Weather Patterns and Lunar Cycles Shape the Soundscape of an Estuarine Ecosystem

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Acoustic indices are an emerging tool for the remote assessment of habitat health. Our research focused dually on an understudied habitat type and disruptive geophonic phenomenon. We collected environmental data and designed a novel acoustic index to (1) identify rain from sound recordings and (2) better understand the drivers of acoustic variability in a tidal river estuary. Our findings suggest biophony (animal generated sounds) is tied to environmental, lunar, and tidal cycles, as well as time of day.

Objectives
- Characterize the soundscape of a tidal river habitat using raw call counts and conventional acoustic indices
- Identify the primary correlates of temporal variability
- Design a novel acoustic index to automate recognition of rain, the most common source of disruptive geophony

Methods
- We deployed a Wildlife Acoustics recorder in a forested peninsula neighbouring the confluence of two tidal rivers in Machiasport, Maine. Continuous audio data were collected in four week-long intervals over the summer and batched in hour-long intervals
- Weather and tidal measurements were taken from a SensorPush monitor, a local weather station, and a novel rain index
- We used the computer software Kaleidoscope Pro and R to perform basic cluster, SPL, and acoustic index analyses

Results
Multiple variables were predictive of acoustic variability (Figures 1, 3). Descriptive statistics are presented in Figure 4. Multicollinearity was addressed by removing redundant independent variables with the exception of time of day.

Future Directions
The Kaleidoscope Pro cluster analysis data that helped us construct our call count and rain index are two steps removed from the real world phenomena that we aim to characterize. In the future we anticipate more headway from dealing directly with raw acoustic data and creating our own modes of acoustic data analysis from the ground up. For instance, the field may benefit from a more discerning index that better separates biophony from other discontinuous acoustic signatures like wind and rain.

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References