Analysis of Ectoparasites of Dominican Bats

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Abstract

Streblids are parasitic flies that are primarily found on bats, including those of Dominica. This study examined the relationship between species of streblids and their preference for particular species of bats. We netted at seven different locations in Dominica for a total of ten nights, and determined that *Trichobius intermedius*, in the family Streblidae, was the most common ectoparasite, found primarily on the bat species *Pteronotus davyi* and *Natalus stramineus*. *Megistopoda proxima complex* was the most abundant ectoparasite on *Artibeus jamaicensis*. The streblid *Megistopoda sp.* was the least commonly found ectoparasite on any species of bats. Overall, four species of streblids were observed on five species of Dominican bats.

Introduction

Parasites are organisms that live in or on other organisms, during at least some part of their life cycle. They may feed off of their hosts, providing no benefits in return. This study examined ectoparasites, those that live on the exterior, of Dominican bats. Since most parasites are host-specific, we wanted to determine the relationship between the types of ectoparasites found on different species of bats. Specifically, we examined parasitic flies in the family Streblidae. We were interested in determining which species of streblids were associated with particular species of the order Chiroptera.

Host Descriptions:

A total of eight species of bats (hosts) was examined. *Natalus stramineus*, or the funnel-eared bat of the Natalidae family, are insectivores, having a slim body with long, slender wings. With a wingspan of 275 mm, they are quite small but have large funnel-shaped ears that are separated on the forehead. *Natalus stramineus* has a pointed uropatagium that is larger than its body and encloses all of its slender tail. They are common in all habitats.

Three species of the family Phyllostomidae, spear-nosed bats, were captured: *Sturnira lilium*, *Artibeus jamaicensis*, and *Monophyllus plethedon*. *S. lilium*, also known as the yellow-shouldered bat, has a leaf nose and no uropatagium. They are a dark brown color with reddish epaulettes, and are fairly large with a 330 mm wingspan. They are common in all habitats, especially moist parts of forests and open areas where fruit is plentiful to feed on (Evans 1997).

Artibeus jamaicensis, the Jamaican fruit-eating bat, also has a nose leaf, but it posesses an inverted-V shaped uropatagium. They are quite large, having a wingspan of 430 mm and roost in sea caves and trees (Evans 1997).

The Antillean long-tongued bat, *Monophyllus plethedon*, has an elongated muzzle that aids in feeding on soft fruit or nectar. They appear to be shades of brown with gray underneath, with a wingspan of 320 mm. The tail of *M. plethedon* projects slightly beyond the edge of the uropatagium. They are known to roost in trees and are distributed among elfin woodland, montane thicket, and banana plantations (Evans 1997).

Pteronotus davyi, Davy's naked-backed bat, of the family Mormoopidae has a bare back with its wing membranes fusing along the mid-dorsal line. They appear brown and have a wingspan of about 320 mm. *P. davyi* are insectivores.

Two species of the family Molossidae are on the island: *Molossus molossus* and *Tadarida brasiliensis*. *M. molossus*, or Pallas' mastiff bat or the velvety free-tailed bat, has a free tail with long thin wings. It is blackish to reddish-brown with a wingspan of 260 mm and ears that meet on the forehead. They are common insectivores that are widely distributed. Typically, they roost in buildings and open caves (Evans 1997).

Tadarida brasiliensis, the Brazilian (Mexican) free-tail, differs from *M. molossus* by having large forward ears that are separated on the forehead and have a distinguishable wrinkled upper lip. They are reddish-brown to black, feed on insects, and have a wingspan of about 225 mm. Very common in all habitats, *T. brasiliensis* often roost in buildings and caves (Evans 1997).

The big brown bat, *Eptesicus fuscus*, is a member of the family Vespertilionidae. They are insectivores with a wingspan of 280 mm. First discovered in 1982, *E. fuscus* are now known to roost in the rainforest (Evans 1997).

Ectoparasite Descriptions:

Streblids are ectoparasitic flies in the Class Insecta and Order Diptera. Streblids live on bats and are characterized by having no ocelli. They also have either small compound eyes, or none at all (Borror, et. al 1989). In addition, some species may be wingless.

Megistopoda proxima complex. These streblids have greatly elongated hind legs, about twice the length of the fore legs. In addition, *M. proxima complex* may either have reduced wings, or are completely wingless. Also, there is no ctenidium on their heads.

Aspidoptera phyllostomatis. These streblids have no ctenidium on their heads and have either wings that are reduced in size or are completely absent. Their hind legs are not as elongated as their fore legs. They also have three rows of setae of various lengths on the dorsal part of their mesepisternum.

Trichobius intermedius. These also do not have a ctenidium on their heads. The *T. intermedius* are the only species in the family Streblidae to have fully developed, functioning wings.

Mites, in the order Acari, are also commonly found on bats. These arachnids have oval-shaped bodies and have very little differentiation between the head and abdomen. The adult mites have four pairs of legs, while some newly hatched mites have only three pairs. They are usually parasitic and are found in the same habitats as the hosts (Borror, et al. 1989).

Bat bugs, a member of the family Polyctenidae, are wingless and lack compound eyes and ocelli. They have short, flat front legs, while the middle and hind legs are long and slinder. Normally they are 3.5 to 4.5 mm in length and are covered with bristles (Borror, et al. 1989).

Method and Materials

Mist nets, each six meters in length, were set up in six locations: Check Hall River, the Springfied Estate Guest House's veranda, Bee House, Fort Shirley-Cabrits, Rodney's Rock sea cave, and Stinking Hole. The net at the Check Hall River transected the water at the base of the trail. At the Bee House, a net was placed on the north and west side of the pond. A net was placed at the northwest end of the veranda of the Guest House in Springfield. One mist net was used at Fort Shirley in the Cabrits National Park about fifteen meters from a *Tadarida brasiliensis* roost. It was placed in a corridor that was surrounded by vegetation. The vegetation forced the bats to fly down into the net. At Rodney's Rock, a net was spread across approximately one-third of the entrance of the

sea cave that opened onto a pebble beach. The last night of batting, a net was placed over the first stream crossing of the Middleham Falls trail in Morne Trois Pitons National Park.

The mist nets, secured by bamboo poles, ropes, stakes, and rocks, were raised at dusk for a total of ten nights. After at least an hour, the net was checked for tangled bats. Once each bat was freed, they were placed into socks that were sealed with clothespins. Individually, the bats were processed. Processing included using soft-touch tweezers to capture the ectoparasites, which were then placed into a vial partially filled with 70% ethanol. The ectoparasites were returned to the lab for identification using the dissecting microscope and the *Key to Genera and Species of Streblidae Known From Dominica* (Warriner and Woolley 2001).

Table 1: Overview of Captured Bats

LOCATION	*SPECIES*	# OF MALES	# OF FEMALES
Check Hall River	*Tadarida brasiliensis*	2	0
Check Hall River	*Molossus molossus*	5	20
Check Hall River	*Artibeus jamaicensis*	1	1
Check Hall River	*Sturnira lilium*	0	1
Bee House(N of pond)	*Artibeus jamaicensis*	1	4
Bee House(N of pond)	*Tadarida brasiliensis*	3	0
Bee House(N of pond)	*Sturnira lilium*	0	2
Bee House(W of pond)	*Tadarida brasiliensis*	3	2
Bee House(W of pond)	*Natalus stramineus*	1	0
Bee House(W of pond)	*Pteronotus davyi*	1	0
Bee House(W of pond)	*Monophyllus plethodon*	1	0
Bee House(W of pond)	*Artibeus jamaicensis*	0	1
Fort Shirley-Cabrits	*Tadarida brasiliensis*	10	2
Rodney's Rock	*Tadarida brasiliensis*	4	10
Rodney's Rock	*Molossus molossus*	1	2
Rodney's Rock	*Artibeus jamaicensis*	0	1
Guest House	*Pteronotus davyi*	0	1
Stinking Hole	*Eptesicus fuscus*	2	1
Stinking Hole	*Natalus stramineus*	2	0
Stinking Hole	*Monophyllus plethodon*	0	1

Results

During a three-week bat study, data were collected to determine the variety of ectoparasites, particularly streblids, which live on Dominican bats. Bats were netted on ten nights at six different locations (Table 1;Appendix 1). At Check Hall River, 34 bats were netted across the water. Of those 34, only one bat carried streblids. It was a male *A. jamaicensis* that hosted two *Trichobius intermedius.* The Bee House was another good location for trapping. On the north side of the Bee House's pond, three of the nine bats that were captured carried streblids. *Megistopoda proxima complex* and *Aspidoptera phyllostomatis* were found on the two *A. jamaicensis*, and *Megistopoda sp.* was located on the body of the *S. lilium*. On the west side of the Bee House's pond, eight

bats were collected, but only two contained parasites. One was a *P. davyi* and the other was a *M. plethodon*, both possessing *T. intermedius*. Fort Shirley at Cabrits only had *T. brasiliensis* roosting there, so no streblids were located. At Rodney Rock's, we netted eighteen bats, mostly *T. brasiliensis* and *M. molossus.* There were no streblids found at this site, either, but bat bugs were discovered on the *M. molossus.* *P. davyi* was captured at the northwest side of the veranda of the guest house, but it did not have any streblids.

VIAL #	HOSTS	TYPE OF STREBLID	# STREBLIDS /BAT
79	*Sturnira lilium*	*Aspidoptera phyllostamatis*	1
79	*Sturnira lilium*	*Megistopoda proxima complex*	2
82	*Monophyllus plethodon*	*Trichobius intermedius*	3
85	*Natalus stramineus*	*Trichobius intermedius*	11
86	*Natalus stramineus*	*Trichobius intermedius*	3
32	*Pteronotus davyi*	*Trichobius intermedius*	15
33	*Artibeus jamaicensis*	*Megistopoda proxima complex*	5
34	*Sturnira lilium*	*Megistopoda sp.*	2
44	*Artibeus jamaicensis*	*Trichobius intermedius*	2
59	*Monophyllus plethodon*	*Trichobius intermedius*	2
60	*Artibeus jamaicensis*	*Aspidoptera phyllostomatis*	1
60	*Artibeus jamaicensis*	*Megistopoda proxima complex*	1
61	*Artibeus jamaicensis*	*Trichobius intermedius*	2
61	*Artibeus jamaicensis*	*Megistopoda proxima complex*	3

Table 2: Compositional Analysis of Bats and Ectoparasites

The final netting site was near Stinking Hole. This location provided six bats with half containing *T. intermedius.* On nearly all the bats in every location, mites were found on the bats' wings.

Discussion

Ectoparasites are often host specific. The streb-lids were mainly found on the hairy portion of the body. They proved to be very agile and elusive. Streblids can move side-ways extremely quickly and they utilize all parts of the bats' crevices to avoid

capture. The *Pteronotus davyi* specimen was infested with *Trichobius intermedius* and white mites. Similarly, *Natalus stramineus* hosted *T. intermedius* and again more mites. *Natalus stramineus* has the largest number of streblids in relation to body size. *Artibeus jamaicensis* had the following streblids: *Megistopoda proxima complex, Trichobius intermedius,* and *Aspidoptera phyllostomatis,* as well as mites. *Megistopoda sp., M. proxima complex, A. phyllostomatis,* and mites were all found on *S. lilium,* a leaf-nosed bat. The aggressive, nectivorous *Monophyllus plethodon* transported *T. intermedius* and mites. Interestingly, the *Molossus molossus* caught at Rodney's Rock, supported a collection of bat bugs and mites. However, the *Molossus molossus* trapped elsewhere displayed only mites, no bat bugs. *Eptesicus fuscus* and *Tadarida brasiliensis* only carried mites (See Table 3). The mites found on all of the bats were unidentifiable due to the lack of necessary equipment. Also, these mites can only be identified by a handful of museum-based specialists.

Overall, *Trichobius intermedius* proved to be the most commonly located streblid on the bats studied. Found in smaller quantities, *Megistopoda proxima complex* was the next most abundant parasitic fly. *Aspidoptera phyllostomatis* were only occasionally seen and captured on just a few species of bats. Finally, there were only two *Megistopoda sp.* on one bat (Refer to Table 3).

Further research is necessary to compensate for Type II errors in the study. The sample size is inadequate for the species *P. davyi, N. stramineus, Sturnira lilium,* and *M. plethodon.* Sites that were very productive were the Bee House (West of the pond) and the Morne Trois Pitons National Park site because there was a diversity of species caught. Also, the Bee House (North of the pond) was considered a fruitful site because of the number of ectoparasites that were collected there.

HOST	ECTOPARASITES
Natalus stramineus	*Trichobius intermedius*/mites
Sturnira lilium	*Megistopoda sp./Aspidoptera phyllostomatis/Megistopoda proxima complex/*mites
Artibeus jamaicensis	*Megistopoda proxima complex/Trichobius intermedius/Aspidoptera phyllostomatis/*mites
Monophyllus plethodon	*Trichobius intermedius/*mites
Pteronotus davyi	*Trichobius intermedius/*mites
Eptesicus fuscus	mites
Molossus molossus	bat bugs/mites
Tadarida brasiliensis	mites

Table 3: Summary of the types of ectoparasites found on the different species of bats.

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