A Characterization, Correlation, and Comparison of Tree Gecko and Tink Frog Vocalizations of Dominica

June 18, 2002

Arturo Vale

Abstract

Animal vocalizations are a very reliable way to characterize and identify species. Bird watching, for example, relies heavily on the differences among birdcalls to identify and distinguish species while in the field. This study is broken up into two parts. The first involves a characterization of the vocalizations of *Thecadactylus rapicauda,* commonly known as the tree gecko, while the second involves a correlation and comparison of vocalizations made by two species of tink frogs, *Eleutherodactylus martinicensis* and *Eleutherodactylus amplinympha*. All calls were recorded, filtered, then transformed into various sound forms and transects for characterization and correlation purposes through the Canary 1.2 sound analyzing program.

Introduction

Vocalizations in the animal kingdom serve many practical and useful purposes. Animal calls can function as a communication tool among members of the same species, then serve as a territorial boundary setter or a mating call. *Thecadactylus rapicauda* is a rather large gecko that can reach a size of 121 mm snout to vent length, and can grow a tail up to 100mm long. Known on the island as the tree gecko, this reptile also goes by the common name of the turnip-tailed gecko (due to its awkwardly shaped, overly swollen tail). Unlike many of the reptiles on the island this gecko is not endemic to Dominica or even the Lesser Antilles. On Dominica however, this gecko is said to be concentrated mostly in coastal vegetation, close cultivation, and rural areas (Evans 18). Unlike the tree gecko, the two species of tink frogs on Dominica (*Eleutherodactylus martinicensis* and *Eleutherodactylus amplinympha)* are endemic to the Lesser Antilles. *Martinicensis* has a snout to vent length of 47mm and is most commonly concentrated in the rainforests, while *amplinympha* is usually located at higher elevations in montane thicket and can reach a snout to vent length of 45mm (Evans 16).

Materials

PMD22 Portable Cassette Recorder
Shure Beta Green BG 4.0 Recording Microphone
15 ft Microphone Cable
Scotch Brand Master II Chrome Bias Cassette Tape
Microphone Holder
Headlamp
Plastic Ziploc Bag
15 ft Bamboo Pole
Duct Tape

Methods

Tree gecko vocalizations were taken mostly from Mt. Joy, the bee house and other areas relatively close to Springfield research station. *Eleutherodactylus martinicensis* was recorded while searching for tree gecko vocalizations on Mt. Joy and *Eleutherodactylus amplinympha* was recorded near Boeri Lake at Morne Trois Pitons National Park. The methods used for acquiring satisfactory gecko calls involved isolating a gecko to a tree or small group of trees, duct taping the microphone holder to a sturdy position at the tip of a bamboo pole, then raising the pole high into the tree with the microphone in place. Once a steady position was achieved, gecko vocalizations were recorded in twenty to thirty second segments. This practice usually required two people. Tink frog vocalizations on the other hand, were acquired quit simply. Again, the frogs were isolated and approximated. Once close enough (usually two meters to a few inches), twenty to thirty second segments of their calls were recorded. All recordings were then run through the Canary 1.2 sound analyzing program, then cleaned, filtered, and transformed into waveforms and spectrograms for characterization, correlation, and comparison purposes.

Results

The following five figures represent tree gecko vocalizations. Figures 1-3 are five-second segments of gecko calls, while figures four and five are small portions of the gecko calls shown in figures one and two. All figures consist of a spectrogram (kHz vs. time), which composes the bottom half of the box and a waveform (uPa vs time) which completes the top half of the box. Table 1 presents the correlation peak of a of an intra-species correlation comparison run between two different tree gecko vocalization recordings. Correlation peaks are weighed on a 0-1 scale. A high number (ex. .900), closer to one, indicates a high level of similarity, while a small number, closer to zero, indicates a low level of similarity (ex..200).

Fig. 1-Waveform/Sprctrogram Representation of Gecko Vocalization

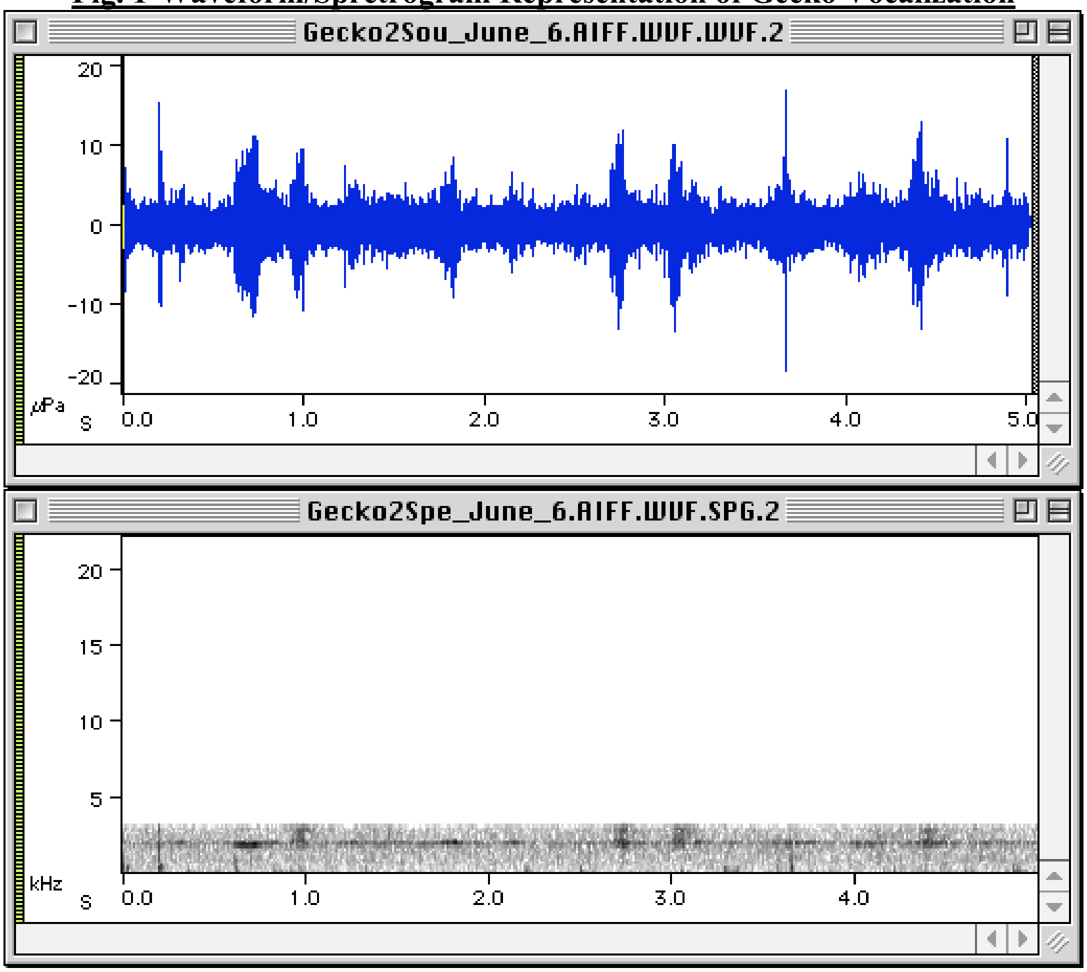


Fig. 2 Waveform/Sprctrogram Representation of Gecko Vocalization

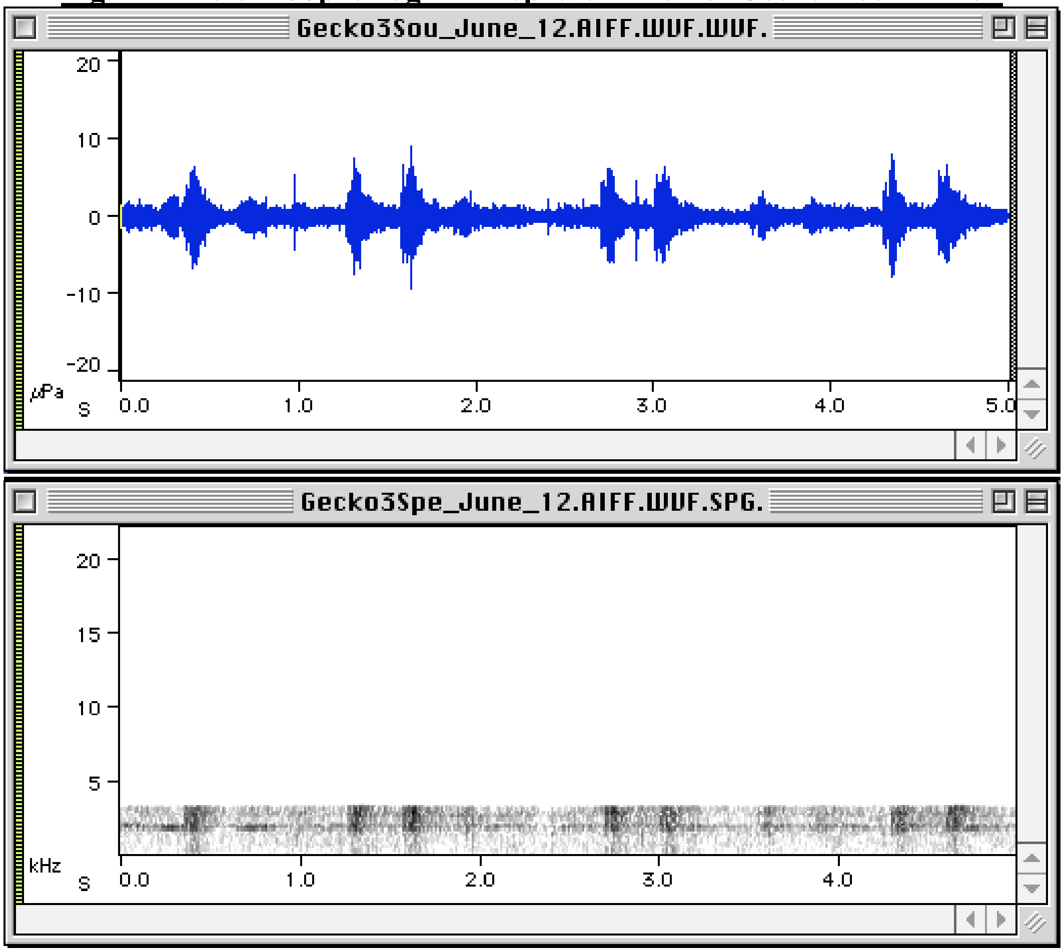
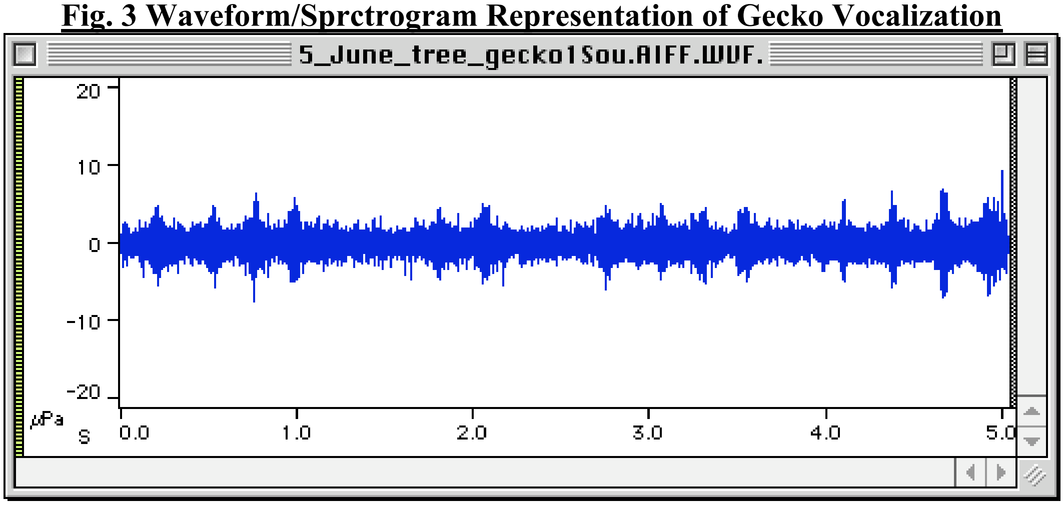


Fig. 3 Waveform/Sprctrogram Representation of Gecko Vocalization



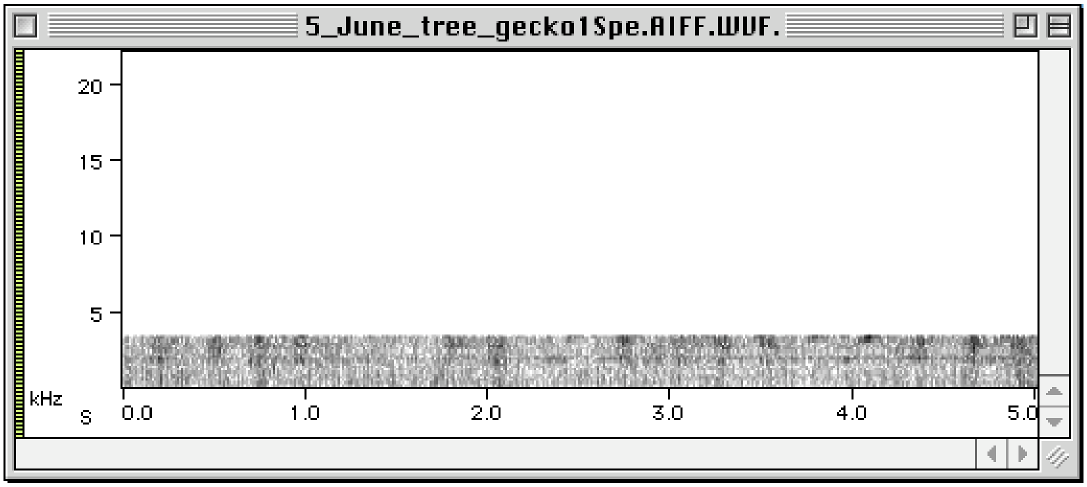


Table 1

Figure 4	Correlation Peak (e-3)
Fig. 4 - Tree Gecko Intraspecific	0.771

Fig. 4

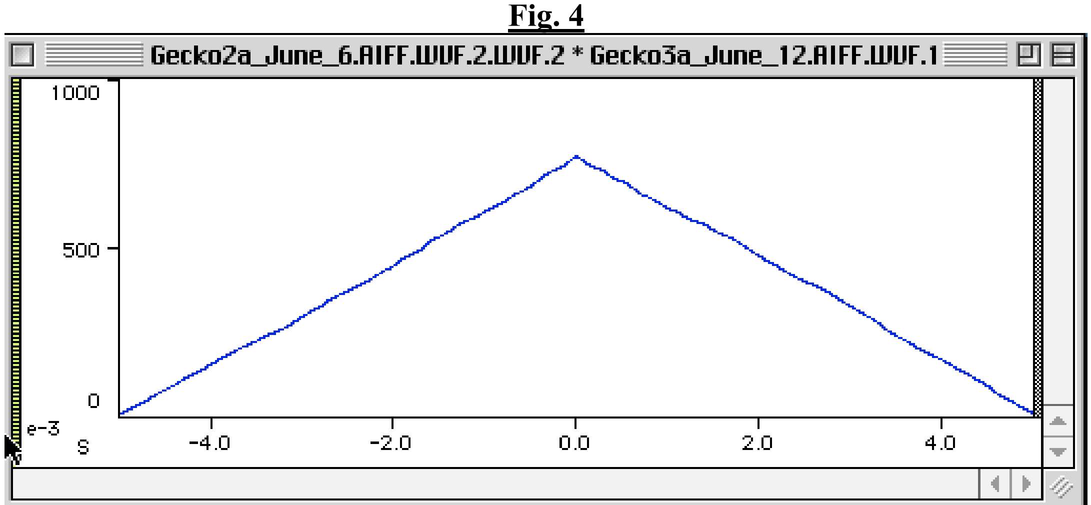


Fig. 5-Tree Gecko Call Segment

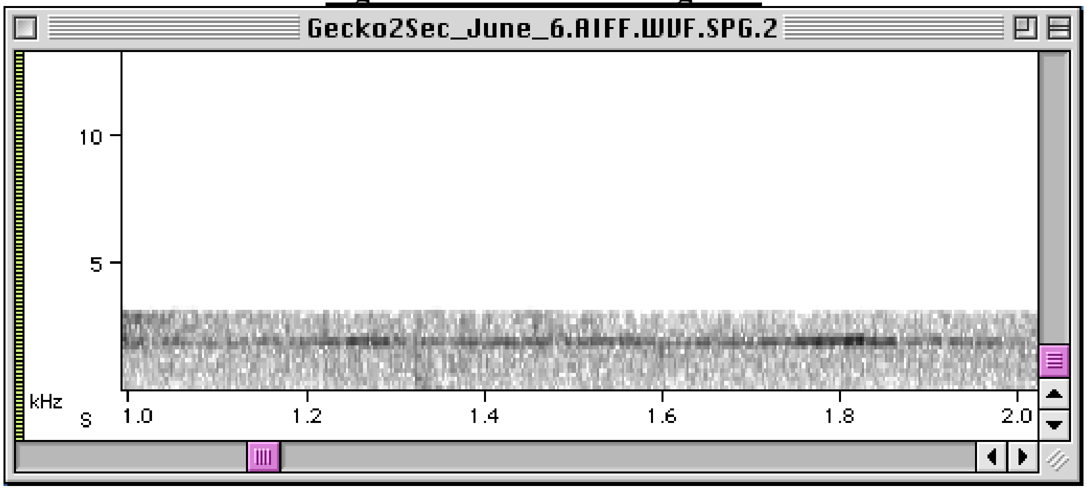
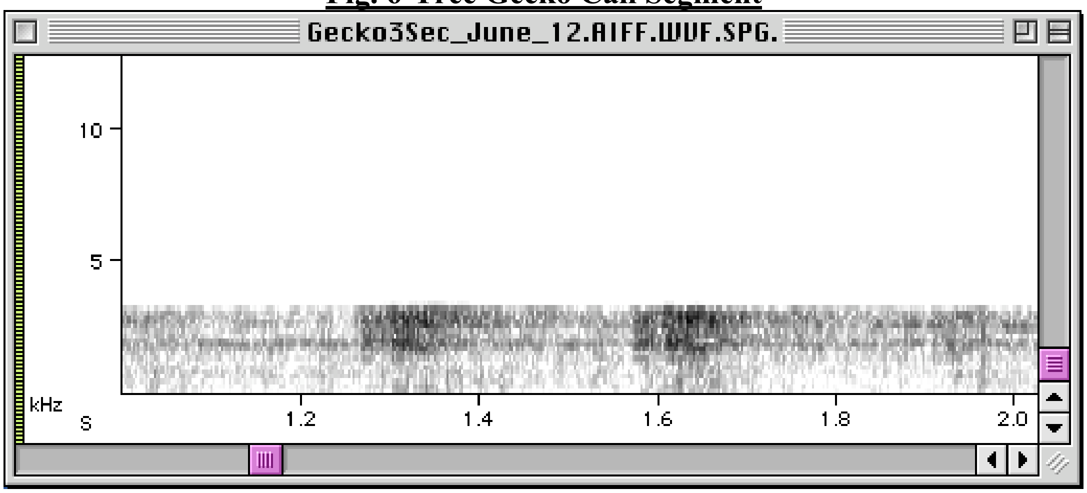


Fig. 6-Tree Gecko Call Segment



Figures seven and nine represent the vocalizations of *Eleutherodactylus martinicensis* & *Eleutherodactylus amplinympha* in the same spectrogram/waveform format as before, while figures eight and ten are more small, one second segments, similar to figures four and five. Table 1 presents the correlation peaks of three different tink frog vocalizations run through the correlation comparison function provided in the canary sound analyzing program. All other figures match their correlation peaks.

Fig. 7-Spectrogram/Wavefore Representation of Martinicensis Vocalization

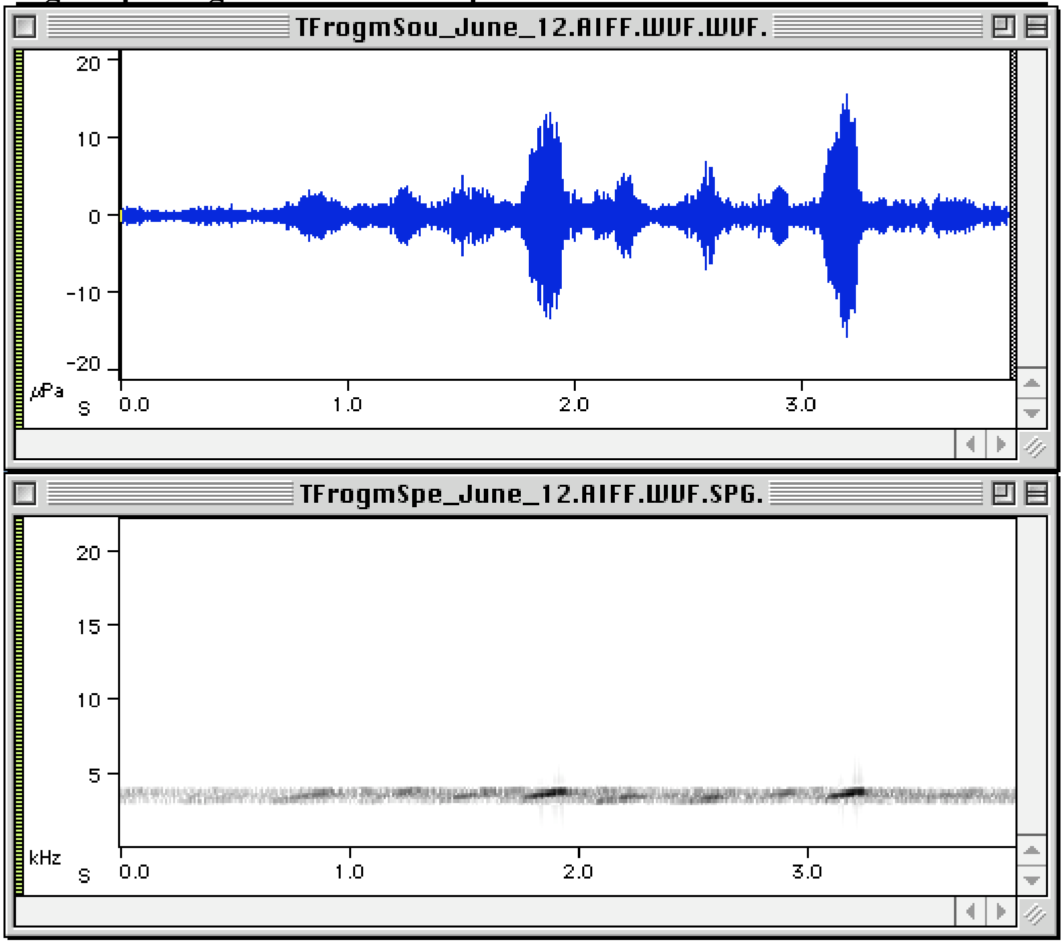


Fig. 8-Martinicensis Call Segment

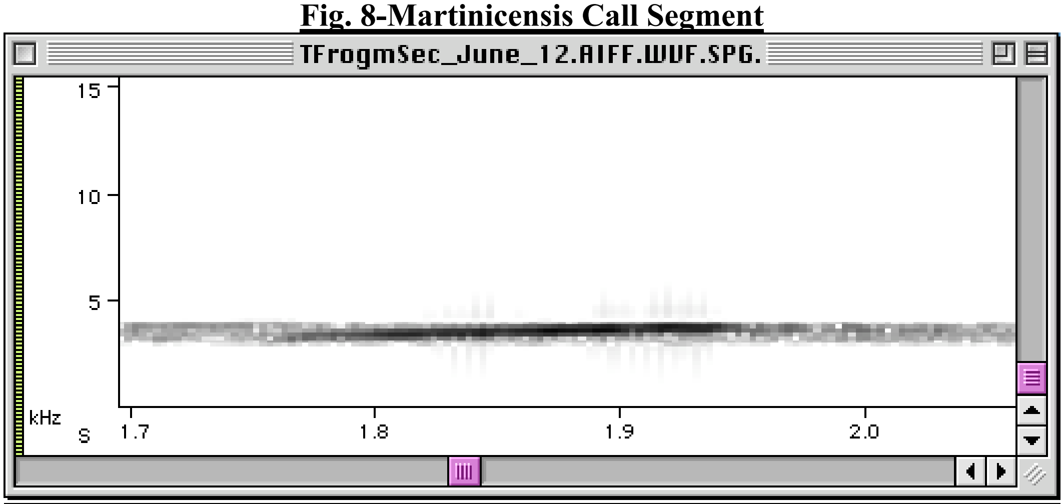
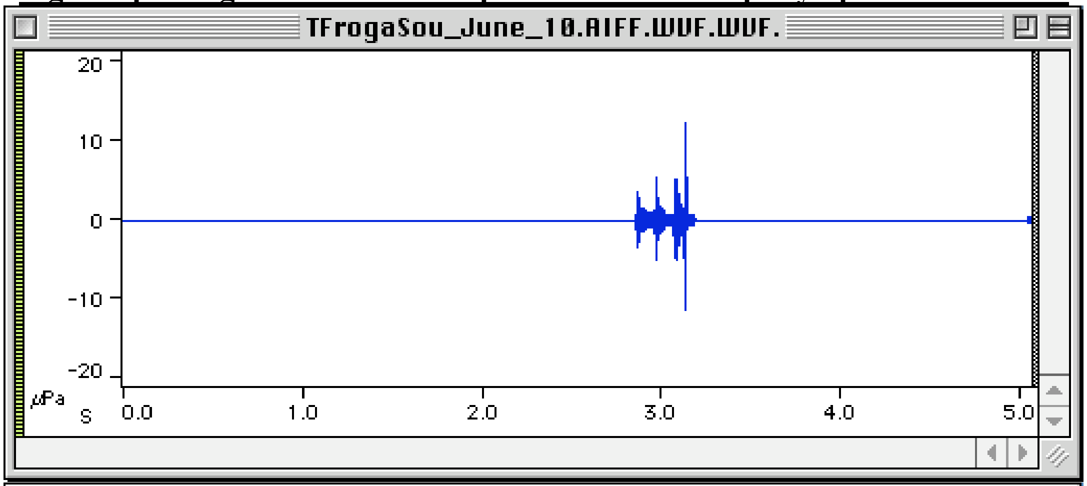


Fig. 9- Spectrogram/Wavefore Representation of Amplinympha Vocalization



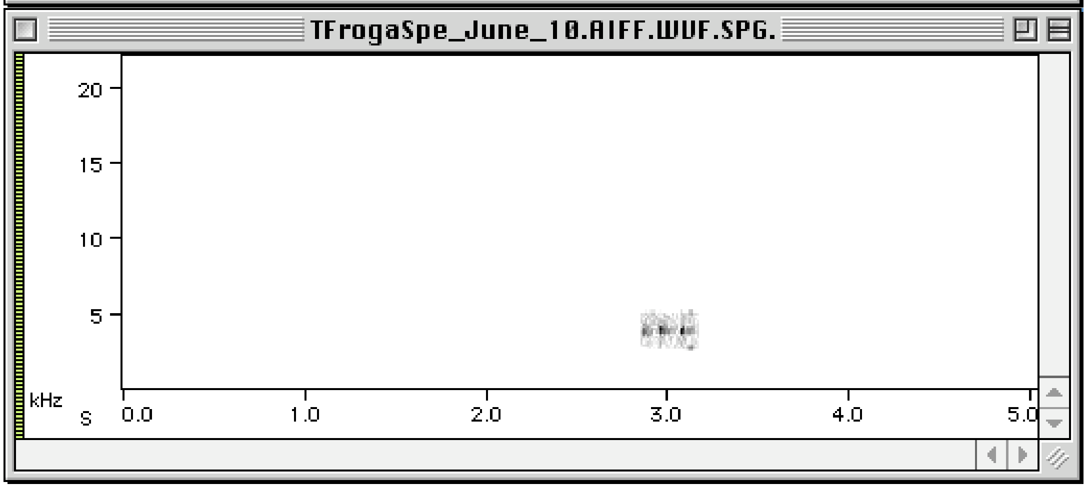


Fig. 10-Amplinympha Call Segment

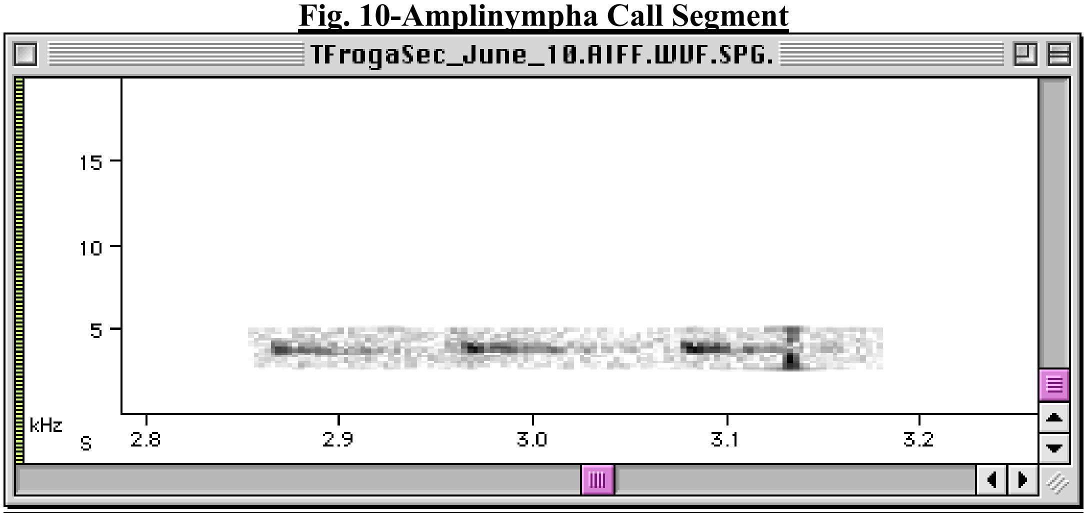


Table 2

Figures 10-12	Correlation Peaks(e-3)
Fig. 10 - Martinicensis & Amplinympha Interaspecific	0.731
Fig. 11 - Matinicensis Intraspecific	0.803
Fig. 12 - Amplinympha Intraspecific	0.834

Fig. 11

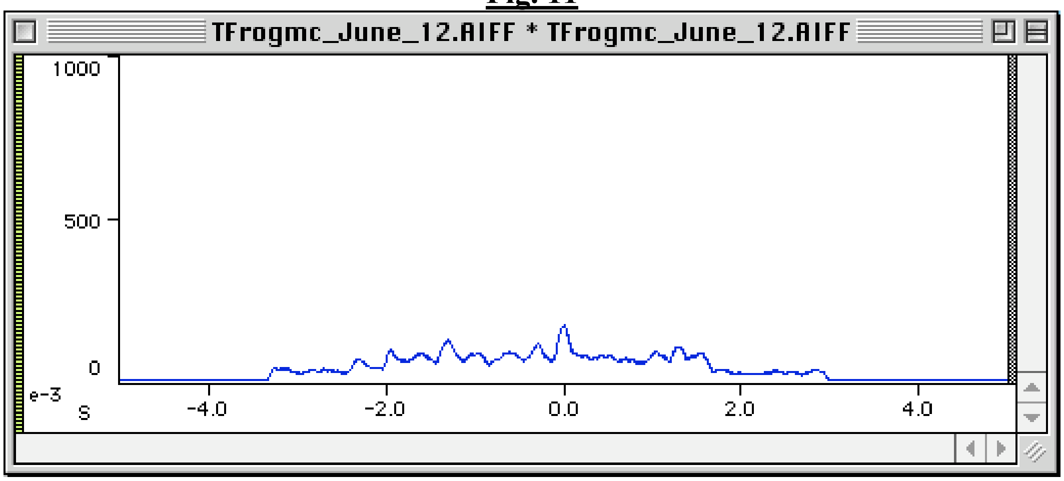


Fig. 12

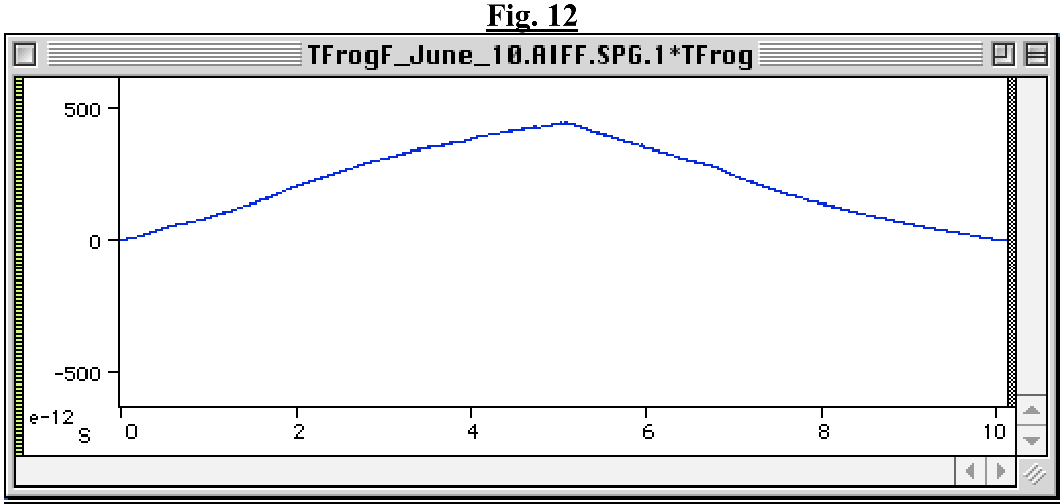
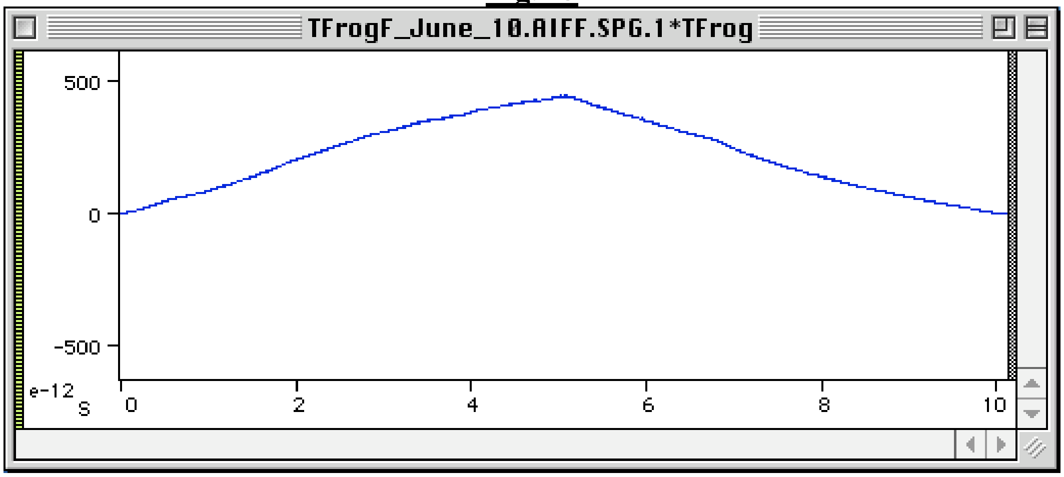


Fig. 13



Discussion

Based on the spectrogram data presented in figures one through six, it is easy to see that all calls retained similar kHZ frequencies. Each call, while varying randomly along the x-axis, can always be found in between the range of 3.1 and 3.5 kHZ on the y-axis. Waveform data, which measures amplitude (power or volume), expectedly fluctuates for each recording as a result of the variable distances at which geckos were recorded. Also , environmental and technical factors like gusts of wind, rain, and an extremely sensitive microphone were sure to have played a part in altering waveform data from one recording to the next. Magnified, one second transects shown in figures five and six, and the correlation peak in Table 1 better presents the similarities of vocalizations for characterization purposes.

Although the vocalizations of the tink frogs *Eleutherodactylus martinicensis(* with its elongated tweets) and *Eleutherodactylus amplinympha,(* with its rapid triplet of tinks) differ in structure, data clearly illustrates their obvious similarities not noticeable to the human ear. Both calls can be pinpointed to the 3.8-4.2kHZ area on the y-axis of figures   Wave form data of the tink frogs may have also varied due to similar environmental and technical factors which influenced the waveform data acquired for *Thecadactylus rapicauda* . As stated above, the distinct structurally unique vocalization of each species may also have influenced the waveform data present in the figures. The interspecific correlation peak in Table 2, acquired from the correlation graphs of figure 11-13 shows that a high level of similarity exists between vocalizations of the two species of frogs. Intraspecific correlation values for both *martinicensis* and *amplinympha* also exhibit relatively high values of .800e-3 and .834e-3, roughly .100e-3 units higher than the interspecific correlation comparison. Interspecific similarities can be due to the fact that the two species are closely related members of the same species. As a result both frogs may follow similar vocal development patterns which create the high level of similarity measured in this study. The high correlation values associated with both intraspecific correlation figures can also be accredited to the simple fact that calls that came from the same species would have an almost, if not exactly identical vocal development pattern.

Conclusion

After a complete analysis of all the information presented above one should be able to easily characterize the vocalizations of *Thecadactylus rapicauda* and observe the similarities present in the calls of *Eleutherodactylus martinicensis* and *Eleutherodactylus amplinympha*. Any sources of error present in this study more than likely stemmed from extensive computer inconveniences and meticulous program handling required by the Canary1.2 sound-analyzing program.

Works Cited

Carif, RA, S Mitchell, and CW Clark. 1995. Canary 1.12User's Manual. Cornell Laboratory of Ornithology, Ithaca, NY.

Evans P.G. H., and Jones A. 1997. Dominica Nature Island of the Caribbean Wildlife Checklist. Ministry of Tourism, Roseau, Dominica.