Effect of Habitat on Bat Feeding At The Cathance River Preserve

Max Mcandrews

Purpose:

The purpose was to determine if bats are more active near the pond or the field when hunting for food, and how their activity varies with month.

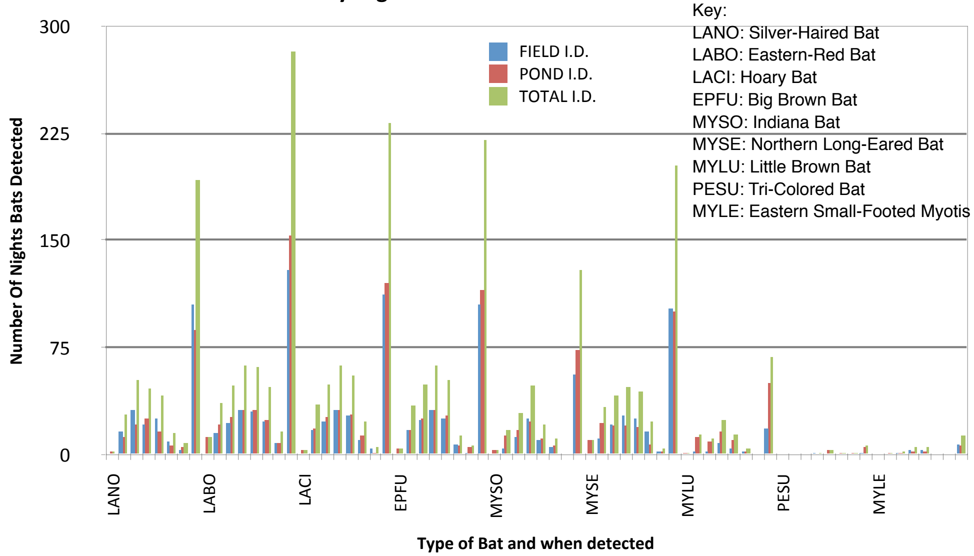
Hypothesis:

It was hypothesized that the bats will hunt more often near the field because it will be easier to hear/see the food there. It was predicted that the bats would generally be more active during the April through June months, rather than during the July-October months.

Procedure:

1. Set up two Anabat Monitors; one near a vernal pool, the other near the CREA Center Field
2. Take out the Z-CAIM from each monitor.
3. Press the LED button on said device, and a light next to standby should turn on.
4. Press power to turn the Z-CAIM off.
5. Open the Z-CAIM and take the memory card from inside.
6. At the CREA Center, put the memory card into a computer using a card adapter.
7. Open Analook exe.
8. Create a folder to store data
9. When computer has analyzed the data from one card, save the spreadsheet given and use a USB drive to move it from the center computer, to a Computer.
10. Put the adapter away, and go to the Anabat monitors with cards, which should be wiped clean of data after use.
11. Replace the cards into their slot on the Z-CAIM, and press the power button. Then press the LED button to turn the standby light on. after it comes on, press the button again to turn it off.
12. Continue each step 2-14 for five weeks.
13. Compile all data for each day, including previous data, with species identified, and total number of bats listed for each month, compile a spreadsheet, for graphing.
14. Create Graphs that represent data table

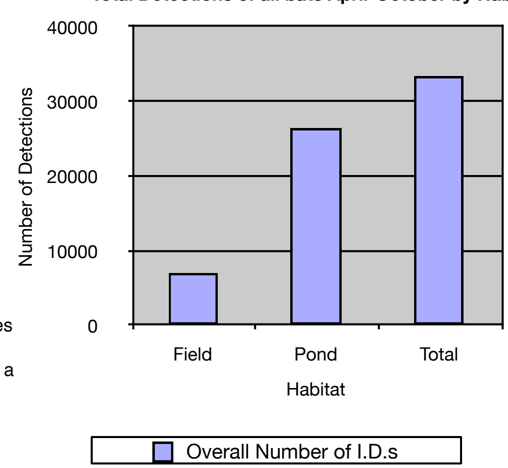
Monthly Nights of Bat Detection at Cathance Preserve



Final Day: Taking Down the Monitors
Trevor (L), Max (R)

Talking about how to set up the Experiment
Max (L), Trevor (R)

Total Detections of all bats April-October by Habitat



Conclusions:

The results of the experiment showed that the original hypothesis was incorrect, that in fact, it was more likely for the bats to hunt near the pond rather than the field. This means that the bats, for some reason, either find more bugs near the pond, or hunt there for some other reason. The months of activity showed that not only was it more likely for the bats to hunt at the pond, but also more likely for the bats to be hunting during the months of July and August, rather than any of the months from April-June as hypothesized. All species of bats were more active in July and/or August with the exception of the Northern Long-Eared bat which also showed high activity during May. It is possible that there were some elements of error in the experiment. For example, a problem was detected upon close examination of the monitor at the pond. It had a problem with the sensitivity of its microphone, causing it to pick up a lot of static and/or crickets.

To make an improvement in the experiment, it would be wise to use more than one program to analyze the data, generating two different data tables from which to compile a final data table, and then into a graph that represents the data. It would also be prudent to make sure that there were no technical errors within the monitors.

Special Thanks:
Firstly, to Mr.Trevor Peterson, for giving me so much help with everything from troubleshooting to ideas on how to do the project. You were a great mentor, thank you.
Secondly, to Mr.Glenn Evans, for not giving up on me, especially when my laziness got in the way, and always believing I could do it.
Thirdly, to the Cathance River Education Alliance, for giving me the opportunity to go to such a wonderful place and learn.

Max McAndrews

11/26/12

The Effects of Habitat on Bat Feeding at the Cathance River Preserve

Problem:

To determine if bats are more active near the pond or the field when hunting for food, and how their activity varies with month.

Background information:

Bats are mammals of the order Chiroptera. Their forelimbs have webbed wings of a sort, making them the only mammals that can actually fly. Bats don't flap their entire wing, instead they flap the digits on those wings, which are very long and have a thin membrane covering them. This membrane is also known as patagium. Bats represent 20% of all known mammal species around the world. There are 1,240 bat species divided into two suborders, which will be covered later.

There are seventy percent of bats that eat insects and most of the rest are major fruit eaters. There is also a fish eating species of bat, called the Fish-Eating Bat, and few others like it. Bats are apparent in most of the world, performing ecological roles like pollinating flowers and spreading fruit seeds. Many tropical plant species depend entirely on bats to spread their seeds. Bats eat many insect pests, which cuts down on the need for pesticides. The smallest bat in the world is the Kitti's hog-nosed bat, which measures 29–34 mm in length, 15 cm across the wings, and 2–2.6 g in mass. The largest Bats are a few species of the Pteropus and the giant golden-crowned flying fox that can weigh up to 1.6 kg and have a wingspan of up to 1.7 m.

Bats are often mistakenly called flying rodents or flying rats. Many languages have the word “bat” in cognate with the word “mouse”. They are not directly related to rodents, and much less to birds, and do not have any closely related animals. Two traditionally recognized suborders of bats are Megachiroptera or megabats, and Microchiroptera or microbats/echolocating bats. Not all megabats are larger that microbats. There are four major differences between the two.

1. Microbats use echolocation, megabats do not, with the exception of the Rousettus and its relatives.
2. Microbats do not have the claw at the second two of the forelimb.
3. The ears of microbats don’t form a ring; the edges are separated from each other at the base of the ear.
4. Microbats don’t have underfur; they are either naked or have guard hairs.

Megabats eat fruit, nectar or pollen most microbats eat insects; others may feed on the blood of animals, small mammals, fish, frogs, fruit, pollen or nectar. Megabats have good visual cortices and high visual acuity, while microbats use echolocation for navigation and finding prey.

Flight enables bats to become one of the most widely distributed groups of mammals. Excluding the Arctic, Antarctic, and few isolated oceanic islands, bats are in ecosystems all over the world. Different species select different habitats during different seasons, ranging from seasides to mountains and even deserts, but bats have two basic requirements: a roost, where they spend their time of hibernate, and foraging areas. Bat’s will roost in hollows, crevices, foliage, and human-made structures, including the tents the bats construct from biting leaves.

The United States supports an estimated 45-48 different species of bats. The two most common of these in the are the *Myotis lucifugus* (Little Brown Bat), *Eptesicus fuscus* (Big Brown Bat), and *Tadarida brasiliensis* (Mexican Free-tailed Bat). The Mexican Free-tailed bat is not native to Maine and therefore was not included in the study.

Bat echolocation is a system where bats give out ultrasonic sounds specifically to produce echoes. By comparing the outgoing pulse with the returning echoes, the bat’s brain can produce detailed images of the bat's surroundings. This allows bats to ‘see’, and even classify their prey in complete darkness. At 130 decibels, bat calls are some of the most intense animal sounds in the world. To fully understand the information that their calls give, bats must be able to separate their calls from the echoes of other bats calls they receive simultaneously. Microbats use two distinct approaches.

1. Low duty cycle echolocation: Bats can separate their calls and returning echos by time. They measure the amount of time it takes for their call to echo. This is important because Microbats bats contract their middle ear muscles when emitting a call so

they can avoid deafening themselves with their own call. The time interval between call and echo allows them to relax these muscles so they can clearly hear the returning echo, without being deafened by the original call. The delay of the returning echos provides the bat with the ability to estimate range to their prey.

2. High duty cycle echolocation: Bats emit a continuous call, separating pulse and echo in frequency. The ears of these bats are sharply tuned to a specific frequency range. They emit calls outside of this range to avoid self-deafening. They then receive echoes back at the finely tuned frequency range by taking advantage of the Doppler shift of their motion in flight. The Doppler shift of the returning echos yields information about the motion and location of the bat's prey. These bats must deal with changes in the Doppler shift due to changes in their flight speed. They have adapted to change their pulse emission frequency in relation to their flight speed so echoes still return in the optimal hearing range.

The Doppler effect (or Doppler shift), named after the Austrian physicist Christian Doppler, in 1842 in Prague, is the change in frequency of a wave for an observer moving relative to its source. It is, for an example, heard when a vehicle that is giving off a siren or horn approaches, passes, and recedes from an observer. The received frequency is higher (compared to the emitted frequency) during the approach, identical at the instant of passing by, and lower during the recession.

Although their eyes are small and poorly developed, leading to poor visual acuity, no microbats are completely blind. Microbats use vision to navigate, especially for long distances when echolocation will not have any noticeable effect. Some species have given evidence to suggest the ability to detect ultraviolet light. Microbats also have highly-developed senses of smell and hearing. Bats hunt at night, reducing competition with birds, and travel distances of up to 800 km while searching for food.

The finger bones of bats are more flexible than other mammals, this being caused by their flattened cross-section and to the low levels of minerals such as calcium near the tips of the fingers. The skin on their wing membranes has higher levels of elasticity, so it is able to stretch much more than other mammals. The wings of bats are also much thinner than the wings of birds, which allows bats to maneuver more quickly and accurately than birds are able to. It is, as a result, very delicate, ripping easily; however, the tissue of the bat's wing membranes have the ability to regrow, enabling small tears to heal quickly.

The surface of their wings has touch-sensitive receptors on small bumps called Merkel cells, which are also found on human fingertips. These sensitive areas are different in bats, as each bump has a tiny hair in the center, making it even more sensitive and allowing the bat to detect and collect information about the air flowing over its wings, also helping it to fly more efficiently by changing the shape of its wings in response. An additional kind of receptor cell is found in the wing membrane of species that use their wings to catch prey. This receptor cell is sensitive to the stretching of the membrane. The cells are concentrated in areas of the membrane where insects hit the wings when the bats capture them.

Most microbats are nocturnal. A large portion of bats migrate hundreds of kilometres to winter hibernation dens, some pass into torpor in cold weather, rousing and feeding when warm weather allows for insects to be active. Torpor is a state of temporary hibernation, and is only used for short periods of time. Others retreat to caves for winter and hibernate for six months. Bats rarely fly in rain, as the rain interferes with their echo location, and they are unable to locate their food.

The social structure of bats varies, with some bats leading solitary lives and others living in caves colonized by more than a million bats.The fission-fusion social structure is seen among several species of bats. The term "fusion" refers to a large numbers of bats that congregate in one roosting area, and "fission" refers to the separating and the mixing of subgroups, with individual bats switching roosts with others and often ending up in different trees and with different roostmates.

Studies also show bats make all kinds of sounds to communicate with others. Scientists in the field have listened to bats and have been able to identify some sounds with some behavior bats will make after the sounds are made.

Insectivores make up 70% of bat species and locate their prey by means of echolocation. Of the remainder, most feed on fruits. Only three species sustain themselves with blood.

Big brown bats, or *Eptesicus fuscus,* are considered "large" for an American bat. They have brown to glossy copper-colored fur on their back with the belly fur being lighter. Their ears are small, rounded and black in color as are their wing membranes and tail. Their lips are fleshy and their nose is broad for the size of their face.They range from the extreme northern parts of Canada through the United States, Mexico, Central America, northern South America and the Caribbean Islands. These bats are widespread because they are very hardy and can withstand conditions that other bats can't. Those that hibernate will do so in caves, mines, walls, attics or other buildings. Some may migrate short distances to find an appropriate location for hibernating. The big brown bat is found in almost all habitats from deserts, meadows, cities, to forests, mountains and chaparral.

These bats are insectivorous. They prefer eating beetles over other insects, using their powerful jaws to chew through the beetles' hard exoskeleton. They will also eat other flying insects including moths, flies, wasps, and flying ants all of which they capture while in flight. Big brown bats choose the locations for their roosts for many reasons, one being to protect themselves from predators. These predators will often take the pups if they have fallen on the ground. Cats, snakes, and raccoons will search maternity roost sites for such pups. Flying bats can be predated upon by owls as they leave their roosts. Big brown bats can live up to 18-20 years in the wild. Unfortunately most big brown bats die during their first winter because they did not store enough fat to survive through their entire hibernation period.

The little brown bat, or *Myotis lucifugus*, has glossy brown fur. It has hair on its toes and it has pointed ears. It is between three and five inches long and weighs between 1/16 and 1/2 an ounce. The little brown bat can be found in most of the United States and Canada except for the south central and south eastern United States and northern Alaska and Canada. The little brown bat lives along streams and lakes. It forms nursery colonies in buildings. In the winter it hibernates in caves and mines. The little brown bat eats insects like gnats, flies, moths, wasps and beetles. It uses echolocation to locate prey. When it finds its prey, it grabs it with its wings and tucks it into a pouch formed when it brings its wing and tail membranes together.

The Northern Long-eared Bat, or *Myotis septentrionalis,* looks very much like other members of the Myotis species, such as the little brown bat. However, it can be easily distinguished from its cousins by its long ears. There are two primary types of habitats for many bats: hibernation sites used during the winter (caves, mines) and roosting sites for reproduction (tree cavities) during the summer. Its typical Foods include insects, moths, beetles, bugs, caddisflies and stoneflies. It feeds one or two hours after sunset and before sunrise.

The Eastern Small-Footed Myotis, or *Myotis leibii,* is the smallest myotis in the eastern U.S. with a total length of 2 7/8 - 3 1/4 inches. It has long glossy chestnut brown fur with black accents. The hardiest species are found in caves/mines of eastern North America, though they generally roost on the ground under rocks, in crevices/

occasionally in buildings and under tree bark. They can be found in wild, heavily forested, mountain regions, frequently but not exclusively in caves in hemlock forests. It is known from hemlock forest habitats and from rock falls, caves, mines and rock crevices associated with hemlock forest regions. In summer, the bats occasionally inhabit buildings. Caves and mines are the only known winter habitat. It has been found in mountains rising to 2000 feet. Its basic diet consists of mosquitoes and small beetles.

The tri-colored bat, or *Perimyotis subflavus*, is one of the most common species of bats found in the eastern forests of America – from Nova Scotia and Quebec, south through to the east coast of Mexico into northern Central America. These bats are among the first bats to emerge at dusk each night, and their appearance at tree-top level indicates that they may roost in foliage or in high tree cavities and crevices. They are not usually found in buildings or in deep woods, seeming to prefer edge habitats near areas of mixed agricultural use. Where information about their foraging behavior is known, these bats have been found to feed on large hatches of grain moths emerging from corn cribs, indicating that they may be of important agricultural benefit.

The Tri-colored bat cannot function in freezing temperatures and are one of the first bats to enter hibernation each fall and one of the last to emerge in spring. Hibernation sites are found deep within caves or mines in areas of relatively warm, stable temperatures. These bats have strong roost fidelity to their winter hibernation sites and may choose the exact same spot in a cave or mine from year to year.

The eastern red bat, or *Lasiurus borealis,* are widespread across eastern North America. Moths form the majority of the diet, but red bats also prey heavily on beetles, flies, and other insects. Echolocation calls have low minimum frequencies, but calls are highly variable ranging from (35–50 kHz). Eastern red bats are best suited for foraging in open spaces due to their body size, wing shape, and echolocation call structure. However, red bats are frequently captured by researches foraging over narrow streams and roads. In late summer, eastern red bats from the northern parts of the range may migrate south for the winter. In winter, red bats forage for insects on warm nights and even warm days occasionally. On warm days during the winter, red bats usually enter torpor while roosting in the canopy of hardwood or coniferous trees, but during cold bouts they crawl underneath dead leaf litter on the ground and use their furred tail as a blanket.

The Hoary Bat, or *Lasiurus cinereus,* has dorsal fur that is yellowish to brownish with white tipped hairs producing a frosted appearance. The tail membrane is heavily furred. A tan throat patch is present and a cream-to-white spot in just behind the thumb. Newborn bats are covered with fine silvery-gray hair. It ranges from southern British Columbia east across northern Canada to Nova Scotia, southward along the Atlantic Coast to northern Florida, west into Texas and south into Mexico, west to Baja California and north along the Pacific coast. It is present in all forested areas but may be less common in urban zones. Hoary bats usually roost at the edge of clearings preferring foliage of both coniferous and deciduous trees. Less common places are, in unusual situations, caves or anthropomorphic structures. It feeds on grasshoppers, dragonflies, wasps, beetles, flies, and moths. Hoary bats are most common in the southwest. They roost individually in trees, usually at the end of branches where they often choose a site that is not visible from above. The area below the roost is open, usually along the edge of a clearing. Hoary bats enter torpor during cold periods and may feed in cold weather.

The Silver-Haired Bat, or *Lasionycteris noctivagans,* is a medium-size bat. It's dark brown-black hairs are tipped with silver giving it an icy appearance. The silver-tipped hairs do not extend to the face or neck. Their ears are short, rounded and without fur. Silver-haired bats typically hibernate in small tree hollows, beneath sections of tree bark, in buildings, rock crevices, in wood piles, and on cliff faces. Occasionally they will hibernate in the entrances to caves, especially in northern regions of their range. Silver-haired bats are among the most common bats in forested areas of the United States. They are considered to be a solitary, tree-roosting species. Silver-haired bats are insectivorous. They are known to take flies, midges, leafhoppers, moths, mosquitoes, beetles, caddisflies, ants, crickets, and they have been observed consuming larvae on trees and occasionally spiders. Silver-haired bats mostly feed in mid-flight, but will occasionally go to the ground to obtain food.

The Indiana Bat (*Myotis sodalis*) is a medium-sized, dull gray bat. The Indiana bat spends summer months living throughout the eastern United States. During winter, however, they cluster together and hibernate in only a few caves. The past 25 years, the population of Indiana bats has declined by about 50 percent. As a result, this bat has been classified as an endangered species by the United States government. Based on a 1985 census of hibernating bats, the Indiana bat population is estimated at about 244,000. About 23 percent of these bats hibernate in caves in Indiana. The Indiana bat dwells in caves only during the winter; however, there are few caves that provide the conditions necessary for hibernation. Stable, low temperatures are required to allow the bats to reduce their metabolic rate and conserve fat reserves. These bats hibernate in large, tight clusters which may contain thousands of individuals.

Indiana bats feed entirely on night flying insects, and a colony of bats can consume thousands of insects each night. A gray bat (an endangered species) will eat up to 3,000 insects per feeding. Bats locate these insects by emitting high-pitched sounds and waiting for the echo, which allows them to zoom in on the bug's location. The fat reserves accumulated by devouring these large quantities of insects during the summer and fall allow the bat to sustain itself during hibernation. In spring, bats emerge from hibernation and migrate to their summer homes. Because they separate into smaller social units, little is known about summer habitat requirements. Females form maternity colonies of up to 100 bats during the summer. But only a few of these colonies have been found. The colonies discovered were located behind the loose bark of trees, usually near tree-lined streams and rivers.

Hypothesis:

The bats will hunt more often near the field because it will be easier to hear/see the food there. Bats will also generally be more active during the April through June months, rather than during the July-October months.

Procedure:

1. Set up two Anabat Monitors; at the Cathance River Preserve, Topsham, Maine; to record bat sounds near the vernal pool and near the field behind the CREA center.
2. Leave monitors up for a week, and then open them by unscrewing the four screws on the front of the box.
3. Take out the Z-CAIM from each monitor.
4. Press the LED button on said device, and a light next to standby should turn on. If this light does not go on, then there is either a problem, or the monitor has shut down.
5. Press power to turn the Z-CAIM off.
6. Open the Z-CAIM and take the memory card from inside.
7. At the CREA Center, put the memory card into a computer using a card adapter.
8. Open Analook exe.
9. Create a folder to put that data in once the program has analyzed it completely.
10. When computer has analyzed the data from one card, save the spreadsheet given and use a USB drive to move it from the center computer, to a Computer.
11. Count the total number of bats, and identify their species, record in a data table.
12. Wipe data from cards, then take them and the adapter out of the computer.
13. Put the adapter away, and go to the Anabat monitors with cards, which should be wiped clean of data after use.

14. Replace the cards into their slot on the Z-CAIM, and press the power button. Then press the LED button to turn the standby light on. after it comes on, press the button again to turn it off.
15. Continue each step 2-14 for five weeks. It is okay to allow data to build up to two weeks, but beyond that will cause analyzation to take a very long time.
16. Compile all data for each day, with species identified, and total number of bats listed for each month, including previous data from 2012, compile a spreadsheet, for graphing.
17. Create Graphs that represent your data table, create final lab report.

Safety Considerations:

When handling the monitors and their respective parts, take care not to jostle any of the fine-tuning knobs and wires. Also, when extracting the Z-CAIM from the monitor box, because it is very tight within the box, try not to yank it out, which can cause damage to the Z-CAIM.

Observations:

The Monitors sensitivity is controlled by the sensitivity knob on the Z-CAIM, but it seems that the monitor at the pond has a problem where its sensitivity is much greater than the monitor in the field near the center, because the monitor by the pond picked up many more calls than it should have. Most of it was simply crickets. The data is biased towards the pond due to this.

Calculations:

The only calculations used in the making of the report was during the compiling of the data to make the final data table, when the data was totaled.

Analysis:

Of the 1,344 total nights that calls were heard, 635 were detected at the Field, and 709 were detected at the Pond. This table does not include the unknown bat calls detected per night, because of a problem explained in the Observations section. The bats that spent more time at the field were the Silver-Haired Bat (105 field nights compared to 87 pond nights). Ones that spent fairly equal nights at each location were the Northern Long-Eared Bat (102 field nights compared to 100 pond nights), the Eastern Small-Footed Myotis (7 field nights compared to 6 pond nights), the Hoary Bat (112 field nights compared to 120 pond nights), and the Big Brown Bat (105 field nights compared to 115 pond nights). The rest of the bats spent more nights at the pond rather than the field. These bats were the Eastern Red Bat (109 field nights compared to 153 pond nights), the Indiana Bat (56 field nights compared to 73 pond nights), the Little Brown Bat (18 field nights compared to 50 pond nights), and the Tri-Colored Bat (1 field night to 5 pond nights).

The data of the first table shows that there were clearly more nights at the pond where a larger number of bats were heard than at the Ecology Center Field each month. The second data table shows that the gross amount of calls was also higher at the pond than at the center each month. In the field, the most bat activity was detected during the month of July (3,302 detections). At the pond, the most bat activity was detected during the month of August (9,839 detections).

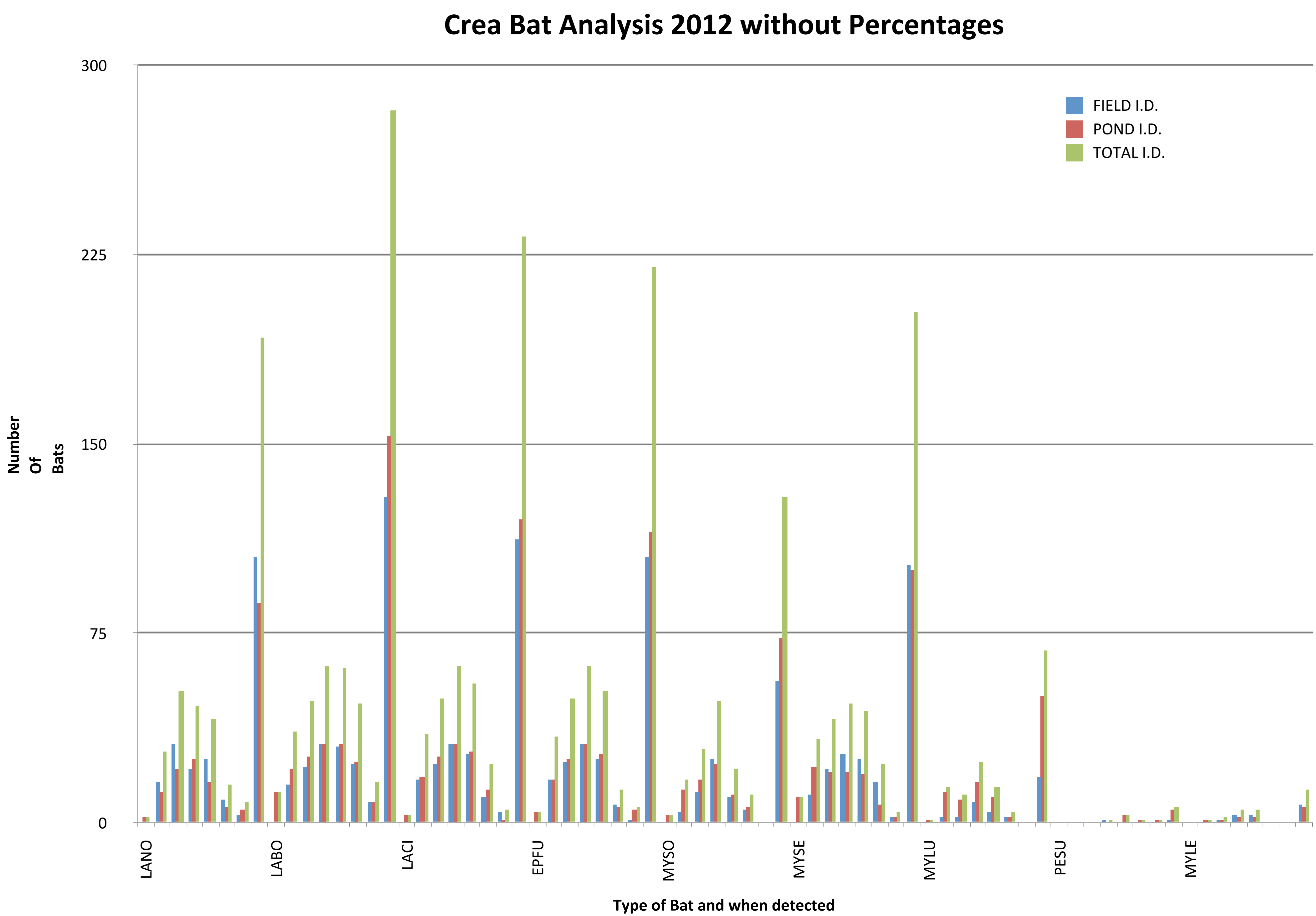
The Big Brown bat was most active during July (986 detections at the field and 1,986 detections at the pond). The Eastern Red bat was most active during July and August (507 detections at the field in July and 2362 detections at the pond in August). The Hoary bat was most active during July and August (340 detections at the field during July and 1329 detections at the pond during August). The Silver-Haired bat was most active during July (284 detections at the field and 75 detections at the pond). The Easter Small-Footed Myotis was most active during July and August (4 detections at the pond during July and 3 detections in July and August at the pond). The Little Brown bat was most active during July (37 detections at the field and 92 detections at the pond). The Northern Long-Eared bat was most active during July and May (107 detections at the field during July and 263 detections at the pond during May). The Indiana bat was most active during July (118 detections at the field and 748 detections at the pond). The Tri-Colored bat was most active during July and August (1 detection at the field during July and 4 detections at the pond during August). The unknown bat calls that the analyzing program could not identify were most active during July and August (918 detections at the field during July and 5641 detections at the pond during August). During the month of April, there was no detector at the Field, so there were no calls detected on any of the nights during April.

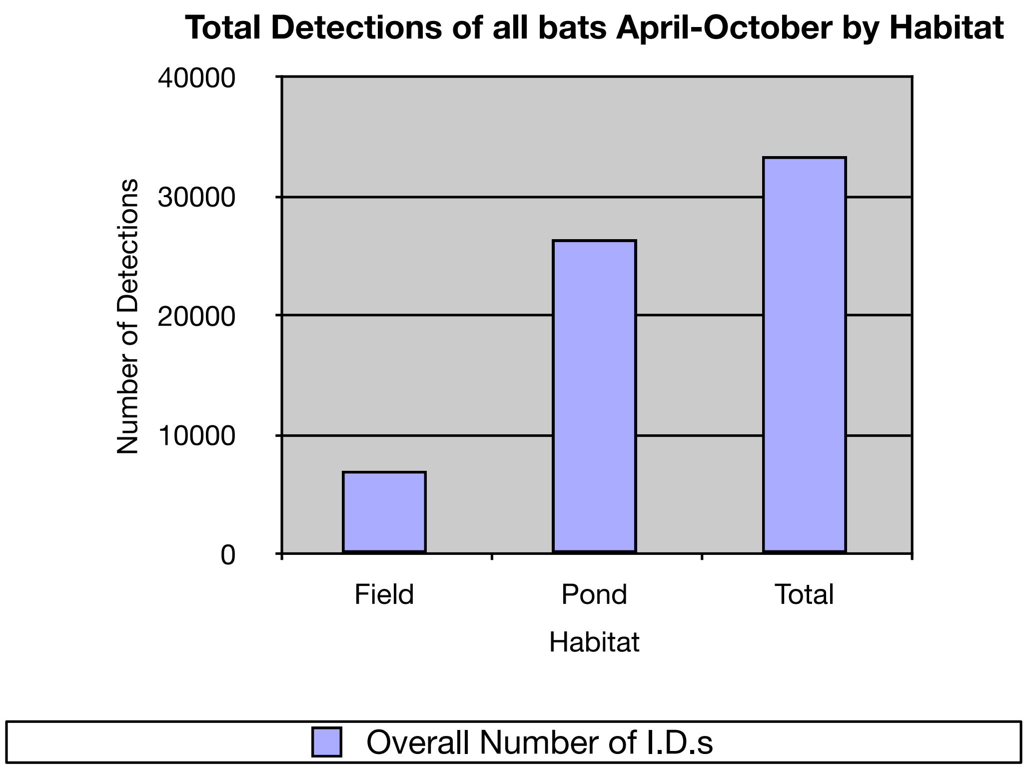
Conclusion:

The results of the experiment showed that the original hypothesis was incorrect, that in fact, it was more likely for the bats to hunt near the pond rather than the field. The field had an overall total of 6971 detections, whereas the pond had 26374 detections from April through October. This means that the bats, for some reason, either find more bugs near the pond, or hunt there for some other reason. Whatever the case, the pond is a much more active place than the field. The months of activity showed this in that they showed which month had a higher amount of calls detected. The months showed that not only was it more likely for the bats to hunt at the pond, but also more likely for the bats to be hunting during the months of July and August, rather than any of the months from April-June as hypothesized. All species of bats were more active and/or august with the exception of the Northern Long-Eared bat which also showed high activity during May.

It is possible that there were some elements of error in the experiment. For example, a problem was detected upon close examination of the monitor at the pond. It had a problem with the sensitivity of its microphone, causing it to pick up a lot of static and/or crickets. The program that was used to analyze the data classified these extra sounds as unknown bats. Also, at a certain point, the examiner of the data could have made a mistake when totaling numbers for the final tables for the report.

To make an improvement in the experiment, it would be wise to use more than one program to analyze the data, giving you two different data tables from which to compile into a final data table, and then into a graph that represents your data. It would also be prudent to make sure that there were no technical errors within the monitors. Also, the experiment could have gone on for a longer period of time. Or, the experimenter could meet with their mentor more often than once a week. After a certain point, there are no bats detected because it simply is too cold for them to fly, so extending the experiment may or may not have any effect.


Crea Bat Analysis 2012 without Percentages
300
225
150
75
0
Number
Of
Bats
FIELD I.D.
POND I.D.
TOTAL I.D.
LANO
LABO
LACI
EPFU
MYSO
MYSE
MYLU
PESU
MYLE
Type of Bat and when detected



Total Detections of all bats April-October by Habitat
40000
30000
20000
10000
0
Number of Detections
Field
Pond
Total
Habitat
Overall Number of I.D.s

Batometer Detections by Bat Species per Month at Field and Pond Habitats

Bat	Month	# of Night FIELD I.D.	# of Nights POND I.D.	TOTAL I.D.
LANO	APRIL	0	2	2
	MAY	16	12	28
	JUNE	31	21	52
	JULY	21	25	46
	AUGUST	25	16	41
	SEPT.	9	6	15
	OCT.	3	5	8
	TOTAL	105	87	192
LABO	APRIL	0	12	12
	MAY	15	21	36
	JUNE	22	26	48
	JULY	31	31	62
	AUGUST	30	31	61
	SEPT.	23	24	47
	OCT.	8	8	16
	TOTAL	129	153	282
LACI	APRIL	0	3	3
	MAY	17	18	35
	JUNE	23	26	49
	JULY	31	31	62
	AUGUST	27	28	55
	SEPT.	10	13	23
	OCT.	4	1	5
	TOTAL	112	120	232
EPFU	APRIL	0	4	4
	MAY	17	17	34
	JUNE	24	25	49
	JULY	31	31	62
	AUGUST	25	27	52
	SEPT.	7	6	13
	OCT.	1	5	6
	TOTAL	105	115	220
MYSO	APRIL	0	3	3
	MAY	4	13	17
	JUNE	12	17	29
	JULY	25	23	48
	AUGUST	10	11	21
	SEPT.	5	6	11
	OCT.	0	0	0
	TOTAL	56	73	129
MYSE	APRIL	0	10	10
	MAY	11	22	33
	JUNE	21	20	41
	JULY	27	20	47
	AUGUST	25	19	44
	SEPT.	16	7	23
	OCT.	2	2	4

	TOTAL	102	100	202
MYLU	APRIL	0	1	1
	MAY	2	12	14
	JUNE	2	9	11
	JULY	8	16	24
	AUGUST	4	10	14
	SEPT.	2	2	4
	OCT.	0	0	0
	TOTAL	18	50	68
PESU	APRIL	0	0	0
	MAY	0	0	0
	JUNE	0	0	0
	JULY	1	0	1
	AUGUST	0	3	3
	SEPT.	0	1	1
	OCT.	0	1	1
	TOTAL	1	5	6
MYLE	APRIL	0	0	0
	MAY	0	1	1
	JUNE	1	1	2
	JULY	3	2	5
	AUGUST	3	2	5
	SEPT.	0	0	0
	OCT.	0	0	0
	TOTAL	7	6	13

Key:
LANO: Silver-Haired Bat
LABO: Eastern-Red Bat
LACI: Hoary Bat
EPFU: Big Brown Bat
MYSO: Indiana Bat
MYSE: Northern Long-Eared Bat
MYLU: Little Brown Bat
PESU: Tri-Colored Bat
MYLE: Eastern Small-Footed Myotis

Total Detections of All Bats April-Oct. by Habitat

	Pond	**Field**	**Total**
Overall	26374	6971	33345