Acoustic Sampling of Species in The Costa Rican Rainforest

Abstract:

The Forman School Rainforest Project is a 24 year running program dedicated to rainforest education and field biology. The philosophy of this program is to contribute to science well as needed information on endangered species. It consists of different teams with a specific goal for data collecting: Spider Silk Team, Mammals Team, Reptiles and Amphibians Team, Birds Team and the Bioacoustics Team. 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.

This year, the bioacoustics team was paired with the birds team in hopes of collecting more sounds and make it easier to record data. The collection took place in Sarapiqui, Costa Rica from March 1st to March 10th. The team recorded a total of 58 species, Most of our recordings consisted in birds species, yet, because the team went on research hikes along other team it was possible to catch sounds beyond Cornell's hitlist.

Introduction:

Bioacoustics is a cross disciplinary science that studies how animal sounds are produced and how these influence the behavior of creatures around them. It includes within its scope: animal communication and associated behavior, and effects of human-made noise on animals. The sounds produced by animals have relevance to many aspects of ecology, environmental science, and evolutionary biology. Recording and listening to wildlife helps us learn and understand the communication between species and different callings. Bioacoustics uses digital technology, including equipment and software, to record and the sounds of species around the world. The sounds of any natural place are completely unique and can reveal important information about the health of that location. Acoustic sampling can help conservationists gather evidence to see if conservation efforts are working. The sounds of any natural place are completely unique and can reveal important information about the health of that location. Acoustic sampling can help conservationists gather evidence to see if conservation efforts are working.

All the recordings collected by the Bioacoustics Team are sent to Cornell University's Macaulay Library. It is the biggest archive of sounds, containing an estimated 75% of the global avian species. The database provides a useful and accessible tool for scientists, with numerous scientific publications making use of the sound and video specimens. Recent studies suggest that individually distinctive vocalizations found in many avian species can be used in population monitoring. The animal species intended to be recorded are animals under the taxonomic classes: Aves, Mammalia, Reptilia, Amphibia and Insecta.

Methods and Equipment

When working in the bioacoustics area, it's important to have good audio quality. The equipment we used is specialized for sound gathering and recording, which made our mission of sound data possible.

Parabolic Dish (Microphone)

- **Sennheiser ME62 Omnidirectional Microphone**

One of the best tools used to record for nice, isolated sounds. It's composed by multiple tools put on together to create the complete set of the parabolic dish. Mainly, to uses an omnidirectional microphone which is connected to the parabola along with a little wind protector in the middle. They work by amplifying sound that comes from the direction that they are being pointed at, reflecting the sound waves to a focal point in the middle of the dish. They do that because their curve is a 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 act to be slightly directional. They cancel out sound waves coming from the sides and let in the ones coming from the front, giving then a little directionality but not as much as the parabola. The windshield that was utilized was a softie from Rycote. Windshield prevent air from interrupting the recording. The longer the hair the better it can stop wind. It does that in the same way that animal hair works; it traps layers of air around the

microphone. For animals, it keeps them warm, for the mic, once the air is trapped, additional air can't get in.
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**
Sony MDR-7506 Headphones
Porta Brace Audio Recorder Case

TABLE 1: *List of equipment used by the Bioacoustics Team in order to record sound data.*

Methods

For the achievement of high quality audio and isolated recordings it's essential to have techniques for the best results. Methods are used or created depending on the type of environment and natural factors that could affect the recordings. While it is crucial that these factors are considered in the recording methods for better recordings, the location and direction of the sound source may make these factors certain. Even in these cases, the sound would be recorded with attempts to eliminate unwanted noise, and eventually discarded if the recording is not wanted.

- **Call Back**
    1. The technique of calling and playing back pre-recorded calls of species, prey species or competitive species has been used in studies to demonstrate or proof the species behavior. Callback techniques work best in open habitats and enable researches to perform interesting behavioral experiments. "Call back" technique

included our trip leader Wendy Welshans to imitating a Howler Monkey's morning call.

- **Pishing**
- It refers to a group of noises that birders make in the hope of attracting birds. Making any small, repetitive noise in an effort to attract birds can be considered a type of pishing. While these noises are obviously not bird sounds, there are several theories as to why birds will respond. The raspy, rough quality of a pish is similar to alarm or scolding calls from many small birds. Those birds are accustomed to mobbing together to chase away larger predators. Many birders also believe, after watching birds respond to their pishing, that some species of birds have a natural curiosity and playfulness and simply enjoy investigating unknown noises."

- **Alarm Call**
    1. This was our most successful technique, and it was the reason why the birds and bioacoustics teams were combined this year. In the process of getting the birds from the nets and processing them for Cornell University's Ornithology Lab and National Audubon Society, birds naturally gave an alarm call.

Results

The identified species were not intended to be recorded. The team was guided by Cornell's hitlist. The hitlist is a list of some species that are in the macaulay library that are the main goal for the team. It served as guide to maintain wide awareness of where this species were. This year a total of 50+ clean recording were identified and are ready to be sent through ebird for Cornell's Lab of Ornithology. Few species from the hitlist were identified making those recording valuable data for the Macaulay Library. A number of other recordings had species that were not identified. The unidentified species recorded, thus, could not be given a recording quantity in the Macaulay Library.Most of the the recording that were collected were not meant to be targeted (total of 50+ recordings.) Nevertheless, a total of five species from the hitlist were able to be identified, making them the most valuable contributions to the Macaulay Library's archive from the team. A number of other recordings had species that were not identified. The unidentified species recorded, thus, could not be given a recording quantity in the Macaulay Library.

In relation to last year's weather, the project had an unfortunate encounter with heavy rain, total of 7in or 17.78cm. This interfered with the data collection, limiting time and recordings. Methods for preventing the equipment from getting wet and continue data recording were taken, but resulted unsuccessful. Overall, while the quality of recordings did not yield the *most* valuable recordings to Macaulay Library, these recording, nonetheless, contribute both rarely documented species and high quality recordings in an area of great diversity to the Macaulay Library.

Table 2: The table above shows true data of acoustic samples from the species that were captured during March 1st - March 10th. The first column shows the common name for the

species while the second column shows their scientific name (latin: genus and species.) The third column represents the number of recordings already registered in the Macaulay Library. The bold rows signify Cornell's hitlist.

Discussion

Most of the the recording that were collected were not meant to be targeted (total of 50+ recordings.) Nevertheless, a total of five species from the hitlist were able to be identified, making them the most valuable contributions to the Macaulay Library's archive from the team. A number of other recordings had species that were not identified. The unidentified species recorded, thus, could not be given a recording quantity in the Macaulay Library.

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Acknowledgements

The author would like to thank Ms. Wendy Welshans for her invaluable contribution to many aspects of team's work, as well as Mr. Sean Graesser for his help with species identification. The author would also like to acknowledge the birds team leader Kseniya Kotova for contributing on the data collecting for bioacoustics and making acoustic sampling easier and more successful. Final thanks to Eli Del Castillo, former guide for the bioacoustics team, for helping with the organization of data and a mentor in the recording field.

Citations

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