Streblidae Association with Different Bat Species and Genders

Matti Bradshaw, Devon Eldridge, Audrey Holstead

Texas A&M University

Dr. Thomas E. Lacher, Jr.

Dr. Jim Woolley

Dr. Adrienne Brundage

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Abstract

The purpose of this study was to explore associations between the host bat and the ectoparasites found on each bat. This study focused on just ectoparasite association with bat species and gender. After netting multiple nights at different locations, 5 species of bat were caught and data were compiled and analyzed statistically. No significant relationship was found between the number of streblids, size, and sex of the bat. There were, however, differences noted among species.

Introduction

There are 12 species of bats on the island of Dominica, West Indies. The diets of these species vary widely, ranging from insects, fruits, and nectar. Roosting areas can also vary, such as trees, lava tubes, trees, and even in houses (Genoways et al. 2001). Bats also serve as the host to multiple species of parasites, including many members of the family Streblidae within the superfamily Hippoboscoidea (Triplehorn, et al. 2005). The island's diverse environments and large number of bat species provides a unique opportunity to gain hands-on experience in working with bats in a relatively safe environment. The purpose of this study was to find an association between the host bat and the ectoparasites found on each bat. We netted at Emerald Pool, Stinking Hole, and the Checkhall River at the Archbold Tropical Research and Education Center based on previous populations caught at these locations (Moore, et al 2015; Alexander, et al. 2007).

Materials and Methods

The bat net was strategically placed front of the pool at the base of the trail down to the Check Hall River (Figure 1). At Emerald Pool, three nets were set out, one crossing the stream to target bats drinking water, and the other two stretching down the hiking trail to cover a large series of gaps in the trees along the trail. At Stinking Hole, one net was set up perpendicular to the hiking trail for the bats to fly into as they left the lava tube. The net was kept closed and bunched together and held in places with clothes pins to prevent animals from getting trapped.

Figure 1: The net set up at the Checkhall River. The net isn't visible, but the bat poles can be seen.

We returned to the net(s) at dusk to open the nets and prepare for the bat emergence. The net was opened and stretched to the top of the poles. The net remained open until the desired/suitable number of bats were caught and was then closed to prevent other bats and animals from getting caught while we were processing bats and collecting data.

Each bat was weighed, removed from the sock, and had its measurements taken. The sock is also weighed and subtracted from the combined weight of the sock and bat to determine

the bat's weight. We measured forearm, ear, and hind foot length from heel to toe in millimeters (Figure 2). Gender was determined, and the ectoparasites were collected with a pair of soft-tipped forceps and placed in a numbered vial in 95% ethanol. Once all measurements and data was collected, the bat was released.

Figure 2: The forearm of Myotis dominicensis being measured.

The vials of parasites were brought back to the lab and all examined to determine the species of the parasites in each one with an identification key (Woolley & Warriner, 2001).

Once the data was all compiled, a chi-square test, t-test, and Spearman Rank correlation test were run to attempt to find any existing significant result.

Results

At the 3 different locations sampled, we caught 5 species of bats. The 5 species of bats captured were *Artibeus jamaicensis*, *Brachyphylla cavernarum*, *Molossus molossus*, *Monophyllus plethodon,* and *Myotis dominicensis.* Each data measurement taken from every

caught bat was compiled into Table A in the appendix. There were only enough individuals of one species, *Monophyllus plethodon*, to run statistical tests. No significant relationship between the number of streblids on the bat, size, and sex of the bat was found for *Monophyllus plethodon*. A chi-squared test was run on the data in Table 1 and produced a chi value of X^2=0.257, df=1, and p=0.61This was not significant. A t-test was ran on the mean number of streblids verses sex. The mean number of streblids on male *Monophyllus plethodon* were 1.71 +/- 0.36 standard error and the mean number of streblids on females was 1.88 +/- 0.42 standard error. The results of the t-test produced a t=0.24, df=22, and p=0.81. This also resulted in insignificant difference. A correlation between forearm length and the number of streblids found on the bats was done by conducting a Spearman's Rank test. The test resulting with a Spearman's value of 0.081 and a p=0.71, again insignificant. All comparisons between streblids, and *Monophyllus plethodon* characteristics, size and gender were insignificant.

The intended objective of this study was to determine a correlation between the species of ectoparasites and the gender and species of the bats. Of the four species, *Monophyllus plethodon* was the only one that we were able to run statistical analysis on, since it was the only species with enough individuals caught. The other bats that were caught and had streblids on them were *Artibeus jamaicensis*, *Myotis dominicensis*, and *Brachyphylla cavernarum.* However, there were not enough data per species to run tests on and there was only one female with the *Molossus molossus* to analyze statistically.

The statistical analysis that was run on *Monophyllus plethodon* did not produce evidence of a relationship between the number of ectoparasites, gender of the bats, and size of the bats.

Monophyllus plethodon Gender	Streblids Present	Streblids Absent	Total
Male	6	1	7
Female	13	4	17
Total	19	5	24

Table 1: The number of Monophyllus plethodon that did or did not have streblids on them based on species.

Discussion

Molossus molossus and *Monophyllus plethodon* consisted of the highest number of bats captured compared to the other species. All *Monophyllus plethodon* captured were netted at Stinking Hole, which is notorious for its large number of roosting bats (Corso 2008). The low numbers of *Brachyphylla cavernarum* captured and recorded may have been due to having to close the net early at Stinking Hole. It began to rain and we could no longer wait to start processing the bats already caught, due to fear of the weather becoming extreme. Therefore, the net was closed before the desired time to close the net. The other two species of bats consisted of significantly fewer individuals, both caught at the Emerald Pool location. The reason for the low numbers of *Artibeus jamaicensis* and *Myotis dominicensis* may have been because there was no roosting area located near where we netted.

Since it is likely that each individual bat nests with its own species (Kunz, T. H. 1982), it is possible that each species of streblid may transfer between individuals nesting in the same area. At the Stinking Hole location, *Monophyllus plethodon* and *Brachyphylla cavernarum* were the two species that were caught. Each of these species possessed *Trichobius intermedius* (Streblidae). It is likely that these two species roost together, so the commonality of the same species of streblid on each bat does not indicate that the streblids are specific to a certain species within stinking hole. There were only two individual bats caught at the Emerald Pool location,

both of which were different species, *Artibeus jamaicensis* and *Myotis dominicensis.* The *Myotis dominicensis* individual was caught on the first night and the *Trichobius intermedius* was found on this individual. *Artibeus jamaicensis* was caught on the second night and possessed two species of streblids: *Megistopoda proxima complex* and *Aspidotera phyllostomatis*. These two additional species of ectoparasite were unique to this one individual bat, but without analyzing more than one individual it is impossible to know if these streblids are species specific. Streblids on *Molossus molossus* were not observed, since this insectivorous bat less frequently has streblids.

Throughout this study, *Trichobius intermedius* was the most common species of streblid found on the most species of bats. It is likely that when compared to other species of streblid, *Trichobius intermedius* does not select its hosts according to species. However, it may be possible that this species may be specific to location, since the *Myotis dominicensis* individual's roosting site is unknown and the two species found at stinking hole each possessed this species.

In order to obtain better results in the future, the data collection should be run for an extended period of time with more netting attempts done in the same locations in order to catch more individuals from each species of bat. In doing so, we would be able to accurately discuss whether or not there is a relationship among the species of ectoparasites and the gender and species of the bats.

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Works Cited

Moore, B., Rice, H., Stroud, M., Lacher, T., & Woolley, J. (2015). Diversity of Bat Species across Dominica.

Alexander, K., Peredo, A., & Towers III, L. W. (2007). A Select Survey of Roosting Sites and Flight Corridors of Bats in Dominica.

Corso, Mandy. (2008). Population Estimate of the Chiropteran Emergence at Stinking Hole, Dominica.

Genoways, H. H., R. M. Timm, R. J. Baker, C. J. Phillips, and D. A. Schlitter. (2001). Bats of the West Indian island of Dominica: Natural history, areography, and trophic structure. Special Publications, Museum of Texas Tech University 43:1–43.

Kunz, T. H. (1982). Roosting ecology of bats. In *Ecology of bats* (pp. 1-55). Springer US.

Triplehorn, C. A. J., Borror, N. F., Triplehorn, D. J. C. A., & Johnson, N. F. (2005). *Borror and DeLong's Introduction to the Study of Insects* (No. QL463 B69 2005).

Woolley, J., & Warriner, L. (2001). *Key to genera and species of Streblidae (bat flies) known from Dominica* (Biological Identification Key). College Station, TX: Texas A&M University.

Appendix

Species	Gender	Forearm (mm)	Hind foot (mm)	Ear (mm)	Weight (g)	Vial #	# of strebs	species
Artebeus jamaicensis	F	62	15	15	47	29	3	Megistopoda proxima complex (2), Aspidotera phyllostomatis
Artebeus jamaicensis	F	65	14	16	60	0	0	
Artebeus jamaicensis	F	61	18	13	53	0	0	
Brachyphylla cavernarum	F	66	16	15	37	2	0	
Brachyphylla cavernarum	F	65	16	24	44	7	1	Trichobius intermedius
Brachyphylla cavernarum	F	64	16	20	44	8	0	
Molossus molossus	M	38	9	10	13	0	0	
Molossus molossus	F	37	8	6	13	0	0	
Molossus molossus	M	40	7	9	14	0	0	
Molossus molossus	M	41	7	7	14	0	0	
Molossus molossus	M	37	6	8	12	0	0	
Molossus molossus	M	38	9	7	11	0	0	
Molossus molossus	M	37	8	6	12	0	0	
Molossus molossus	F	41	7	6	11	0	0	
Molossus molossus	M	42	7	8	11	0	0	
Molossus molossus	F	36	6	6	12	0	0	
Monophyllus plethodon	F	41	11	11	14	3	1	Trichobius intermedius
Monophyllus plethodon	F	42	10	11	14	4	1	Trichobius intermedius
Monophyllus plethodon	F	39	13	10	10	5	0	

Monophyllus plethodon	F	42	11	9	15	6	2	Trichobius intermedius (2)
Monophyllus plethodon	F	44	6	7	15	9	3	Trichobius intermedius (3)
Monophyllus plethodon	F	41	7	7	14	10	6	Trichobius intermedius (6),
Monophyllus plethodon	M	40	6	5	13	11	2	Trichobius intermedius (2)
Monophyllus plethodon	F	39	7	6	16	12	5	Trichobius intermedius (5)
Monophyllus plethodon	F	42	7	6	15	13	2	Trichobius intermedius (2)
Monophyllus plethodon	F	41	7	6	13	14	1	Trichobius intermedius
Monophyllus plethodon	F	42	8	7	14	15	3	Trichobius intermedius (3)
Monophyllus plethodon	F	41	6	5	13	16	2	Trichobius intermedius (2)
Monophyllus plethodon	M	41	8	5	15	17	2	Trichobius intermedius (2)
Monophyllus plethodon	M	42	6	6	18	18	0	
Monophyllus plethodon	M	39	8	6	17	19	3	Trichobius intermedius (3)
Monophyllus plethodon	F	40	7	6	14	20	0	
Monophyllus plethodon	F	42	8	6	15	21	1	Trichobius intermedius
Monophyllus plethodon	M	42	8	6	14	22	2	Trichobius intermedius (2)
Monophyllus plethodon	F	43	7	6	12	23	2	Trichobius intermedius (2)
Monophyllus plethodon	M	42	9	10	13	24	2	Trichobius intermedius (2)
Monophyllus plethodon	F	42	8	10	14	25	3	Trichobius intermedius (3)
Monophyllus plethodon	F	42	10	9	15	26	0	
Monophyllus plethodon	F	40	11	9	13	27	0	
Monophyllus plethodon	M	42	11	9	15	28	1	Trichobius intermedius
Myotis dominicensis	M	33	7	6	6	1	1	Trichobius intermedius