Ectoparasites of Dominican Bats in Springfield

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Introduction

Parasite-host relationships are highly evolved interactions that affect all animals. Ectoparasites inhabit and feed on the external surfaces of their host, yet rarely provide benefit or fatality to the host. Bat ectoparasites either spend their entire life on the body of the host, or remain in the hosts' roosts (Gannon and Willig, 1995). Locational specificity may possibly reduce removal or occurance of being dislodged during grooming, the major source of mortality for most bat ectoparasites (Gannon and Willig 1995). Many parasites are highly host-specific due to the lifestyles of their hosts, and all species show some degree of host limitations.

We were interested in exploring the relationship of Dominican bats and their ectoparasites. Specifically, we wanted to identify the ectoparasites of Dominican bats and their body region preference. We also hoped to observe the differences in the parasite species between bat species. There have been no published studies on ectoparasites on Dominican bats, so our information sources were very limited. *The Manual of Neartic Diptera, Volume 2* was used as a preliminary source for identification of specimens.

Hypothesis: Ectoparasites predicted to be obtained from Dominican bats included ticks, mites, and Streblid flies, as observed in Puerto Rico by Gannon and Willig, 1995. Considering the membranous nature of the bat wing, we hypothesized that numerous parasites would be removed from this region. Also, we believed that there would be variation in ectoparasite species among bat species.

Materials

aspirator
tweezers
95% ethanol
plastic vials and lids
petri dish
glass vials and lids filled with 95% ethanol
data log
dissecting microscope
mist nets
bamboo poles
leather gloves
eyebrow brush
cuticle scissors
small paintbrush

Methods

Mist nets were placed in four locations around Springfield, Dominica. Two locations were near a water source, Bee House and Check Hall Stream, while the other two were placed in recognized flight pathways, Dining Hall and Streamhouse. The nets were dropped on separate nights.

Before sampling began, a series of plastic collection vials, filled with 95% ethanol, were assembled. Separate vials for each bat's head, back, and wing region were used for parasite collection. For simplicity, each set of the three vials was assigned a number that represented a specific bat. In the field, a captured bat was identified, sexed, and written into a numbered log.

All visible ectoparasites were removed with tweezers or an aspirator and placed in the vial of the corresponding body region. On *Artibeus jamaicensis* and *Sturnira lilium*, the head and back were combed with an eyebrow brush dipped in ethanol. On the smaller bats, *Molossus molossus*, a small paintbrush dipped in ethanol was used in the head and back region. The paintbrush was also used to sample the wings of all captured bats. After combing or brushing, the tool was placed in the appropriate vial to deposit the ectoparasites. The tools were cleansed between body regions and between each new bat.

The entire process was approximately thirty minutes per bat. All bats were successfully released and unharmed.

In the lab, each vial was emptied into a petri dish and scanned under the dissecting microscope. Parasites were identified as thoroughly as possible and transferred to small labeled glass vials with 95% ethanol.

Results and Discussion

Figure 1 shows all the data obtained on the ectoparasites from the twenty sampled bats.

The types of streblid flies obtained differed between bat species. *Sturnira lilium* and *Artibeus jamaicensis* both had *Trichobius sp.1* and *Strebla sp.* They differed in that *S. lilium* had *Paratrichobius sp.* and *A. jamaicensis* had *Trichobius sp.2.* There were no streblids recovered from *M. molossus.* This could possibly be explained by their choice of roost. Unlike forest roosts, the corrugated roof of the streamhouse may not provide an adequate environment for the streblid life cycle. Grooming habits may also influence streblid exploitation of *M. molossus.* All of the variations of ectoparasites between species may be due to a highly specific parasite-host interaction.

With respect to the mites, *A. jamaicensis* had mite A. One *M. molossus* had a single mite B. There were no mites removed from *S. lilium.*

The wing region had the largest concentration of ectoparasites with 9 out of 19 parasites collected. The back and head each had a total of 5 ectoparasites (see figure 2 for ectoparasite concentrations on body regions). The larger Mite A was found only on the wings and close to the body. This highly pocketed region is ideal for avoiding grooming practices by the host. Mite B, however, is so small that active grooming provides no threat; this may explain why it was found near the head of the host. There was no observable preference of body region by the streblids. This is probably because they are highly mobile, and can utilize much of the bat without being removed through grooming. However, this may also have been caused by our efforts to remove them; invariably, we provoked their movement.

With an inadequate sample size, it is difficult to draw any susbstantial conclusions from the data. Obtaining more samples could help in determining patterns between ectoparasites and bat species. Our results were also hindered by the lack of an adequate taxonomic key and a low-quality microscope. It is undeniable that we simply did not see all of the parasites collected. Furthermore, our technique was designed to avoid harming the captured bats; unfortunately, this made it almost impossible to recover all ectoparasites.

Description of Streblid Bat Flies

Class: Insecta, Order: Diptera, Family: Streblidae

The following ectoparasite species were collected from bats in the Springfield area. The most suitable genera were assigned to the collected streblids according to a North American key. Further taxonomic studies will be undertaken by Dr. Jim Woolley and Laurie Warriner at Texas A&M University upon return.

Strebla sp.: head flattened with ctenidia (See figs. 3 and 4).

Trichobius sp. 1: Brachypterous with rounded head lacking compound eyes. Antennae in lateral plane (See fig. 5).

Trichobius sp. 2: Fully winged with small compound eyes (See fig. 6).

Paratrichobius sp.: Straplike reduced wings. Head with small compound eyes. Very long hind legs. Fore femur with row of stout spikes (See fig. 7).

Streblid flies are obligate hematophagous parasites of bats. They are viviparous and their larvae develop while nourished by uterine milk glands. A puparium is formed immediately proceeding the larval deposit. Some species of Streblidae have communal deposition sites, where the female leaves the host and deposits its larva in flat depressions, or on the ground below the hosts' roosts (Wenzel and Peterson, 1987). In some species, the average life span is 29 days, with mortality resulting from disassociation, grooming and predation by the host. Previous observations show that some species did not survive after one to two hours of removal from their host (Wenzel and Peterson, 1987). Newly emerged adults feed before mating, while previously gravid females mate multiple times. Mating is necessary after each larval deposit to ensure fertilization of the proceeding ovum.

Streblids are usually found on colonial, cave-dwelling bats or on bats roosting in forest habitats. Like their host bats, streblids occur in tropical and subtropical regions. Rarely are they observed on solitary-roosting bats. Mobility of streblids is remarkable in that they can move in any direction with equal facility (Wenzel and Peterson, 1987). Agility in locomotion is especially noticable when they are on the wing membranes of the host. Flightless species tend to occur on fish-eating and fruit-eating bats. Streblids are frequent feeders, due to their high mortality rates after 24 hours of food deprivation.

Description of Bat Mites

Class: Arachnida, Order: Acari

The specimens of mites (Mite A and Mite B) removed from the sampled bats will be later identified and described by Dr. Jim Woolley and Laurie Warriner of Texas A&M University. This is due to the inadequate microscope, and lack of time and proper taxonomic key.

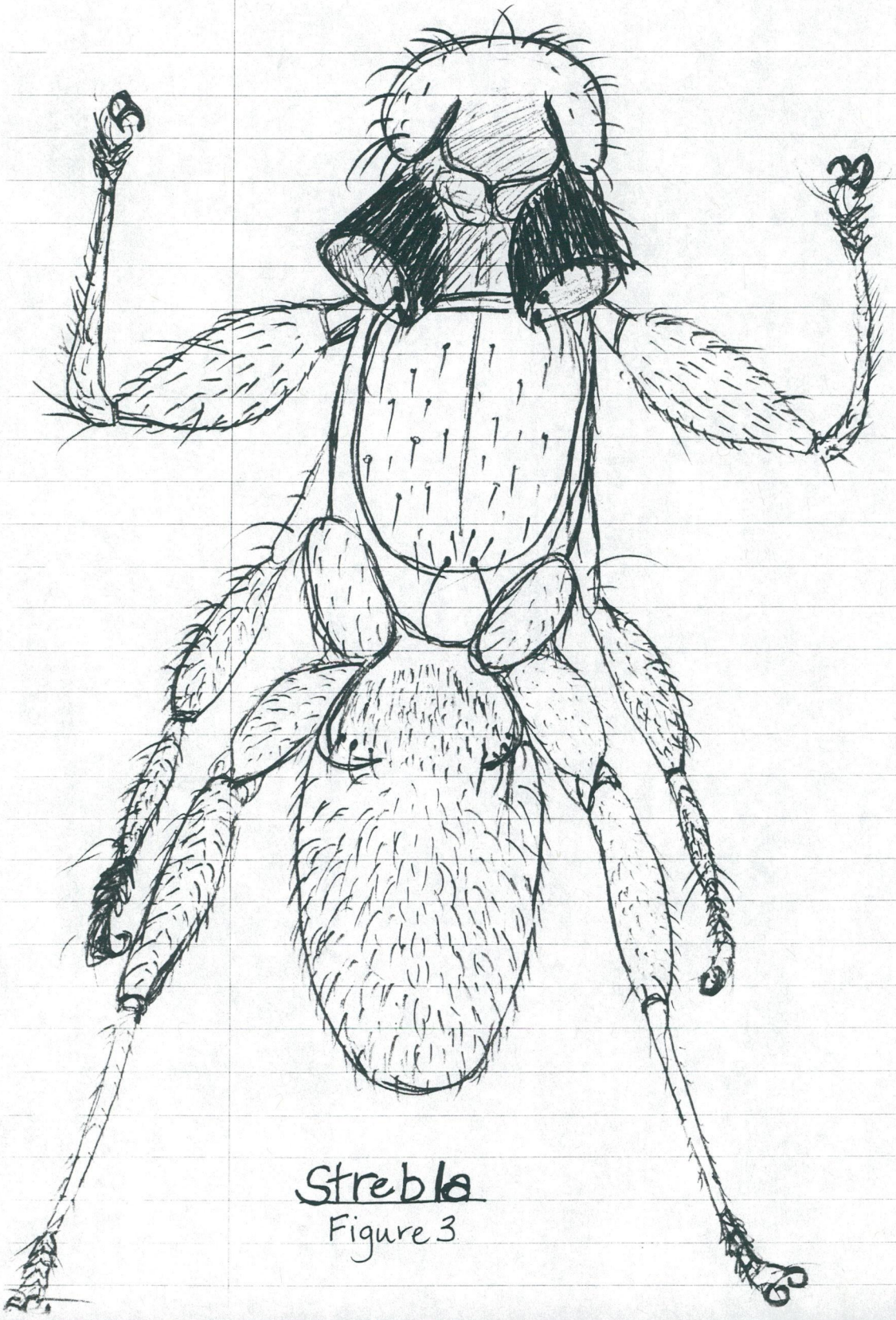
Mites are a very large group of minute animals. Their bodies are usually oval with little or no differentiation between the two body regions. The larvae of mites only have three pairs of legs, and aquire the fourth pair after their first molt. Acari occur in practically all habitats in which any host animal is found. Most of the parasitic forms are external to their hosts, although many free-living forms are predaceous.

Literature Cited

Borror, D.J., C.F. Triplelorr, and N.F. Johnson. 1989. *An Introduction to the Study of Insects.* Saunders College Publishing, Philadelphia.

Gannon, M.R., and M.R. Willig. 1995. Ecology of Ectoparasites from Tropical Bats. Environmental Entomology. 24(6): 1495-1503.

Wenzel, R.L. and B.V. Peterson. 1987. Streblidae. pp. 1293-1301 in J.F. McAlpine et al., eds., *Manual of Neartic Diptera, Vol. 2*, Agric. Canada, Monograph No. 28, Ottawa.



Strebla
Figure 3

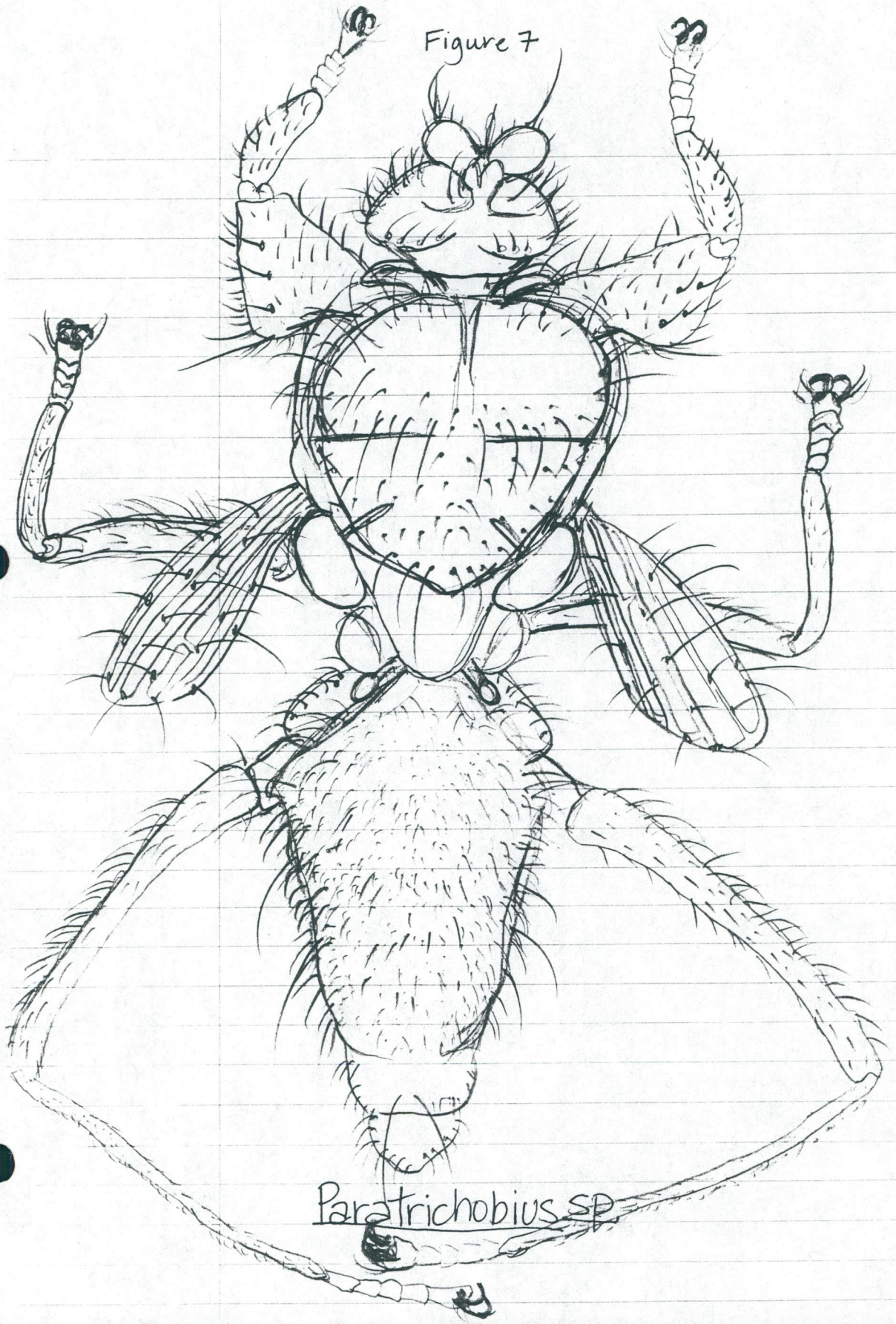
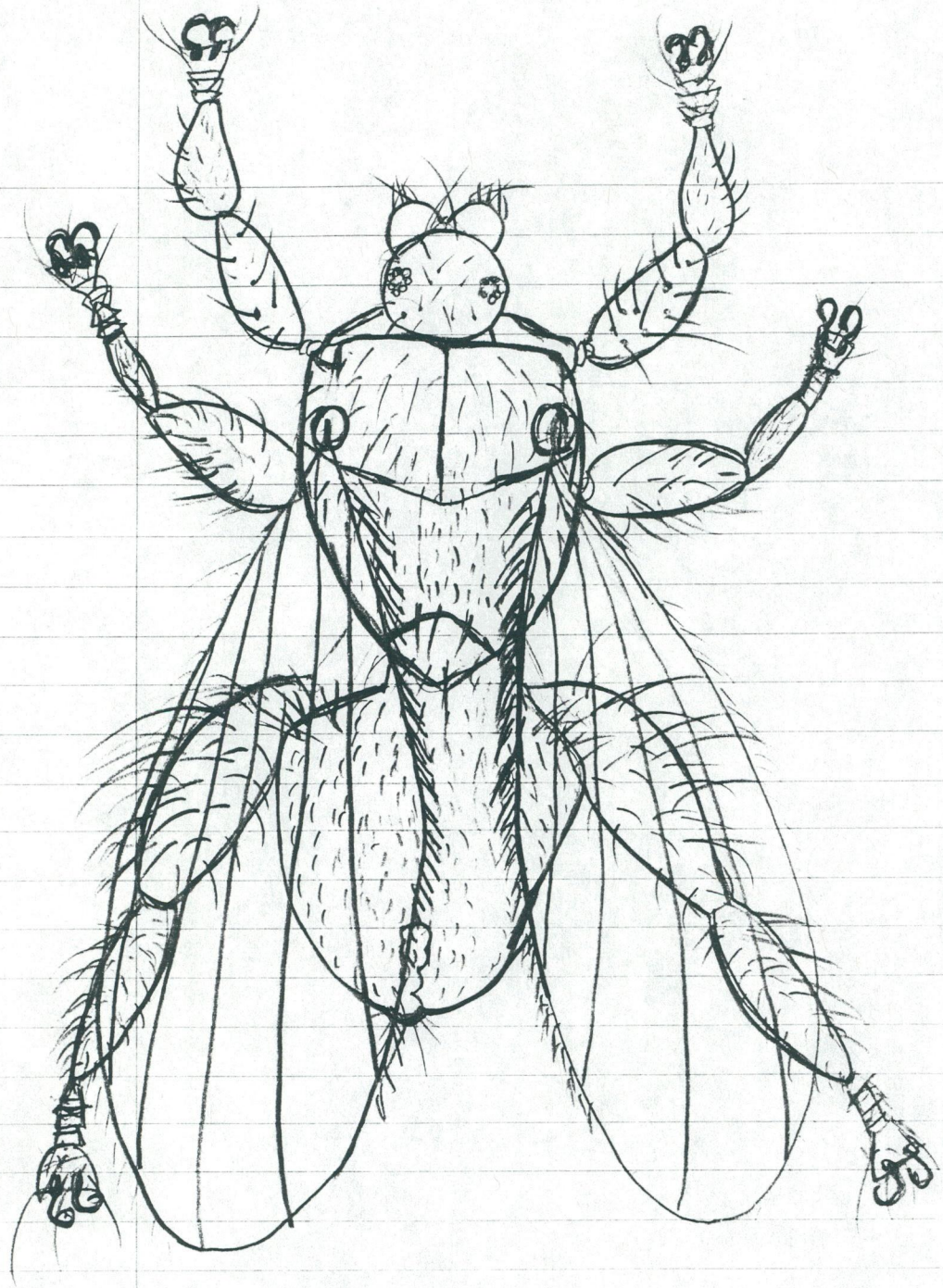
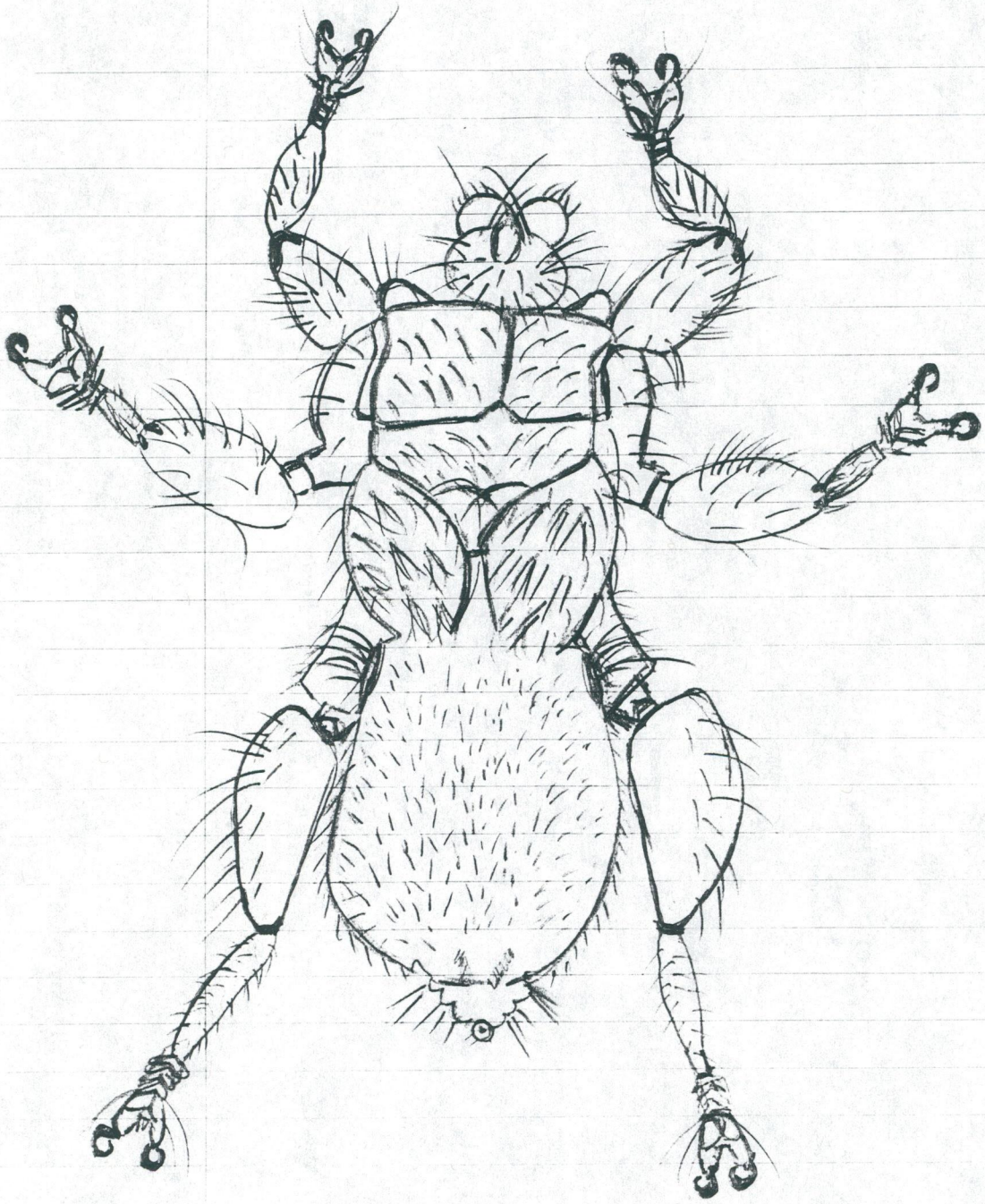


Figure 7
Paratrichobius sp.

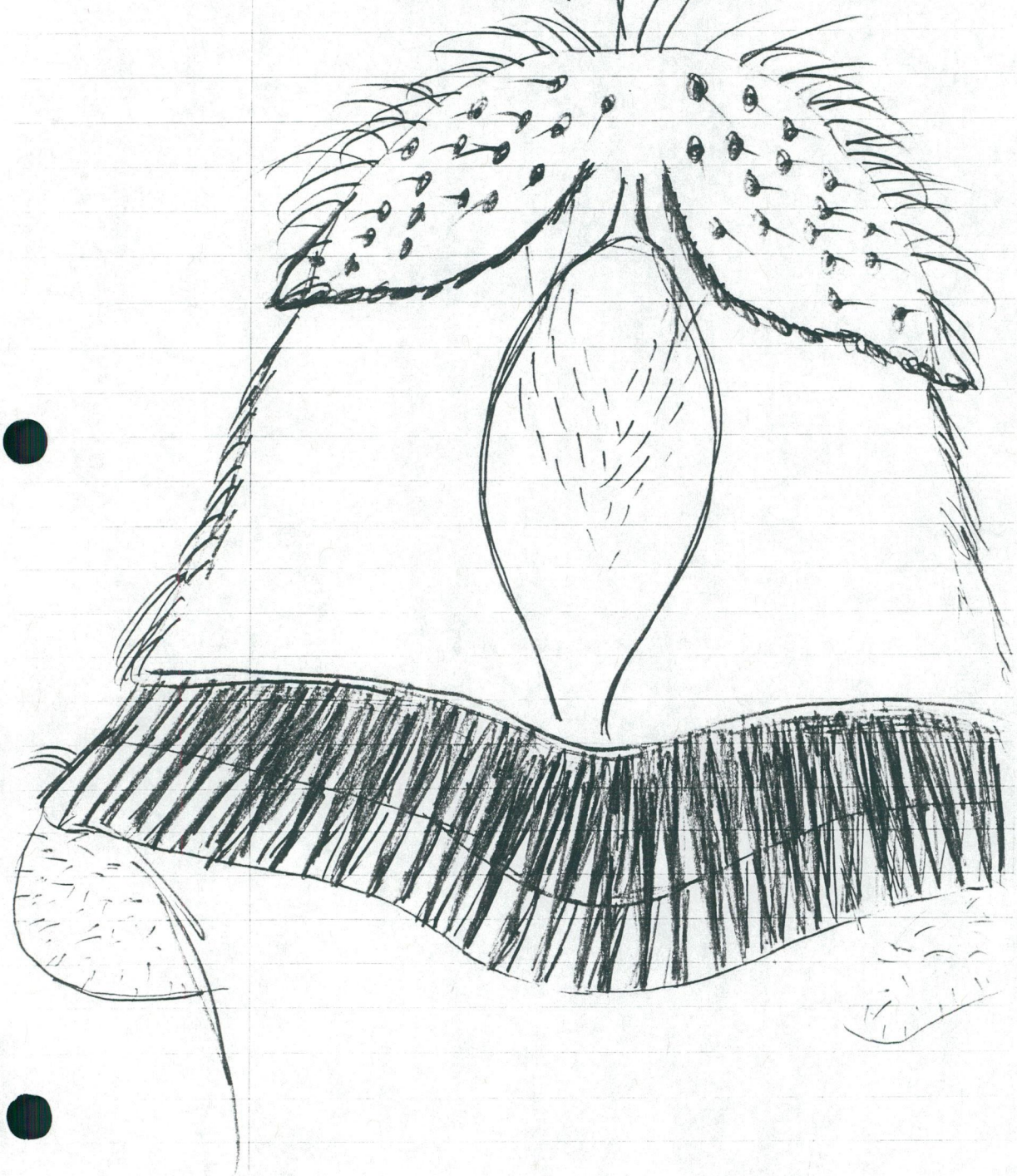


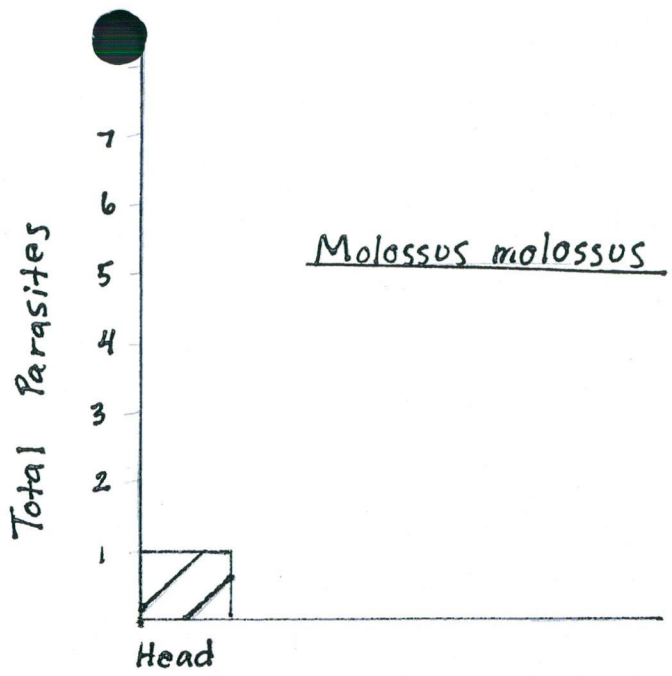
Trichobius sp. 2
Figure 6



Trichobius sp. 1
Figure 5

Figure 4
Strebla (ventral view)





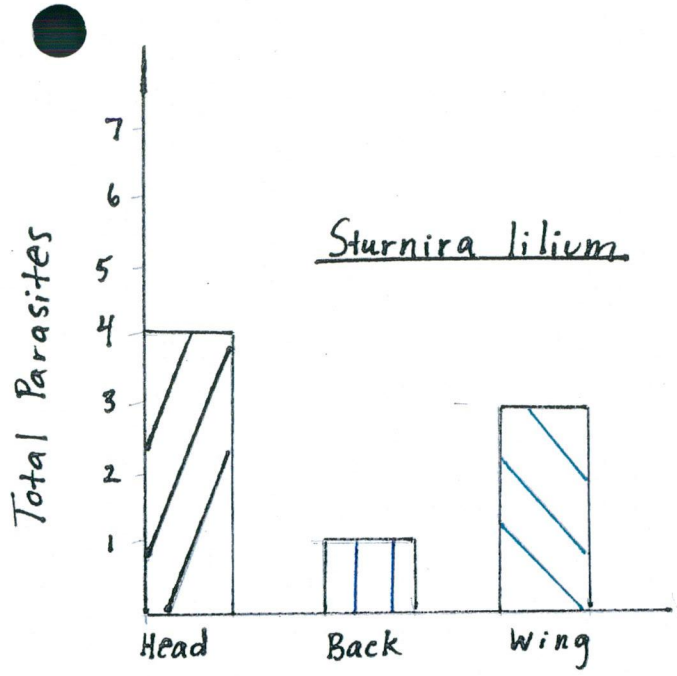
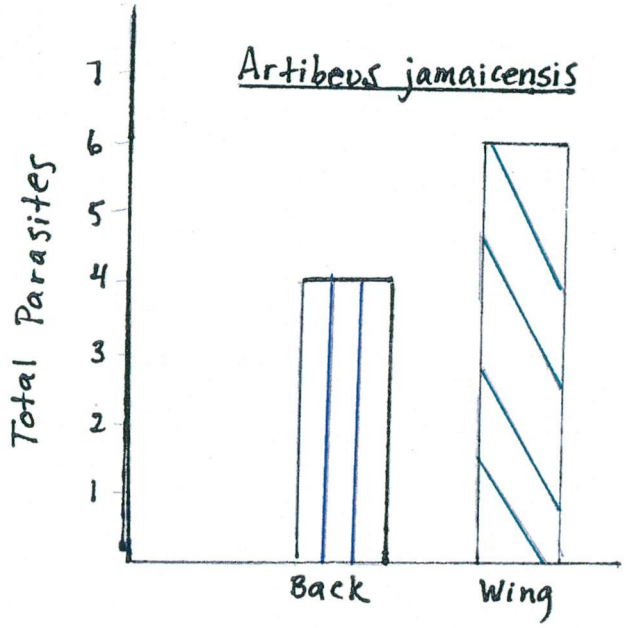


Figure 2

Body Region Preferences of Ectoparasites on Springfield Bat Species



Ectoparasites of Springfield Bats

Figure 1

Bat Number	Bat Species	Bat Sex	Head Ectoparasites	Back Ectoparasites	Wing Ectoparasites
3	*Artibeus jamaicensis*	♀		3 - *Strebla* sp. 1 - *Trichobius* sp. 1	3 - Mite A
4	*Molossus molossus*	♂	1 - Mite B		
6	*Artibeus jamaicensis*	♂			1 - Mite A 1 - *Trichobius* sp. 2
8	*Artibeus jamaicensis*	♀			1 - *Trichobius* sp. 2
12	*Sturnira lilium*	♀	1 - *Strebla* sp. 2 - *Paratrichobius* sp.		2 - *Trichobius* sp. 1
13	*Sturnira lilium*	♀	1 - *Trichobius* sp. 1		1 - *Paratrichobius* s
20	*Sturnira lilium*	♀		1 - *Paratrichobius* sp.	