

Note

## New records of bats from Saint Barthélemy, French West Indies

Nouvelles captures de chauve souris de Saint Barthélemy, Antilles françaises

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**Keywords:** Antilles; biodiversity; Chiroptera; inventory.

**Mots clés:** Antilles; biodiversité; Chiroptères; inventaire.

The only published report of bats from the Antillean island of Saint Barthélemy (French West Indies) was by Allen (1911) based on three specimens of *Tadarida brasiliensis* in the collections of the Museum of Comparative Zoology at Harvard University (MCZ). Believing that this paucity of records was an artifact of collecting effort rather than a biological phenomenon, we visited the island during 19–25 May 2004. Our work resulted in the collection of four species of bats not previously recorded from the island, as well as additional specimens of *T. brasiliensis*. Subsequent to our field studies, we examined Allen's (1911) original material, as well as several specimens previously obtained on Saint Barthélemy in 1982 that were deposited in the National Museum of Natural History (NMNH) but had not been recorded in the literature.

Saint Barthélemy (18°N, 63°W) is located 30 km south of Saint Martin and was connected to that island and Anguilla during the Pleistocene (Pregill and Olson 1981). The island has an arid climate, and steep mountains (highest point 281 m) constitute much of its 25-km<sup>2</sup> area. Saint Barthélemy receives approximately 1000 mm of rain annually and has mean temperatures of 21°C and 25.5°C in winter and summer, respectively. We found significant tourism development and a paucity of fresh water on the island. Agriculture and tourism development has done little to alter the native flora, which comprises arid- and saline-adapted plants such as *lignum vitae* (*Guaia-cum officinale*), manchineel (*Hyppomane mancinella*), geranium tree (*Cordia sebestena*), sea grapes (*Coccoloba*

*uvifera*), and Englishman's head cactus (*Melocactus intortus*), none of which are particularly beneficial for bats. The flora on St. Barthélemy that is potentially useful as food or shelter for bats include trees such as flamboyant (*Delonix regia*), frangipani (*Plumeria* spp.), sabal palm (*Sabal palmetto*), and royal palm (*Roystonea* spp.), as well as scattered banana (*Musa* spp.), mango (*Mangifera* spp.), and breadfruit (*Artocarpus* spp.) trees. Because much of the island is composed of limestone, the discovery of numerous cave systems that provide shelter for at least four of the five species of bats now known from the island is not very surprising.

Mist-netting for bats was conducted in a variety of habitats that exhibited some fruiting trees. Bats were measured and examined at the end of the evening: weight (g), length of forearm (mm), reproductive status (testis length [mm], crown-rump length of embryos [mm], and lactation), and tooth wear. Length of forearm and cranial measurements (mm) were taken from museum specimens using digital calipers. Voucher specimens from our work were deposited in the research collections at the Museum at Texas Tech University (TTU) and the Laboratoire de Zoologie Mammifères and Oiseaux at the Museum National d'Histoire Naturelle in Paris (MNHN).

### *Monophyllus plethodon luciae* Miller, 1902

Specimen examined (n=1): 0.4 km S, 0.4 km W Lurin, 17°53'22.5" N, 62°50'47.3" W, 95 m, n=1 (TTU).

This specimen represents the first record of the Insular single leaf bat from St. Barthélemy. The species is known from nearby islands such as Sint Maarten (Genoways et al. 2007), St. Kitts (Pedersen et al. 2005), and Nevis (Pedersen et al. 2003), so its presence on the island was not unexpected. When caves are available as daytime roosts, this species can be found foraging in xeric habitats such as those on St. Barthélemy. Forearm and cranial measurements of our adult male are presented in Table 1. These measurements fall within the range for five males sampled on St. Maarten, except for a smaller mastoid breadth (Genoways et al. 2007) and the range for most measurements of a sample of three males from St. Kitts (Pedersen et al. 2005). When compared with a sample of three males from Antigua (Pedersen et al. 2006), the St. Barthélemy specimen is smaller in most measurements. We follow Schwartz and Jones (1967) in placing all populations from St. Lucia, northward in the Lesser Antilles, in the subspecies *M. p. luciae*, but we recognize that the variation represented among samples in the northern Lesser Antilles calls for a re-evaluation of

**Table 1** Length of forearm and seven cranial measurements for five species of bats from the island of Saint Barthélemy, French West Indies.

	Length of forearm	Greatest length of skull	Condylbasal length	Zygomatic breadth	Post orbital constriction	Mastoid breadth	Length of maxillary tooththrow	Breadth across upper molars
<i>Monophyllus plethodon luciae</i>								
TTU 101816, male	42.9	23.2	20.8	10.2	4.6	9.7	8.1	5.5
<i>Brachyphylla cavernarum cavernarum</i>								
Males (n=5)								
Mean	65.2	32.2	28.8	17.4	6.3	15.1	11.1	11.6
Range	(63.5–66.8)	(31.5–32.6)	(28.3–29.2)	(17.0–17.8)	(6.0–6.4)	(14.7–15.4)	(10.9–11.3)	(10.9–11.9)
±SE	±0.55	±0.21	±0.16	±0.16	±0.07	±0.12	±0.06	±0.19
Females (n=5)								
Mean	65.2	32.0	28.8	17.5	6.4	14.8	11.1	11.6
Range	(63.4–67.7)	(31.2–33.0)	(28.0–29.8)	(16.9–17.9)	(6.4–6.5)	(14.4–15.2)	(10.9–11.4)	(11.3–11.9)
±SE	±0.83	±0.30	±0.29	±0.18	±0.02	±0.14	±0.08	±0.12
<i>Artibeus jamaicensis jamaicensis</i>								
Males (n=5)								
Mean	59.5	28.3	25.1	16.8	7.3	14.6	9.8	12.7
Range	(56.1–61.8)	(27.7–28.3)	(24.7–25.4)	(16.5–17.1)	(7.0–7.4)	(14.2–15.1)	(9.6–10.0)	(12.7)
±SE	±1.00	±0.20	±0.10	±0.10	±0.10	±0.20	±0.10	±0.00
<i>Molossus molossus molossus</i>								
TTU 101817, female	38.8	16.5	14.4	9.9	3.2	9.4	5.8	7.3
TTU 101818, female	36.9	16.3	14.1	10.1	3.3	9.6	5.7	7.3
TTU 101819, female	36.5	15.7	13.9	9.8	3.1	9.2	5.6	7.1
<i>Tadarida brasiliensis antillarum</i>								
Males (n=4)								
Mean	38.6	15.9	14.8	9.1	3.6	8.9	5.7	6.4
Range	(37.5–39.3)	(15.5–16.2)	(14.4–15.1)	(9.0–9.4)	(3.5–3.8)	(8.6–9.3)	(5.6–5.9)	(6.2–6.4)
±SE	±0.44	±0.17	±0.15	±0.10	±0.07	±0.16	±0.06	±0.05
Females (n=5)								
Mean	38.9	15.6	14.5	9.1	3.6	8.6	5.6	6.5
Range	(37.5–39.9)	(15.4–16.0)	(14.2–14.7)	(8.8–9.3)	(3.6–3.7)	(8.3–8.8)	(5.5–5.7)	(6.4–6.7)
±SE	±0.40	±0.11	±0.10	±0.08	±0.02	±0.08	±0.04	±0.06

geographic variation now that more samples are available.

Our single specimen of this glossophagine was taken in a cave southwest of Lurin. This cave consists of two chambers, approximately 6 m underground, under boulders in a large rock fall. Our specimen was mist-netted in the larger, innermost of the two chambers that measures some 10 m in length and 8 m in height. This individual was the only bat that we observed in this cave, but given the presence of several deep crevices and three access points leading to the outside, other bats may have gone unnoticed.

Our specimen was an adult male that weighed 15.4 g and had a testis length of 1.5 mm when captured on 20 May 2004.

#### *Brachyphylla cavernarum cavernarum* Gray, 1834

Specimens examined (n=14): 0.3 km S, 0.7 km W Gouverneur, 17°53'01.3" N, 62°50'25.5" W, 30 m, 13 (TTU); Quarter St. Jean, n=1 (NMNH).

Specimens captured/released (n=11): 0.3 km S, 0.7 km W Gouverneur, 17°53'01.3" N, 62°50'25.5" W, 30 m, n=8; Lurin, 17°53'33.3" N, 62°50'27.5" W, 150 m, n=2; Public, 17°54'18.8" N, 62°51'09.5" W, 7 m, n=1.

These are the first specimens of the Antillean fruit-eating bat to be reported from St. Barthélemy. Swanepoel and Genoways (1978) assigned members of this species from St. Croix southward to St. Vincent to the nominate subspecies; we follow that arrangement here. Table 1 presents length of forearm and cranial measurements for five males and five females from St. Barthélemy. Males and females in our sample revealed no significant secondary sexual variation; in fact, the sexes had the same mean values for four of the measurements studied: length of forearm, condylbasal length, length of maxillary tooththrow, and breadth across upper molars (Table 1). For the other four measurements, males averaged larger in two and females were larger in two (Table 1). This differs from the situation on St. Martin (Genoways et al. 2007), where males were significantly larger than females in greatest length of skull and condylbasal length and males averaged larger than females in all other measurements studied. Swanepoel and Genoways (1978) also found that males were larger than females and analyzed the sexes separately in their analyses.

We captured three *Brachyphylla* along flyways during four nights of mist netting and a single female was captured on the night of 20 October 1982 in a mist net in

Quarter St. Jean. However, all of our vouchers were captured in a cave southwest of Gouverneur. This cave appears to have been a large erosion pocket situated within a steep hillside littered with boulders, cactus, and thorny scrubland. This cave consisted of a single oblong chamber measuring 10 m in length with a high, domed ceiling 16 m above the soft floor of the cave. During our two visits to this cave, we sifted through guano and explored rock crevices and found some complete and many partial skeletons of *Brachyphylla*, one of which we collected. Another cave near the main road to Gouverneur has been reported to have a large colony of bats; however, during our search of this rather extensive cave (100 m in length), we did not observe bats or evidence of guano that would suggest that bats had resided there in recent times.

All six adult females taken on 20 and 22 May 2004 were pregnant. One female (forearm 63.4 mm) gave birth in a holding bag to a live female infant that had a forearm length of 32.7 mm. The infant weighed 13.9 g and its mother weighed 46.4 g. The crown-rump length of embryos found within the remaining five females averaged 38.4 mm (range 35.5–40.5). The five pregnant females weighed an average of 63.0 g (range 59.4–67.0). The six adult males in our sample had an average testis length of 6.2 mm (range 5–8.5) and an average weight of 47.5 g (range 45.2–50.8).

***Artibeus jamaicensis jamaicensis* Leach, 1821**

Specimens examined (n=9): 0.3 km S, 0.7 km W Gouverneur, 17°53'1.3" N, 62°50'25.5" W, 30 m, n=5 (TTU); Lurin, 17°53'33.3" N, 62°50'27.5" W, 150 m, n=1 (TTU); Public, 17°54'18.8" N, 62°51'9.5" W, 7 m, n=1 (TTU); St. Jean Bay, Hôtel Émeraude Plage grounds, n=2 (NMNH).

These are the first specimens of the Jamaican fruit-eating bat to be reported from St. Barthélemy. Length of forearm and cranial measurements for five males are given in Table 1. During our work on the island no females were obtained, although two females were taken during earlier work in 1982 (NMNH). Genoways et al. (2001) reviewed morphological variation in Antillean populations of this species. Our sample from St. Barthélemy (Table 1) most closely matches the measurements of other samples of *A. j. jamaicensis*, averaging larger than *A. j. parvipes* from Cuba and the Bahamas and smaller than *A. j. schwartzi* (*A. schwartzi*; Larsen et al. submitted) from St. Vincent.

Our largest sample of Jamaican fruit-eating bats came from the cave southwest of Gouverneur. In this cave, *Artibeus* was noted roosting along the walls of the high, domed chamber just below the top of the dome where the *Brachyphylla* were roosting. When *Artibeus* was disturbed, they relocated from the main chamber into a side chamber that tapered into a 6 m convoluted chimney that had a separate exit to the outside of the cave. Several bats exited the cave through this chimney only to re-enter the main chamber through the main entrance to the cave. During our two visits to this cave, we found skeletons of *Brachyphylla*, but none of *Artibeus*. A local naturalist, Mr. K. Questal, described for us a large cave on Île Coco, an islet south of Morne Rouge, in which the

number of bats present and their clustering pattern suggests that this was *A. jamaicensis*, although the presence of *B. cavernarum* cannot be ruled out. We also examined the well at Grottes a Sel on the xeric eastern-most peninsula of the island, where bats had reportedly been seen in the past. No bats were observed along the walls of the deep shaft of this well, but given the large amount of light entering this space, Jamaican fruit-eating bats would be the most likely species to occur here.

We captured individuals in foraging areas on two separate nights. At Lurin, we netted two *Brachyphylla* and a single *Artibeus* in six mist nets set along a road at the highest elevation (150 m) worked on the island. The native vegetation in this area was low and scrubby, with the larger trees being imported ornamental species associated with residences. In Public, six nets were placed near a small grove of sabal palm, banana and mango trees, and several houses <100 m from the beach. Despite intermittent rain, a single adult male *Artibeus* was taken in association with one *B. cavernarum* and five *T. brasiliensis*. Two adult *Artibeus* females were captured as they foraged among the gardens on the grounds of Hôtel Émeraude Plage in St. Jean Bay in 1982.

One of the females taken on 17 October 1982 from St. Jean Bay was lactating, whereas the other evinced no gross reproductive activity. The mean length of testis for the seven adult males was 5.9 mm (range 4.5–8). The lactating female weighed 43.8 g and the other weighed 40.8 g. The seven males weighed an average of 38.4 g (33.4–41.2 g). The five males examined lacked both upper third molars M3, but had the lower m3 present in both jaws, as is the condition in other populations of *A. j. jamaicensis* (Genoways et al. 2001).

***Molossus molossus molossus* Pallas, 1776**

Specimens examined (n=4). Lorient, 17°54'28.0" N, 62°49'16.7" W, 2 m, n=3 (TTU); Quarter St. Jean, n=1 (NMNH).

Additional record (n=2), Lorient (Timm and Genoways 2003).

These are the second specimens of Pallas's Mastiff bat to be reported from Saint Barthélemy. We also examined an unpublished voucher of this species taken 19 October 1982 at Quarter St. Jean. Husson (1962) restricted the type locality of *M. molossus* to the island of Martinique, which led Dolan (1989) to apply the name *M. m. molossus* to this species throughout the Lesser Antilles. Length of forearm and cranial measurements for three females from Saint Barthélemy are given in Table 1. These measurements compare favorably with samples of five females from St. Martin/St. Maarten (Genoways et al. 2007), two females from Nevis (Pedersen et al. 2003), and four females from St. Kitts (Pedersen et al. 2005). Based on these results, we continue to follow Dolan (1989) until an analysis of variation in all Antillean population of this species can be completed.

In four nights of mist-netting on Saint Barthélemy, we collected all three specimens in two mist nets within 100 m of the beach on 21 May 2004. This is surprising because this insectivorous bat is often the most common species on other Lesser Antillean islands. The conditions under which our three females were taken at Lorient are

discussed in more detail in the species account for *T. brasiliensis*. We are unaware of the conditions under which the adult female was taken on 19 October 1982 at Quarter St. Jean.

Two of three females taken on 21 May carried embryos that measured 4 and 10 mm in crown-rump length, whereas the other female revealed no gross reproductive activity. The three females taken in May weighed 12.9, 14.1, and 11.3 g, respectively, and the female taken in October weighed 11.3 g.

***Tadarida brasiliensis antillarum* Miller, 1902**

Specimens examined (n=12). Lorient, 17°54'28.0" N, 62°49'16.7" W, 2 m, n=5 (TTU); Public, 17°54'18.8" N, 62°51'9.5" W, 7 m, n=5 (n=2 MNHN, n=3 TTU); no specific locality, n=2 (MCZ).

We mist-netted the Brazilian free-tailed bat at two sites on Saint Barthélemy and examined two of the three specimens that formed the basis of Allen's (1911) first report of the species from the island. Length of forearm and cranial measurements for four males and five females are reported in Table 1. The mean values for forearm and cranial measurements of specimens from Saint Barthélemy match closely values for samples from Saint Martin/Sint Maarten (Genoways et al. 2007) and Dominica (Genoways et al. 2001). We continue to follow Schwartz (1955) in assigning all Lesser Antillean populations of this species to the subspecies *T. b. antillarum* until a comprehensive study of geographic variation in Antillean populations is undertaken. Males and females in our sample did not differ significantly in any of the measurements studied. However, males averaged slightly larger than females in four measurements, females averaged slightly larger in length of forearm and breadth across upper molars, and the sexes had the same mean values for zygomatic breadth and postorbital constriction (Table 1).

All specimens were mist-netted amongst sabal palms near the beach at both Lorient and Public. At Lorient, however, other trees including banyan and coconut trees were intermingled among the palms. Ground cover at both locations consisted of low weeds and small bushes. At Lorient, Brazilian free-tailed bats were taken along with *M. molossus*, with both species seeming to arrive at our nets at the same time. At Public, five free-tailed bats, one *Brachyphylla*, and one *Artibeus* were taken in two adjacent nets set beneath large palm trees. The first specimens of this bat from Saint Barthélemy were collected on an unknown date by F. Lagois and deposited in MCZ (Allen 1911). This species generally occupies caves or abandoned mines as day roosts. We did explore an abandoned copper mine south of Lorient for this species and others that use such structures for roost sites. This was a horizontal shaft mine that was explored as far as was safe with the equipment available and then a mist net was placed at the entrance for one night, but no bats were obtained.

A female taken on 24 May 2004 carried a single embryo that measured 10 mm in crown-rump length. The other seven females taken on 21 and 24 May 2004 evinced no gross reproductive activity. Two adult males taken on 24 May 2004 had a testis length of 2.5 and

4.0 mm. The seven non-pregnant females weighed an average of 9.4 g (range 8.4–10.3), whereas the pregnant female weighed 9.8 g. The two males both weighed 9.3 g.

Our field research on Saint Barthélemy supports our initial hypothesis that the chiropteran fauna of the island is more diverse than is reflected in the literature. Five species of bats are now known from the island – two insectivorous species, two frugivorous species, and one nectarivore. This fauna is still smaller than those of some of the surrounding Lesser Antillean islands recently studied, including Saint Martin/Sint Maarten with eight species (Genoways et al. 2007), Nevis with eight species (Pedersen et al. 2003), St. Kitts with seven species (Pedersen et al. 2005), Antigua with seven species (Pedersen et al. 2006), and Montserrat with 10 species (Pedersen et al. 1996).

Despite our negative results in spotlighting ponds for fishing bats, we expect that *Noctilio leporinus* will eventually be reported from the island. In fact, "large" bats were reported to be occupying a rock outcrop north of the Anse de Grande Saline, where the saline ponds and quiet bays in the area provide adequate foraging habitats for this species. Although these outcrops provide ample shelter in several places, we found no evidence (guano, urine stains) of recent occupation by bats.

Given the natural history of the other two species commonly found on northern Lesser Antillean islands – *Ardops nichollsi* and *N. stramineus* – the potential for either occurring on St. Barthélemy is unlikely. Fruit-eating bats are relatively rare on Saint Barthélemy; therefore, *A. nichollsi*, which depends on native fruits and large trees for roosting, may not have been able to establish populations on the island. Although there are caves present on the island, those that we investigated are probably too dry to support *N. stramineus*, which requires caves with high temperatures and humidity for roost sites.

We find the apparent low populations of bats on Saint Barthélemy to be of some concern. Only two foraging individuals of the Jamaican fruit-eating bat (*Artibeus jamaicensis*) were taken during 30 net-nights. This may be explained in part by the very dry aspect of this island and a series of hurricanes over the past 10 years. No specimen of the nectarivore species, *Monophyllus plethodon*, was ever netted and only one was found in a cave roost. This is somewhat surprising given that Genoways et al. (2001) found that faunas with a high percentage of nectarivorous bats tend to be associated with arid islands. Even populations of insectivorous bats, which also tend to do well on arid islands, seemed very low on St. Barthélemy. This was especially true for *M. molossus*. Pallas's mastiff bats prefer to roost under corrugated metal roofs and loose roofing tiles. The homes and commercial buildings on Saint Barthélemy are different from those on other islands and may provide less access and hence fewer roost sites.

Based on experience on other Antillean islands, we believe that caves are extremely important for maintaining healthy bat populations. Saint Barthélemy does have a number of important caves that can be used as roosts by four of the five species on the island (*M. molossus* is the exception). It will be important as development of the island proceeds to protect these cave systems.

## Acknowledgements

We wish to thank the following for financial and material support throughout the project: Totten Trust, Hagan Fund of the University of Nebraska State Museum, and Robert and Dottie Chertok, along with Dale and Alice Vanwormer (American University of the Caribbean Medical School). We thank local authorities for their assistance in arranging collecting permits and access to public lands – Ronan Kirsch and Jean-Marc Pons (Museum National d'Histoire Naturelle) and Luc Legendre and Nadia Roseau (Bureau de l'Environnement-Prefecture de la Region Guadeloupe). We also wish to thank Jean-Philippe and Laurence Tran Hau (Salines Garden) for their hospitality, support, and interpreter skills. We kindly thank our new colleague Karl Questal for his guidance and assistance in the field. The patience and courtesy extended to us by Monique Genet and Didier Trotin for allowing us to work on their property is most gratefully acknowledged. Curatorial support was by the Natural Science Research Laboratory, Museum of Texas Tech University, with special thanks to Robert J. Baker, Heath Garner, and Kathy MacDonald. We wish to thank the following curators and collection managers for allowing us access to specimens housed in their research collections: Judith M. Chupasko, Museum of Comparative Zoology, Harvard University; Jean-Marc Pons, Museum National d'Histoire Naturelle, Paris, France; Richard W. Thorington Jr. and Linda Gordon, National Museum of Natural History; and Robert J. Baker, Museum of Texas Tech University.

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