Howler Monkey Study

at the BFREE Property

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The first objective was to locate a troop of Mexican howler monkey (*Alouatta pigra*) near or on the BFREE property and collect information on troop composition, home range and social behaviors. No known surveys have been conducted on primates in this area. A trail will be made if there is no other access to the monkeys.

The researcher found two troops. One troop was studied on and off for two weeks, and one for only one day. An access trail was made into an area where a troop lives on the BFREE property. The other troop was observed on the Forest Hill in the Cockscomb Basin Wildlife Sanctuary for a couple weeks. The Forest Hill troops' observed range was mapped out, and some basic data was collected. The observed members of the Forest Hill troop were two adults, one large juvenile, one medium juvenile, and an infant that was carried on the back of the mother.
ACKNOWLEDGMENTS

I wish to thank my project advisor Robin Brockett for sharing her wisdom about howlers. I give thanks and praise to the entire BFREE staff for allowing me to do my research at such an amazing and positive place. I would like to thank my assistants Juan Mikin and Rubin Cal for helping me in the data collection process. A special thanks to my family and friends back home for much love and support.
The researcher has been studying primates back home during the last few semesters. One motivation for coming to Belize was to see the primates. The researcher has been wanting to do primate fieldwork for a while.

It was decided to do a howler monkey study at BFREE because nobody else had done one. If something bad happened to the howler monkey troops in this area nobody would know. Finding a troop, and gathering as much information as possible about it was my goal. This study will be a foundation for future howler monkey research. The BFREE staff are putting together management plans for the area, and the monkeys are an important part of the local ecosystem.

The behavior and ecology of the howler monkeys in this area of Belize has been a mystery. Maybe this area will contribute important information to the study of primates in the future. It is a honor to be able to observe these beautiful animals in such a spectacular location.
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INTRODUCTION

Many primate species around the globe are being threatened by human activities. The country of Belize has a spectacular biodiversity that includes two species of primates, the Mexican black howler monkey (*Alouatta pigra*) or "baboon" in Creole, and the Black-handed spider monkey (*Ateles geofroyi*). Both species of monkeys came close to the brink of extinction in 1957 by the yellow fever epidemic, and remain listed as endangered. Howlers are making a comeback in at least one studied area of Belize. At the Community Baboon Sanctuary (CBS) the howler is thriving (Brockett, pers.comm). A great deal of research has been done at the CBS on these animals. However, in many parts of Belize little or no baseline research has been done on many populations of howlers. The researcher wanted to do a baseline study of a howler troop in a place that has not been studied. Howlers are killed for food in some parts of Belize. Also, sometimes the mothers are killed and the babies are taken for pets. Under the Wildlife Protection Act of 1981 both these practices are illegal.

After viewing the Belize Foundation for Research & Environmental Education (BFREE) property in the Toledo district the researcher decided to do a study at this location. It was
obvious by the numerous howling heard at the base camp of the property that there were a number of howler troops all over the area. If something were to happen to any of the primates in this area nobody would know. No baseline information is known about any troops that live in and around the 1,150 acre BFREE property. The exact number of troops in the area is unknown. The troops size, members, and range are also unknown. BFREE is an NOO that helped put together the management plans for the Bladen Nature Reserve. The BFREE staff is putting together management plans for their own reserve. Parts of the BFREE property are being developed for human use. Any information collected about howler troops around the area would be beneficial to BFREE in helping protect these mammals, and for help in future research.
The first objective of this study was to locate a troop in the area of the BFREE base camp. Mapping out the observed range of the troop was an important next step. The size of each troop member, and the size of the troop will be recorded. A number of social behaviors will be recorded. Trails will be established and mapped when needed to follow the troops. This study will provide the first small piece of the puzzle to unlocking the mystery of howler monkey behavior and ecology in this area.
BACKGROUND

A.

The Mexican black howler monkey is one of the largest monkeys in the Neotropics. This species is only found in Guatemala, southern Mexico, and Belize, and is presently in danger of extinction in much of its former home range (Harwich 1990). In Belize the howler is flourishing in many areas (see figure I-A). The black howler is an arboreal species that "prefers low lying tropical rain forest under 1000 ft." (Horwich 1990). All monkeys in the genus *Alouatta* are diurnal, and polygamous (MacDonald 1984).

What makes this species of monkey so different from other New World monkeys is a large hollow hyoid bone that is found in the throat of these animals (see diagram 2-A). This elaborate throat structure is used to roar very loudly. "In order to produce such sounds, howlers narrow their throat region around their relaxed vocal chords. This increases the pressure on the expelled air and extends the chambers in the hyoid cartilage which funnels the sounds into the large, hollow hyoid bone. The hyoid bone acts as a resonating chamber, much as a guitar box amplifies the sounds of its strings (Horwich 1990)."
Howler monkeys have a prehensile tail which they use to prevent them from falling when jumping from branch to branch. They also hang from their prehensile tail often when feeding. The black howler monkeys have a long pad at the last part of their tail with "dermatoglyphs," which are "fingerprint" type skin (Horwich 1990).

The howlers use their incredible voices to defend their territory from other troops. The monkeys are often heard howling at around dusk and dawn. Each troop is territorial and does not allow other troops in the immediate area. The territories of the howler monkeys do not overlap. However, the ranges of the troops may overlap. A troop's range is defined by troop size, and availability of food. At the Community Baboon Sanctuary, the average "territory" size is around 12-15 acres (Horwich 1990).

Howlers live in small troops of usually 4-8 members, and are generally no larger than 10. Most troops only have one adult male, although multi-male troops do occur (Horwich 1990). The monkeys in a troop live in relative "synchronicity" with each other, generally sleeping, eating and traveling together. On occasion a troop will split up and later re-form (Horwich 1990). Although often they keep a cohesive bond by remaining in visual or auditory contact with each other (Brockett pers.comm.).
Wild primates display behaviors very much like people. Howlers eat with their hands, nurse their infants, and show a wide range of emotions. A troop is kept together "by a balance of friendly and aggressive behaviors both within and between troops (Horwich 1990)." It is believed that howling helps to space the troops out in an area, and this helps avoid physical confrontations. If two troops do meet, the intruding group is chased back to their own territory, and both troops may roar or show ritualized aggressive displays. Grooming is not commonly seen in black howlers but it does happen between adult males and females who know each other well (Horwich 1990). "Play is common between young in a troop but even adults will chase and wrestle with each other, sometimes displaying an open mouth with teeth and giving a low-pitched play grunts. Subadult males often try to begin play with the dominant male, and this is thought to cause the adult male to eventually make the subadult leave the troop (Horwich 1990)."

Males mature at 6-8 years old. Females reach adulthood at 4-5 years of age and are capable of becoming pregnant. Mature females go into estrous for three days, once a month. A single infant is born after a six month gestation. The infant is born charcoal-gray in color, but eventually changes to longer black hair after three months. In the beginning the infant clings to
the mother's belly and nurses from her breasts which are located under each arm. Around two
months of age it rides on the mother's back (Horwich 1990).

Howlers are generally folivorous. "Tender leaves and fruits are the largest and most
important part of their diet (Horwich 1990)." They do also eat flowers and flower buds. The
howlers eat more leaves than any other monkey in the Americas. Sometimes they survive on
only leaves when this is all that is available. Studies done at the CBS have shown that the
monkeys prefer to eat a mixture of fruits, flowers, and leaves all within the same day. The
howler's diet must be flexible because most trees fruit and flower seasonally (Horwich 1990).

Howlers rest up to 70% of the day in addition to resting during the night. The main rest
period of the day is at midday.

Normally after this midday nap the monkeys travel and feed before settling down for the
night (Horwich 1990).

The only natural enemies of the howler monkey are the harpy eagle and the large cats.
The biggest threat to the howler is deforestation. In much of the species' range for-e-t is being
cleared and the animals are in danger of extinction (Hom-ich 19-90).
The BFREE property was established as a private, non-profit, membership organization to acquire the 1,153 acre parcel. The organization wanted to turn the land into a wildlife sanctuary. They have set up a biological research station, and provide a place for environmental education. BFREE works closely with the Belize government and other non-governmental organizations to help protect the Maya Mountains. The area is nestled in the foothills of the Maya Mountains due east of the Bladen Nature Reserve. Four protected areas come together and surround the property. These areas are the Bladen Nature Reserve, Deep River Forest Reserve, Cockscomb Basin Wildlife Sanctuary, and the Maya Mountain North Forest Reserve (see map 4-A). The BFREE presence is the only protection for the surrounding areas that is a constant. The BFREE staff helped put together the management plans for the Bladen Nature Reserve. Currently they are putting together management plans for their own 1,153 acres.

A permaculture farm is being grown on the part of the property that was a "milpa" (slash and burn) farm fifteen years ago. Six people are currently living near this area of the property full time, and there are usually some guests around. This area of Belize gets around 2,540mm of rainfall each.
year (Jolly 1998).

The pristine headwaters of the Bladen River flow out of the BNR and into the BFREE property. The forest type changes from limestone to alluvial bottom forest as the river moves into the property. A general term for the forest of this part of Belize (there are practically infinite forest types in this area) would be lowland, moist, broadleaf, deciduous forest types. More detail will be given to the ecology as it pertains specifically to the study sites. The BFREE property is a transitional zone for the Monkey River Watershed, and an important wildlife corridor.
Figure i-A

Geographic Range in Belize of the Black Howler Monkey

(Horwich '190)
Diagram 2: A

Throat Structures Used in Roaring

(Horwich, '10)
Figure SA

1. Resting

2. Grooming

3. Infant Sharing

4. Fruits and Leaves of the Fig (Ficus glabrata)

5. Feeding on Cecropia Leaves

(Horwich 1990)
METHODOLOGY

A.

The first step was to make note of howling locations within the study area. Time and approximate location of the howl was noted relative to the "milpa" area of the property. This provided a starting point when looking for a troop, and it gave an idea of how many troops live in the area.

The next step was to wake up at 4:30 a.m., and wait for the monkeys to start howling. Howling is often heard in the area during the morning and lasts for varied amounts of time. Using a machete the researcher headed into the bush (using trails when possible) in a straight line toward the howling monkeys. When the howler monkeys are found the trees they were occupying were tagged with green flagging tape. The tape was numbered, labeled, and dated appropriately. In areas without an existing trail, one was made. These trails were tagged with orange tape and labeled accordingly. Distance between tagged trees was measured in meters with the help of assistants, and the degrees from one tree to the next were obtained with a compass. Then the troops' path and any trails made by the researcher could be plotted.
B.

The 'scan technique' was employed when observing a troop (Altman and Eisenberg 1981). This method involves scanning the troop of primates at set intervals and recording what they are doing at that time. Each member within the troop was scanned every fifteen minutes for no more than a minute and a half total for the whole troop, and observations were recorded. The behaviors recorded with the ethogram represent what was observed during the minute and a half scans only. The ethogram was obtained from a researcher who conducts research on howlers at the Community Baboon Sanctuary and is as follows:

R=rest

E=eat-ingesting any material

T=travel

C=climb-moving about only in one tree

PI=play

Gr=groom

N.V=not visible
C.

The criteria for judging the approximate age of the howler monkeys is as follows:

1. Adult (sub-adult looks the same but there are behavioral differences, for example the sub-adult plays more). The sub-adult category was not used because it takes a more experienced researcher to distinguish a subadult from an adult.

2. Juvenile
   - small - <1/2 size of adult
   - medium - 1/2 size of adult
   - large - > 1/2 size of adult

3. Infant - Carried either ventral (front) or dorsal (back). The infant is carried by other group members besides the mother sometimes (Brockett pers. comm.).

D.

The gender of the animals was very difficult to determine because the genitalia of both the male and female look similar to a beginner researcher from far up in the tall canopy.
RESULTS

A. Initial Howling Observations

4/8:
4:45-5:30a.m. --Continuous howling heard from several directions.
5:30-6:30a.m. --Howling from behind Adell's house, and from the lagoon area (two troops?).

--Howling on Forest Hill.

4/9:
3:00-4:00a.m. --Howling from Forest Hill. Why are the monkeys howling at this time?

What are they doing at this time of night?

3:00-3:30p.m. --Howling from behind Marlin's house.
4:15p.m. --Howling from Forest Hill
6:00p.m. --Howling from lagoon area

4/10:
6:00p.m. --Howling heard from forest Hill

--Howling heard from across Bladen River near the access road.
4/11:

2:00a.m. --Howling from across Bladen River near the access road.

4:30a.m. --Howling from Behind Marlin residence.

4:45p.m. --Howling from Lagoon

9:50p.m. --Howling from Forest Hill.

These observations indicate there are what appears to be four troops living in the area.
B. The "Sophia Troop"

4/15/98
Hours: 7: IS-9:30a.m.
Scans: 10

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Juvenile: R=7, T=1, NV=1,
Other: R=0, T=1, NV=9,
C. The "Forest Hill Troop"

4/12/98
Hours: 8:00-11:30 a.m.
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Adult 2: R=3, E=3, T=2, C=0, NV=7, GR=0
*Lar.Juv: NV = 15 (* = this individual was not seen at all during observations on this day)
*Med.Juv: NV=15

4/21/98
Hours: 5:00-9:30 a.m.
Scans: 19

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Adult 2: R=10, E=2, T=5, NV=1, GR=1
Med. Juv: R=9, E=2, T=5, NV=3, GR=0
*Lar., Juv: NV = 19
### 4/23/98

**Hours:** 5:45-10:00 a.m.  
**Scans:** 18

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Adult 2: R=15, E=0, T=1, C=2,  
Lar.Juv: R=14, E=1, T=1, C=2,  
*Med.Juv: NV=18

### 4/24/98

**Hours:** 7:00-10:00 a.m.  
**Scans:** 13

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Lar.Juv: R=3, E=1, T=4, C=3, NV=2,  
Med.Juv: R=4, E=1, T=6, C=2, NV=0,
4/25/98
Hours: 2:00-4:30 a.m.
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Adult 1: R=4, E=4, T=3,
Adult 2: R=4, E=4, T=3,
*Lar. Juv: NV = 11
*Med. Juv: NV = 11

Date of Forest Hill Troop Study: 4/12/98-4/25/98
Total Hours Watching Troop: 17.75
Total Scans: 76
Totals for Adult 1: R=36, E=16, T=17, C=3, NV=3, GR=1
Totals for Adult 2: R=34, E=9, T=15, C=3, NV=14, GR=1
Totals for Large Juv: R=17, E=2, T=5, C=5, NV=47, GR=0
Totals for Medium Juv: R=13, E=3, T=11, C=2, NV=47, GR=0
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PO\th of libCboOhS/H 0., ~Zl = 9B = 1,~.7c

The Fov-est- H! li Troop
Map 7A

The "Forest Hill Troop"

Keys:
Path of "Baboons" on 4-23-98 = 1D→2D
Approximate Path of "Baboons" on 4-24-98 =
Approximate Path of "Baboons" on 4-25-98 =
DISCUSSION

A. The Ecology, and the Encounter With the "Sophia Troop"

Behind the Marlin residence on the BFREE property there exists bottomland alluvial forest. This is a tall forest type with a species diverse canopy 15-25m or higher. This area is a floodplain and is relatively flat, with the exception of a canal (probably built by the ancient Maya), and several lagoons. Bottomland alluvial forest has a palm dominated understory at 4-10m, and a shrub layer at 1.5-3m. There is a mixed herb layer at 30cm-1m. Thick stemmed lianas are frequent and abundant, and epiphytes are relatively scarce (Iregmonger 1994). By the amount of tracks found in this region tapir must abound.

On the morning of April 15, 1998 the researcher woke up at 4:30a.m., and prepared for cutting a trail behind the Marlin residence where no trail exists. The howlers that live in back of the Marlin residence began howling at 5:00a.m. The researcher and two assistants set out into the bush in as straight a path as possible towards the howling monkeys. At 5:50a.m. the monkeys stopped howling but the researcher was close to reaching them. Then suddenly at 6:30a.m. there were two troops of howler monkeys howling at each other from close range. They were only a few
trees away from each other and the researcher. Only one troop was visible (troop 1), but the other sounded only a couple trees away. The two troops were aggressively howling at each other for fifteen minutes (a "howl fight"), until several monkeys (in troop 1) started moving and howling loudly in the direction of the other troop. At 6:45 a.m. troop 1 appeared to have chased the other troop away, and no monkeys were presently visible. "When troops do meet, the intruding troop is chased back to their own territory and both troops roar or bawl from their respective territories. They may also use ritualized aggressive displays and lunges toward each other while roaring at the adjacent troop (Horwich 1990)." This area may be where two troops' ranges overlap, and where their territories meet. Troops do not allow other troops in their immediate area. Troop 1 seemed to be aggressively chasing the other troop from their territory.

At 7:00 a.m. one troop suddenly returned to a near by tree. Three howler monkeys were seen in the tree. This troop was named the "Sophia Troop." There was an adult, juvenile, and another monkey who was not seen clearly. On map 5A, the howlers were in two trees, 6a and 8a. A fruit was collected from the bottom of tree 8a, and it was a Mammy Apple, and tree 8a was a Mammy Apple tree.
The rest of the day was spent measuring and tagging trees, and making the trail back to the Marlin's house. Starting from tree 1A a trail was made going back the way the researcher came in the morning. The first tree tagged on this trail was tree #1, and the last tree was #27 which is located directly behind the Marlin residence. This trail was tagged with orange tape and labeled "trail back to lakes." Although little information was collected on the Sophia Troop, there now exists a tagged trail to help locate this area for future research.

The next several days after 4/15 were spent trying to locate the Sophia Troop. No howling came from this area during the next few days, and the canopy height and lack of additional trails made it impossible to locate the Sophia Troop. This troop was never seen again, and the study became focused on another troop seen a few days earlier at the Forest Hill.
(29)

B. The Ecology of the "Forest Hill"

The Forest Hill is located adjacent to the "milpa" area and property line of BFREE (see map 4A). The Forest Hill is located in the Cockscomb Basin Wildlife Sanctuary.

During the Late Classic period of the ancient Maya Civilization, the Forest Hill was terraced by the ancient Maya to look like a fake Mayan temple. This false temple would probably have been useful in scaring away would be intruders (Jones pers. comm.). Even today the Forest Hill looks like a huge unexcavated temple. The terracing is very obvious when the hill is climbed.

The forest type is called Limestone Hill Forest. This forest type is characterized by a canopy IS-24m high, with an understory of IO-ISm. The shrub layer(s) (possibly two) are between 1-4m tall. The herb layer is usually scant at about 30cm. There are some epiphytes but they are not abundant (Iregmonger 1994).
C. The "Forest Hill Troop"

The first encounter with the Forest Hill Troop began on April 12, 1998. The researcher headed out from base camp and hiked along the Bladen River Trail (BRT) which runs on the east side of Forest Hill. On this day only the two adults were visible. Adult 1 was howling for quite a while. It was rather intimidating to be so close to this roaring. The howler that was not roaring looked slightly larger than adult 1. The two adults were followed up the side of Forest Hill. The researcher did not have help from an assistant so the monkeys path could not be measured. However, the general path of the monkeys was recorded.

On 4/19/98 at 4:50 p.m. howlers were seen and heard in the campground located next to Forest Hill by another party. It may have been the Forest Hill troop considering the proximity of the campground to where the troop had been seen.

While observing two adults and a medium juvenile on 4/21/98 an infant was seen being carried on the dorsal (back) of adult 2. An infant carried dorsally is at least two months of age (Brockett pers. comm.). A behavior was observed where the two adults sat next to each other and let the infant climb on both of them, this is called "infant sharing."
Here is a journal entry the researcher made from 4/21/98. "I had an excellent birthday out here at BFREE. Juan and I found the troop of monkeys right at the Bladen River Trail. The monkeys seen were an adult male, adult female, medium juvenile, and an infant. Today I had the privilege of watching the infant climb all over the parents for almost two hours. It was an amazing site watching the infant and parents because it reminded me of the babies back at BFREE basecamp, Amy and Sophia. All primate babies are extremely helpless, and are dependant for a long time on parental care (especially *Homo sapiens*)."

The two adults were also grooming each other on 4/21/98. This was the only time I saw grooming. Robert Harwich reports that grooming is common behavior in many monkeys but is rarely seen in howlers. Was the researcher lucky to witness this rare event? Or is this common behavior for these two adults?

On 4/22/98 the researcher was stung by bees while climbing the Forest Hill in search of the howlers. The howlers were not found on this day.

On 4/23/98 an adult male, adult female, large juvenile and infant were seen eating on top of a tree. A sample is taken from the ground of the fruit they were eating from this tree. The
fruit sample turned out to be a fig. Tree 2d (on map 7A) must be a Fig Tree. This day was important because it was the first time the large juvenile was visible.

On 4/24/98 the researcher saw for the first time the two juvenile and two adult howlers all together. The infant was not seen probably because a good look at the adults was not possible. On April 21, 1998 the two adults were seen with the infant and medium juvenile. On April 23, the adults were seen with the infant and a large juvenile. For the first time the researcher saw all the older howlers, they included the adults, and the medium and large juveniles. As far as the researcher has seen the Forest Hill troop is made up of an adult 1, adult 2, large juvenile, medium juvenile, and an infant who is at least two months old.

The juveniles were seen eating figs on 4/24/98. The entire Forest Hill troop were all in a large Fig Tree. The Forest Hill troop travelled all around the perimeter of the hill on this morning.

On 4/25/98 the Adult Male, Adult Female, and the infant were seen resting in tree le from 4/21/98 observations.
The adult 1 and adult 2 were seen resting more than 70% of the time they were observed. The medium juvenile and large juvenile may have been observed resting this much if they had been visible more often. The two juveniles were not visible during most of the scans.
CONCLUSIONS AND RECOMMENDATIONS

The researcher has made the first baseline study of a Mexican black howler troop in this area of the Toledo District in Belize. Based on howling observations there appear to be at least four troops in the vicinity.

A trail was made in back of the Marlin residence on the BFREE property that provides access through dense bush into an area where two different troop ranges appear to overlap. One of the troops was briefly seen, and this troop was named the "Sophia Troop." An adult, juvenile, and other monkey were the observed members of the troop, and their locations were documented (see map 8A). In the future this trail behind the Marlins will provide easier access through dense bush to finding this troop.

The Forest Hill Troop consists of an adult 1. adult 2, large juvenile, medium juvenile, and an infant of approximately two months of age. The Forest Hill Troops' observed range is based around the Forest Hill, see map 8A. This troop was seen eating figs on two occasions. Infant sharing was seen between the two adults and the infant. Grooming was observed once between the two adults.
There were many limitations to this study. The researcher had zero field training before this study. It was very difficult to get any references on primates while in Belize. The amount of time allowed for the study was not enough to draw more confident and significant conclusions. Also, the tall canopy found in this part of Belize made viewing and finding the monkeys extremely difficult. When working in such a high canopy one must be careful not to strain their neck. There are very few trails in this area, and this makes tracking the howlers very challenging.

The biodiversity of this area is incredible. But this does not make it easier to work there. The researcher was stung by bees without any warning. "Tommygoffs" and two species of coral snakes are common in this area. The warri ticks were also very uncomfortable to deal with. Some days it took the researcher almost an hour to remove all the ticks from his clothes.

This study is just a brief introduction to two different troops found near the BFREE base camp. It is hoped that this information will be helpful and resourceful for the BFREE staff, and for anyone planning to do a howler study in this area in the future. There exists a need to find out the composition, and range of all the troops in the area. These animals must be protected so that the howler may thrive again in many places it once did.
BIBLIOGRAPHY


Robin Brockett
"Howler Monkey Research"
April 2, 1998
Monkey Bay Wildlife Sanctuary


Will Jones
"History of the Forest Hill"
April 21, 1998
BFREE Property, Toledo, Belize.
### APPENDIX

Rainfall and Temperature at BFREE for April 1998

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