Abstract

The Forman School Rainforest Project is a 25-year-old program dedicated to rainforest education and field biology. The goal of the rainforest project is to collect data in the most endangered environment in the world and use it to find a way to make a difference over time to understand our environment through research.

“The Bioacoustics Team is tasked with collecting and cataloging as many of the thousands of resident species sounds as possible to provide acknowledgement of the health of the targeted environment. This sound data will later go to The Macaulay Library, located inside the Lab of Ornithology in Cornell University. The Macaulay Library is the world’s premier scientific archive of natural history audio, video, and photographs. The main goal is being able to extend Cornell’s Macaulay Sound Library with new calls and or new species.” (Najri, S)

The Bioacoustics Team made 37 recordings this year and submitted 25 recordings to the Macaulay Library. Most of the recording were recorded during lie-and-waits at base camp and on day hikes.

Introduction:

Bioacoustics is a branch of science concerned with the production of sound and its effects on living organisms. The practices of Bioacoustics is used in the fields of ecology, environmental science, and environment biology. The practical applications include-- but are not limited to-- estimation of population density, monitoring of animal diversity, and population health. The ultimate goal of Bioacoustics science is to create a complete library of natural sounds.

The Rainforest program was started by team leader Wendy Welshans 25 years ago with the goal of collect data in the most endangered environment in Costa Rica. This data will make a difference over time to understand our environment through research. In the past 25 years, the Rainforest project has formed many different teams. The current teams are Spider Silk, Mammals, Reptiles and Amphibians, Birds, and Bioacoustics-- all tasked with collecting data in their mentioned field.

The Forman School rainforest projects has been conducting research in the field of Bioacoustics since 2015. The team has taken two trips to the Costa Rican rainforest and collected over 50 audio recordings archived in the Macaulay Library, the world’s premier scientific archive of natural history audio, video, and photographs. While the Macaulay Library’s main focus is rooted in birds, the collection includes amphibians, fishes, and mammals. The collection preserves recordings of each species’ behavior and natural history through sound. The mission of the Macaulay Library is to facilitate the collecting and preserving such recordings, and to actively promote the use of these recordings for diverse purposes that span from scientific research, education, conservation, and the arts. The Forman School Bioacoustic Team contributes to this animal library, in addition to keeping our own archive. The aim of the Bioacoustics Team this year is to obtain high quality recordings for on the Macaulay's hit list.

Methods

“Lie and Wait”

One of the methods we used to capture animal sounds is a “lie and wait”. We go out and find a place with a lot of animal traffic, bringing some tarps to sit on and wait. We wait for the animals around us to make noise after getting used to us. Most of the lie and waits we went on happened at night, meaning we would be sitting in the dark, waiting to hear some animals.

Alarm Call

A few of the recordings the bioacoustic team collected this year were alarm calls. When the Birds Team caught birds in their net, the bioacoustics team would record the birds’ alarm calls.

Voice Announcements

Voice announcements are made at the end of every recording. When the recoderist is finished recording the desired sound, they turn the microphone toward themselves and describe important information about the recording, such as species, current date and time, location, behavioral context of sound, weather or not playback used, number of individuals involved, prominent background species, habitat description, weather, and recording equipment. Voice announcements are crucial so as to provide the most relevant information about sound identification on the spot and not to lose track of the essential dara about a recording.

An example of a voice recording that was made on this trip is as follows: “That was a common Pauraque (Nyctidromus albicollis). The date is the 4th, march 2018, the time is 22:00. The location is El Plastico, Selvatica, Costa Rica. That was a night call. Playback was not used. Three people involved in the recording were Wendy Welshans, Mae Sharpless, and Jason Epstein. Background noises are the local birds and insects. Habitat is a tropical rainforest. The recording equipment used is the shotgun mic.”

To cover all of these aspects of a voice announcement, we tape a list of bullet points to the inside of the microphone case.

Playback

Playback is not a method that we use to record but rather to induce a potential recording. Playback is when someone plays a recording of an animal in the hope to get a response from the animals in the vicinity. Playback is a very common way to prompt responses from birds; however, we did not use playback this year because it is often challenging to differentiate in the recording what is the sound of a playback and what is the sound of a new recording.

Data Entry

At the end of each day, the Bioacoustics Team entered all of the information on the voice announcements into a data sheet on the bioacoustics team computer.

Journal entry

At the end of each day, the Bioacoustics Team also made journal entries in our Rainforest notebooks. The format of the journal entry is as follows: date, name, location, collaborators, habitat, weather, description of activities, and important biological observations.

This is a sample daily journal entry:

- “15, June 2010, Andi Mack. Gahavasuka Provincial Park, EHP (06 °00’53’’ S, 145° 24’45’’E) 2400 m asl. Mid montane forest as described in detail on 13 April 2010. Overcast all day, temp 15-29 C, light mist in the early morning, heavy rain at 1600h. Conducted mist-netting surveys with Paul Igag and Banak Gamui. Opened 15 12m nets along the main trail at 0600 and tended them for birds until closing at 1530 prior to heavy rain. 28 birds captured and banded, noted on data sheets.”

Materials

Parabolic Dish (Microphone)

● Sennheiser ME62 Omnidirectional

The Prabila is the best microphone to recorded isolated clear sounds. It’s composed of multiple components an omnidirectional microphone, wind protector, handle/connector, and parabolic dish. The wind protector is attached to the parabolic dish using the handle/connector. Then the omnidirectional microphone is inserted in the wind protector (the round gray tube seen on the photo to the right). This setup works by amplifying sound that microphone is being pointed at. The parabolic dish reflects the sound waves to a focal point in the middle of the dish. This is due to the parabolic curve, thus all sounds coming in are amplified which are then recorded clean and isolated. Meanwhile, the unwanted sounds reflect at a different angle and leave the dish without being amplified.

Shotgun Long Microphone

- **Rycote Softie Windshield**

- **Rycote Pistol Grip**

The shotgun mic is made out of a windshield, long microphone and a pistol grip. The shotgun sound recording abilts is slightly directional. It cancel out sound waves coming from the sides and let in the ones coming from the front and back.

Marantz PMD661 MKII Digital Audio Recorder

The Marantz digital audio recorder takes in all of the audio that is being recorded.

- ● Record mono/stereo audio directly to SD/SDHC cards for virtually any audio capture application
- ● MP3 and uncompressed WAV formats up to 24-bit / 96kHz

Porta Brace Audio Recorder Case

Results

The following table list how many spices the bioacoustics team recorded this year, this table does not show the multiple recordings we got of the same species.

Scientific Name	**Common Name**	Macaulay library World Wide	Macaulay library Costa rica
Nyctibius grandis	Great Potoo	49	5
Pitangus sulphuratus	Great Kiskadee	282	23
Automolus ochroaemus	Buff-throated Foliage-gleaner	224	32
Caryothraustes poliogaster	Black Face Gross Beak	52	20
Nycidromus albicollis	Common Pauraque	295	30
Ramphastos ambiguus	Toucans	101	45
Columba livia domestica	Piggen	NA	NA
Ciccaba nigrolineata	Black and white owl	55	13
craugastor fitzingerii	common rain frog	NA	NA
klais guimeti	violet-headed hummingbird	11	8

oophaga pumilio	poison dart frog	72	13
Trogon massena	slaty tailed trogon	83	34
Cacicus uropygialis	Scarlet-Romped Cacique	72	22
Manacus candei	White-collared Manakin	29	0
Eleutherodactylus diastema	Tink Frog	NA	NA

All of this data is current as of May 17, 2018. With most of the data we collected submitted to the Macaulay Library.

Discussion

The 2016-2017 Bioacoustics Team had 13 recordings. The 2017-2018 Bioacoustics Team had 37. The lower number of recordings that the 2016-2017 bioavustices is due to poor weather. Last year, the team was hit with heavy rainfall, totaling of 7in or 17.78cm. This interfered with the data collection, limited time, and recordings: many methods were attempted to protect the equipment from water damage in vain. This year's team benefited from good weather and having 2 members instead of 1 during the second week of the trip. This allowed one member to go out on hikes and one to stay at base camp with the Birds Team to recorded any alarm calls from birds caught in the nets.

The 2018 Bioacoustics Team has achieved the goal to obtain high quality recordings of animal sounds, although sometimes the quality of the recordings was slightly diminished by human background noise due to the powerful microphones that pick up the voices of other teams. The Bioacoustics Team submitted 25 sounds to the Macaulay Library this year. The recordings of reptiles and amphibians have not been submitted to the Macaulay Library yet; the Bioacoustics team is working with an archivist to enter those recordings into the library.

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Citations

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