Characterizing the Social Interactions and Vocalizations of Gopher Tortoises (*Gopherus polyphemus*)

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Objectives

As part of an on-going gopher tortoise translocation project in southeast Georgia, we are examining the social interactions between resident and translocated individuals at a local Wildlife Management Area. Vocalizations have been observed in different species of turtles and tortoises around the world, typically in the low frequency range. While gopher tortoise vocalizations have been documented, the associated tortoise behaviors and conditions under which they occur have not been characterized. Our specific goal is to identify the frequencies at which gopher tortoises are vocalizing and to classify the different vocalizations as associated with different behavioral interactions. We are interested in incorporating these potential communications into our current research to better understand the social interactions between resident and recently translocated tortoises.

Burrow Associates

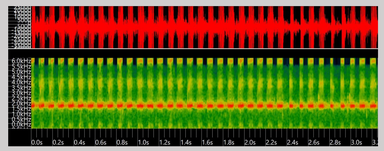
Coachwhip *(Masticophis flagellum)* entering a burrow

Two Owls, species unknown, looking into a burrow

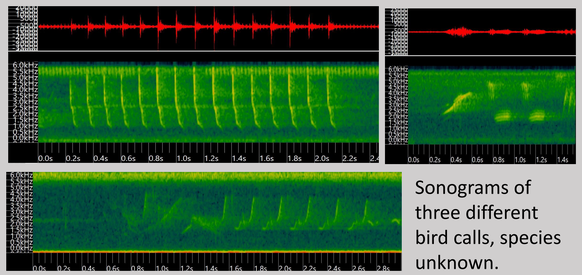
Bobwhite quail (*Colinus virginianus*) on the apron of a burrow

Pine snake *(Pituophis melanoleucus)* exiting a burrow

Eastern hognose (*Heterodon platirhinos*) passing by a burrow as two individuals are mating



Sonogram of a frog call, species unknown



Sonograms of three different bird calls, species unknown.

Female tortoise 121, displaying her equipment. A VHF transmitter, a GPS recorder with onboard data storage, and a temperature logger. An Eastern hognose snake (*Heterodon platirhinos*) is exiting the burrow to her right.

On-Going Research

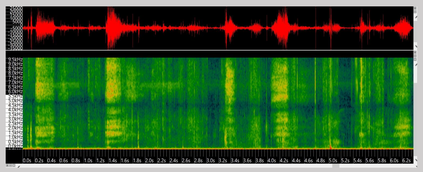
We are employing multiple techniques to study the individual performance and the integration of translocated individuals into the resident population.
1) We maintain monitoring of ~30 resident and translocated tortoises that are tracked weekly using VHF telemetry and are outfitted with both GPS and temperature loggers.
2) We have positioned Bushnell game cameras to overlook the burrow aprons of monitored females to capture intraspecific interactions and commensal activity.
3) We further are interested in whether these behavioral interactions extend to mating and reproductive success. As such, we excavate and incubate eggs from the recipient site in order to collect genetic samples from the hatchlings prior to their release. We will use genetics to determine if translocated individuals are interbreeding with the resident population.

Acoustic Monitoring

Deployment

In order to capture as much audio as possible during tortoise interactions, we deployed the Wildlife Acoustics SM4 recorders at the burrows that showed the highest number of interactions each week. We set the recorders to record 30 minutes on, 30 minutes off, from one hour after sunrise until sunset. Based on this programming, each recorder logs approximately 45 hours of data per week, for a total of approximately 225 hours of data per week.

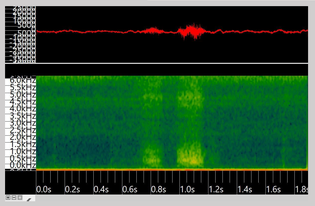
This image shows a Bushnell game camera and Wildlife Acoustics SM4 audio recorder, deployed at the burrow of a tracked resident female.



This image and accompanying sonogram shows an excerpt from a mating event between 145, a tracked translocated female, and 142, an untracked male, on the apron of 145's burrow.

Analysis

We analyzed the audio data using Kaleidoscope software produced by Wildlife Acoustics. Initially, we analyzed audio recordings where an interaction observed from our cameras coincided with the acoustic recording to characterize the patterns and behaviors of the vocalizations. By manually checking these audio clusters in Kaleidoscope, we were able to create a training file for the program to screen for vocalizations. For all new recordings that the program analyzes, the data identifies clusters of potential tortoise vocalizations which we then manually confirm.
Approx. 180,000 vocalizations per week
Approx. 4,200 classified as tortoises



This image shows tortoise 182 excavating the mouth of her burrow. The accompanying sonogram was captured at the same time. We have observed other similar vocalizations that have occurred while individuals were digging at the entrance of their burrows.

Preliminary Results

To date, we have recognized approximately 7 different vocalizations. As we predicted based on vocalizations observed in other tortoise and turtle species, we have found that the vocalizations tend to occur within 0-6 kHz, with fewer of the vocalizations occurring in the 0-2 kHz range.

Acknowledgements

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