flavescens*.

Discussion.— The coefficient of variation values for *Ariteus flavescens* are low for mammals in general, but they are comparable to values presented by Long (1968) for species of bats of the genera *Macrotus*, *Myotis*, *Eptesicus*, *Plecotus*, and *Tadarida*. Long (1968) demonstrated that bats have low variation compared to other mammals possibly because of their adaptation to flight. It is important from a conservation point of view that individual variation in this Jamaican endemic species is not reduced, at the morphological level, compared to other bat species. It will be important in the future to examine individual variation in the species at the genetic level to confirm that it does not possess reduced variability from interbreeding of a small population.

Long (1969) found that in wild mammals there was no basis for considering one sex to be more variable than the other, but in domestic mammals males were more variable than females. In *Ariteus flavescens*, males clearly demonstrated a higher level of variability than females. The variability differences between the sexes of additional species of sexually dimorphic bats need to be studied to see whether the *Ariteus* is anomalous in this feature. Female bats may have their variability limited because of the burden of carrying unborn and newborn young. Of the limited number of measurements studied by Long (1969), he found interorbital constriction to be the most highly variable as was true for female *Ariteus*.

Bats of the species *Artieus flavescens* exhibit a high degree of secondary sexual differences in size. Males are consistently average smaller than females of the species. This is not characteristic of all member so the subfamily Sternoderminae as Davis (1970) was unable to detect significant secondary sexual differences in measurements in samples of the common Jamaican fruit bats, *Artibeus jamaicensis*. On the other hand, closely related species of white-shoulder bats from the Antilles, *Stenoderma rufum* (Jones et al., 1971; Genoways and Baker, 1972) and *Ardops nichollsi* (Jones and Schwartz, 1967; Genoways et al., 2000), display a secondary sexual difference in size approaching that found in *Ariteus flavescens*. A mainland species of white-shouldered bats, *Ametrida centurio*, probably displays the greatest degree of secondary sexual size differences of any species of bat (Peterson, 1965). In this species, the males and females were originally described as separate species. However, in another mainland species of white-shouldered bats, *Centurio senex*, Paradiso (1967) "found no significant sexual size variation."

Table 1. Results of an analysis of geographic variation among six samples of Ariteus flavescens *from Jamaica. The geographic areas represented by the samples are given in Fig. 1 and Specimens Examined.*

Measurements, sex, and samples	N	Mean (Range) ±2SE	CV	Significance
Length of forearm				
Females				
IV	2	42.7 (42.5-42.8) ±0.30	.05	ns
II	6	42.2 (41.4-43.0) ±0.50	1.5	
I	19	42.1 (39.8-43.8) ±0.49	2.5	
V	2	41.6 (41.5-41.7) ±0.20	0.3	
III	8	41.3 (39.5-43.9) ±1.02	3.5	
VI	1	43.5		
Males				
V	8	39.8 (38.4-41.1) ±0.63	2.2	ns
III	9	39.1 (37.5-41.6) ±0.80	3.1	
IV	5	39.1 (37.6-40.8) ±1.07	3.0	
II	6	38.7 (37.7-40.4) ±0.88	2.8	
I	15	38.5 (36.5-39.9) ±0.53	2.7	
VI	1	38.8		
Greatest length of skull				
Females				
I	25	20.6 (20.0-21.3) ±0.15	1.8	
IV	2	20.5 (20.1-20.9) ±0.80	2.8	
II	6	20.4 (20.1-20.8) ±0.21	1.3	
V	2	20.4 (20.2-20.5) ±0.30	1.0	
III	8	20.1 (19.6-20.5) ±0.20	1.4	
VI	1	19.8		
Males				
V	8	19.3 (19.0-19.6) ±0.15	1.1	ns
III	6	18.9 (18.5-19.5) ±0.21	1.7	
II	6	18.9 (18.3-19.4) ±0.31	2.0	
IV	5	18.9 (18.6-19.2) ±0.23	1.4	
I	15	18.8 (17.5-19.5) ±0.25	2.5	
VI	1	18.7		
Condylobasal length				
Females				
IV	2	17.5 (17.2-17.8) ±0.60	2.4	ns
I	25	17.2 (16.3-17.8) ±0.12	1.9	
V	2	17.2 (17.1-17.2) ±0.10	0.4	
III	8	17.0 (16.7-17.5) ±0.19	1.5	
II	4	17.0 (16.5-17.4) ±0.37	2.2	
VI	1	15.9		
Males				
V	8	16.0 (15.8-16.6) ±0.19	1.7	ns
III	9	15.7 (15.5-16.4) ±0.20	1.9	
IV	5	15.6 (15.3-15.9) ±0.25	1.8	
II	6	15.6 (15.3-15.8) ±0.19	1.5	
I	15	15.5 (14.8-16.2) ±0.18	2.2	
VI	1	15.9		
Zygomatic breadth				
Females				
V	2	14.2 (13.9-14.4) ±0.50	2.5	ns
I	24	14.1 (13.4-14.7) ±0.13	2.3	
IV	2	14.0 (13.9-14.0) ±0.10	0.5	
II	5	13.9 (13.5-14.4) ±0.29	2.4	
III	8	13.7 (13.4-13.9) ±0.13	1.3	
VI	1	13.6		
Males				
V	8	13.4 (13.0-14.0) ±0.25	2.7	ns
I	15	13.1 (12.1-13.6) ±0.19	2.8	
II	6	13.1 (12.9-13.5) ±0.21	2.0	
III	9	13.1 (12.9-13.5) ±0.12	1.4	
IV	5	13.1 (12.9-13.2) ±0.17	1.5	
VI	1	13.0		

Table 1. cont.

Measurements, sex, and samples	N	Mean (Range) ±2SE	CV	Significance
Interorbital constriction				
Females				
IV	2	5.3 (5.0-5.5) ±0.50	6.7	ns
I	25	5.2 (4.7-5.7) ±0.09	4.4	
V	2	5.2 (5.1-5.3) ±0.20	2.7	
III	8	5.1 (4.8-5.4) ±0.13	3.6	
II	6	5.0 (4.9-5.2) ±0.10	2.4	
VI	1	5.2		
Males				
V	8	4.8 (4.5-5.2) ±0.16	4.7	ns
I	15	4.7 (4.1-5.1) ±0.11	4.9	
III	9	4.7 (4.5-5.0) ±0.14	4.4	
IV	5	4.6 (4.5-4.8) ±0.14	3.3	
II	6	4.5 (4.4-4.6) ±0.07	2.0	
VI	1	4.9		
Postorbital constriction				
Females				
I	25	4.9 (4.5-5.2) ±0.07	3.6	ns
IV	2	4.9 (4.7-5.1) ±0.40	5.8	
V	2	4.9 (4.8-4.9) ±0.10	1.5	
II	6	4.8 (4.5-5.0) ±0.15	3.9	
III	8	4.8 (4.5-5.0) ±0.12	3.5	
VI	1	4.9		
Males				
I	15	4.7 (4.3-5.0) ±0.11	4.5	ns
V	8	4.6 (4.2-4.8) ±0.14	4.5	
III	9	4.5 (4.2-4.8) ±0.15	5.0	
IV	5	4.5 (4.4-4.7) ±0.11	2.7	
II	6	4.5 (4.4-4.5) ±0.04	1.2	
VI	1	4.9		
Mastoid breadth				
Females				
IV	2	12.1 (11.8-12.3) ±0.50	2.9	ns
II	5	11.7 (11.3-12.3) ±0.36	3.4	
I	25	11.7 (11.1-12.2) ±0.12	2.5	
V	2	11.5 (11.4-11.6) ±0.20	1.2	
III	8	11.5 (10.9-12.0) ±0.24	2.9	
VI	1	11.5		
Males				
V	8	11.2 (10.8-11.8) ±0.25	3.2	ns
I	14	11.0 (10.0-11.6) ±0.19	3.2	
II	6	11.0 (10.7-11.3) ±0.18	2.0	
III	9	11.0 (10.7-11.2) ±0.11	1.5	
IV	4	10.9 (10.4-11.2) ±0.36	3.3	
VI	1	11.0		
Palatal length				
Females				
IV	2	4.1 (4.0-4.1) ±0.10	1.7	ns
V	2	4.0		
III	8	4.0 (3.8-4.4) ±0.14	4.8	
I	25	3.9 (3.5-4.3) ±0.07	4.1	
II	6	3.9 (3.7-4.0) ±0.10	3.0	
VI	1	4.0		
Males				
V	8	3.5 (3.2-3.8) ±0.14	5.8	ns
I	15	3.4 (3.2-3.6) ±0.06	3.5	
II	6	3.4 (3.2-3.6) ±0.13	4.9	
III	9	3.4 (3.2-3.6) ±0.11	4.9	
IV	5	3.3 (3.1-3.5) ±0.15	5.0	
VI	1	3.4		

Table. 1 cont.

Measurements, sex, and samples	N	Mean (Range) ±2SE	CV	Significance
Length of the maxillary toothrow				
Females				
IV	2	6.1		ns
III	8	6.0 (5.8-6.4) ±0.13	3.0	
II	6	6.0 (5.8-6.2) ±0.11	2.3	
I	25	5.9 (5.7-6.2) ±0.06	2.4	
V	2	5.8 (5.7-5.8) ±0.10	1.2	
VI	1	6.2		
Males				
V	8	5.5 (5.4-5.8) ±0.10	2.5	ns
IV	5	5.4 (5.3-5.5) ±0.10	2.0	
III	9	5.4 (5.2-5.5) ±0.08	2.1	
II	6	5.4 (5.3-5.6) ±0.10	2.2	
I	15	5.3 (5.1-5.5) ±0.06	2.3	
VI	1	5.0		
Breadth across upper molars				
Females				
I	25	9.0 (8.6-9.3) ±0.07	1.8	
IV	2	8.9 (8.9-9.0) ±0.10	0.8	
II	6	8.9 (8.7-9.0) ±0.12	1.7	
III	8	8.8 (8.4-8.9) ±0.11	1.8	
V	2	8.8 (8.7-8.8) ±0.10	0.8	
VI	1	9.0		
Males				
I	15	8.2 (7.9-8.5) ±0.09	2.1	ns
II	6	8.2 (7.9-8.3) ±0.12	1.9	
III	9	8.2 (7.9-8.7) ±0.15	2.8	
V	8	8.2 (7.8-8.6) ±0.19	3.3	
IV	5	8.1 (8.0-8.2) ±0.07	1.0	
VI	1	7.9		

The evolutionary forces that drive the development of these secondary sexual size differences in some of these closely related species and not others certainly are not clear. One interesting hypothesis that could be tested in these bats is that these size differences allow members of the same species to take different types or sizes of food items, thus reducing intraspecific competition. The reduction of such intraspecific competition certainly could be important to a species living on an island where food resources are limited and an island that periodically experiences devastating hurricanes.

The samples of *Ariteus flavescens* demonstrated little geographic variation among populations on Jamaica and the little variation present follows no particular pattern. Based upon morphological variation there are no subpopulations of *Ariteus* on the island. It will be of interest to compare variation at the genetic level to this morphological result.

Specimens examined.— SAMPLE I: Orange Valley, St. Ann Parish, 34 (TTU); Queenhythe, St. Ann Parish, 3 (2 CM, 1 TTU); 4 mi. E Runaway Bay, St. Ann Bay, 1 (TTU); Duanvale, Trelawny Parish, 2 (TTU). SAMPLE II: Flint River, 1 1/2 mi. E Sandy Bay, Hanover Parish, 12 (CM). SAMPLE III: Bluefields, Westmoreland Parish, 17 (CM). SAMPLE IV: Mandeville, Manchester Parish, 1 (BMNH); 0.2 mi. E Watermount, St. Catherine Parish, 6 (CM). SAMPLE V: 0.8 mi. W Drapers, Portland Parish, 5 (CM); Hector's River, Portland Parish, 4 (JMM); Whitfield Hall, Penlyne, St. Thomas Parish, 1 (UF). SAMPLE VI: Kingston, St. Catherine Parish, 2 (1 HZM, 1 NMNH).

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It was through the efforts of Horn Professor J Knox Jones, as director of Academic Publications, that Texas Tech University initiated several publications series including the Occasional Papers of the Museum. This and future editions in the series are a memorial to his dedication to excellence in academic publications. Professor Jones enjoyed editing scientific publications and served the scientific community as an editor for the Journal of Mammalogy, Evolution, The Texas Journal of Science, Occasional Papers of the Museum, and Special Publications of the Museum. It is with special fondness that we remember Dr. J Knox Jones.

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