

**Study of *Tadarida brasiliensis* and *Molossus molossus* including:**

**Frequencies emitted**

**Foraging times**

**Flight patterns**

**Sexual dimorphism**

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## Introduction

When we arrived in Dominica we desired to perform a study on general bat behavior. After reading previous studies, especially that done by Melissa White in 1996, we decided to expand on the information available on *Tadarida brasiliensis* and *Molossus molossus*. A colony of *Tadarida brasiliensis* was observed at Fort Shirley in Cabrits National Park, documenting their frequencies and times both within and when leaving their roost. A colony of *Molossus molossus* was also observed at the streamhouse of SCEPTRE in Springfield documenting their frequencies and times of leaving and returning to their roost. On one occasion *M. molossus* was caught using a mist net in order to determine male to female ratios and any sexual dimorphisms. On the night of 31 May 1998 *M. molossus* were caught and measured. Total length, length of forearm, length of ears, length of wing, length of hind leg, and weight were documented, taking into account the gender of each bat. Natalie Holzen was responsible for recording times when leaving and returning to the roost for *M. molossus* and *T. brasiliensis*. Natalie also worked on the flight pattern of these bats when leaving and returning to the roost. Jana Mullinax was responsible for explaining the measurement differences between males and females of the colony as well as comparing the number of males to the number of females. Jana also documented the frequencies of those species of bats roosting, leaving the roost, and for *M. molossus* returning to the roost. We hypothesized that *T. brasiliensis* and *M. molossus* would leave their roosts at the onset of dusk for that particular day. We also believed that the latter of these species would forage until midnight and then return to the roost in the streamhouse. We hypothesized that *T. brasiliensis* would all leave out of one exit facing west toward the Caribbean sea. Additionally we proposed that *M. molossus* would follow the streamhouse porch, coincidentally also going west toward the Caribbean sea, and return the same way they exited. In dealing with a male to female ratio of this species we expected that the ratio would reflect harem-style roosting, including at least three males. We also believed that there would be sexual dimorphisms when taking body measurements. In dealing with frequencies of echolocations emitted from the bats, we believe that lower frequencies are emitted at lower levels of activity when precision and accuracy are not vital. We theorize that frequencies increase when activity levels increase, and frequency levels will differ somewhat between various species of bats.

## Materials

- Echolocator
- Leather gloves
- Measuring tape
- Head lamps/ Flashlights
- Mist net, bamboo, and twine
- Socks and clothespins
- 100 gram scale
- Counter
- Stopwatch
- Tweezers

## Methods

On 31 May 1998 a mist net was erected diagonally facing west toward the Caribbean Sea at the streamhouse of SCEPTRE in Springfield. Because we had observed on previous nights that the bats left their roost at the onset of dusk the net was set up at 6:00p.m. When the bats flew into the net they were removed as quickly as possible and placed in a sock, which was then closed with a clothespin, until there was time to process them. Processing consisted of weighing and measuring total length, forearm, wing, hind leg, and ear. The bats were weighed in the socks using a 100g hanging scale. After the bats were removed, the sock was weighed alone and calculations made. The measurements of the body were taken with a millimeter ruler. Once measured, weighed, and gender determined, the bats were released. In order for the results of the *M. molossus* to not be skewed by the use of the net we observed flight patterns and recorded leaving and returning times on the night of 2 June 1998. Using an echolocator from 6:30p.m. to 5:30a.m. we recorded frequencies when the bats were in the roost, when leaving the roost, and returning to the roost. The number of bats leaving the roost and the number of bats returning to the roost was recorded as well as the flight pattern used by the bats.



On the night of 1 June 1998 at Fort Shirley in Cabrits National Park we observed *T. brasiliensis* in their roost and leaving the roost. We documented both times and frequencies.

### Discussion and Conclusions

#### **Frequencies**

The frequency a bat emits for echolocation is dependent upon the bat's activity. Lower frequencies are emitted at lower levels of activity and when great precision and accuracy is not vital. Frequency levels vary somewhat between species.

A colony of *T. brasiliensis* was observed in a covered passageway of Fort Shirley at Cabrits National Park. At 6:15p.m. the large majority of bats were asleep. No sounds were heard, and the echolocator gave no significant readings. At 6:30p.m. the bats were observed yawning, scratching, and shaking to raise their body temperature. During this time 'clicks' and occasional 'squeaks' were audible, and the echolocator indicated frequencies present at 20 kilohertz (kHz). At 6:38p.m. bats first exited the roost. At this time the echolocator began to indicate frequencies at a range of 35 to 45 kHz. Thus, as the bats began to take flight and need more accurate readings about their environment they raised their frequency level from 20 kHz to a range of 35 to 45 kHz.

A colony of *M. molossus* was likewise observed at the streamhouse of SCEPTRE in Springfield. While in the roost at 6:15p.m. no sounds or frequencies were present. However, at 6:30p.m. soft sounds were indicated by the echolocator at 30 kHz. These soon progressed to loud audible squeaks and hard ticks at 25 to 30 kHz. After the bats began leaving the roost the frequency level rose to a range of 35 to 40 kHz. Hence, the *M. molossus*, though using a more narrow frequency range than *T. brasiliensis*, also exhibit a rise in frequency with a rise in level of activity.

Though the *M. molossus* are successful enough with echolocation to capture enough insects to survive an interesting further study would be to determine their success rate in capturing located insects and the usefulness of echolocation in flight maneuvers. While returning to the roost many of the bats were not able to fly up to and squeeze between the boards of the roof upon their first attempt. Rather, many would crash into the boards, often hitting their heads, and fly off having failed to enter the roost. On our night of observation there were 19 successful returns and 37 failed return attempts. This may be due either to echolocation inaccuracies, which would affect feeding, or to lack of flight maneuvering skills.

#### **Foraging Time**

Both colonies observed left the roost in a very short span of time, and all bats left from the same region of the roost despite other options. Thus, the colonies are very uniform in their foraging times and roost exiting (and entry in the case of *M. molossus*).

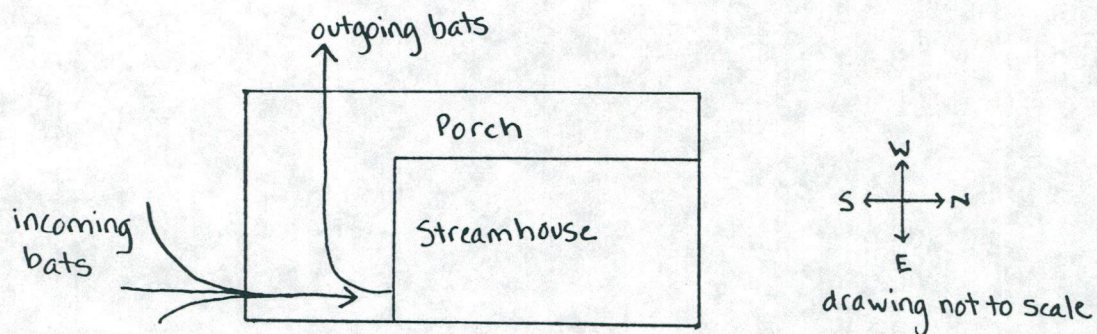
Melissa White observed in 1996 that the *M. molossus* colony at the streamhouse leaves the roost at dusk. Thus, when the *T. brasiliensis* colony was identified it was predicted that these bats would likewise leave the roost at dusk. Dusk began at approximately 6:30p.m. on 1 June 1998 and the colony was subsequently observed leaving the roost beginning at 6:38p.m. (Figure 1). By 6:46p.m. only one bat was found remaining in the roost.

It was known that the *M. molossus* colony leaves the roost at dusk, and it was predicted that the bats would forage until approximately midnight. However, though all eighteen bats had left by 7:16p.m., all eighteen plus an additional bat returned by 7:58p.m. (Figure 2). This provides for a maximum foraging time of about 40 minutes. Though the bats returned about 40 minutes before it began to rain an interesting further study would be to determine whether or not the onset of the rainy season affects foraging times.

#### **Flight Patterns**

For both the *T. brasiliensis* and *M. molossus* roost it was predicted that all bats would leave from the same direction. For the *M. molossus* colony it was additionally predicted that the bats would return from the exact opposite path on which they left. The *T. brasiliensis* colony was predicted to leave via the west entrance of the passage despite the presence of a second opening on the east. This prediction proved true as all bats observed exiting left through the west entrance. Likewise, all of the *M. molossus* bats left by flying down the porch to leave from the west side. However, these bats did not return by the exact opposite path, but circled around the porch to return from the south side of the porch.





#### **Male and Female Ratio**

On the night of 31 May 1998, thirty *M. molossus* were caught using a mist net facing west on the porch of the streamhouse. Four females and one male were examined and the aforementioned measurements documented. The measurements for the single male captured were within the range of the female measurements, thus there was no sexual dimorphism found. The ratio of males to females caught was one 1:29. The male that was processed was the only male caught. We believe that the roost in the streamhouse consists of a harem of females with one male. We expected sexual dimorphism to be apparent and believe that further studies using more males and perhaps more detailed measurements of the head should be done in order to properly conclude that there is no sexual dimorphism in the *M. molossus* species.

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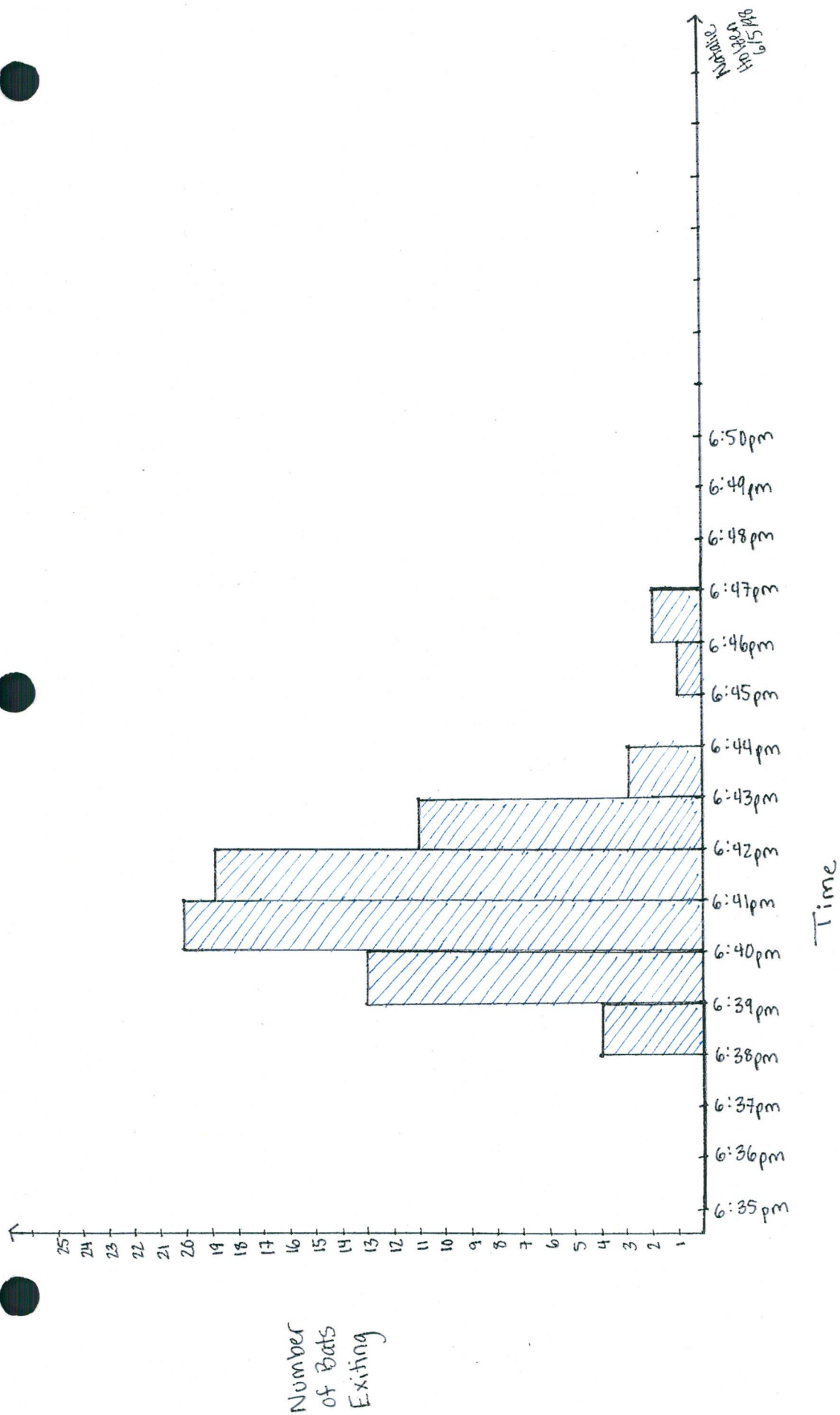


Figure 1  
Tadarida brasiliensis colony 1 June 1998  
 Cabrits National Park, Fort Shirley



Figure 2  
Molossus molossus colony 2 June 1998  
 Springfield, SCEPTRE, streamhouse