



Impacts of Ambient Noise on Automated Acoustic Recording Units

Chad A. Apol, Ethan C. Valentine and Darren S. Proppe
Calvin College, Grand Rapids, MI

Background

The use of microphones and acoustic software is an efficient form of data collection that can help assess species and population dynamics. However, there are limitations to the functionality of acoustic recorders. One such limitation, is the presence of ambient noise. Ambient noise can mask biotic vocalizations and impact the detectability of birdsongs in acoustic data. But, empirical documentation of this prediction is absent. We conducted field experiments with passive acoustic recorders to determine how various frequencies and amplitudes of ambient noise impacted the ability of acoustic recording devices and automated detection software to correctly detect birdsong.

Methods

Two acoustic recorders (SM4, Wildlife Acoustics) were placed in 20 independent hardwood forest sites. Elevated ambient noise was projected into one microphone on one SM4 unit through headphones.

Three noise types

Three noise types	Four noise levels (dB)
Brown (low-frequency)	40
Pink (low-mid frequency)	50
White (full spectrum)	60
	70

Four noise levels (dB)

Acoustic analysis was conducted in Kaleidoscope Pro (Wildlife Acoustics) software. Software was trained to auto-identify 5 bird species:

- Black-throated Green Warbler
- Blue Jay
- Ovenbird
- Eastern Wood Pewee
- Red-Eyed Vireo

The number of correct Kaleidoscope detections for each species was recorded for the microphone subject to ambient noise and the corresponding microphone that was facing the same direction but free of ambient noise.

Field Setup



Noise playback device

Noise impacted microphone

Control and noise-impacted SM4 units, placed 3m apart

Results - Overall

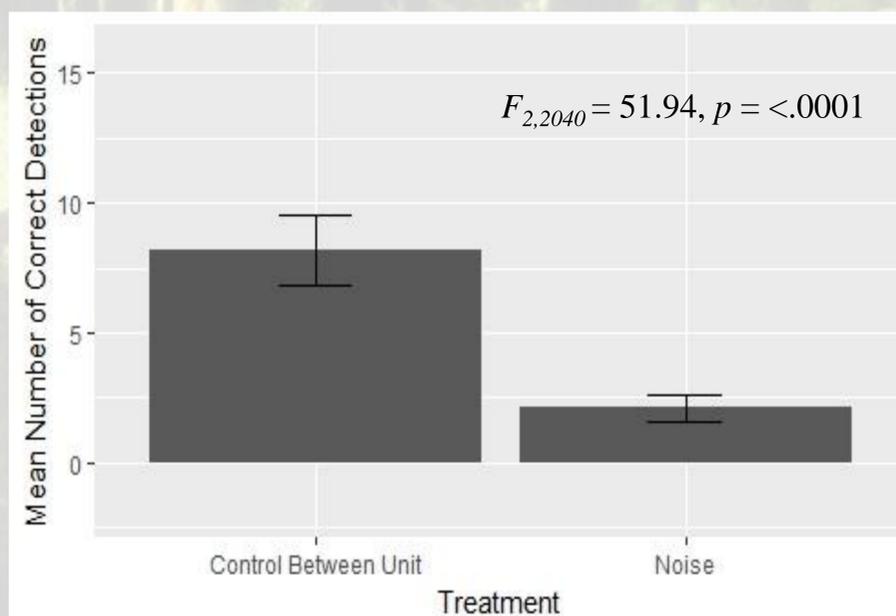


Figure 1. Comparison of mean correct detections between the noisy and control treatments.

Results – Noise Type and Level

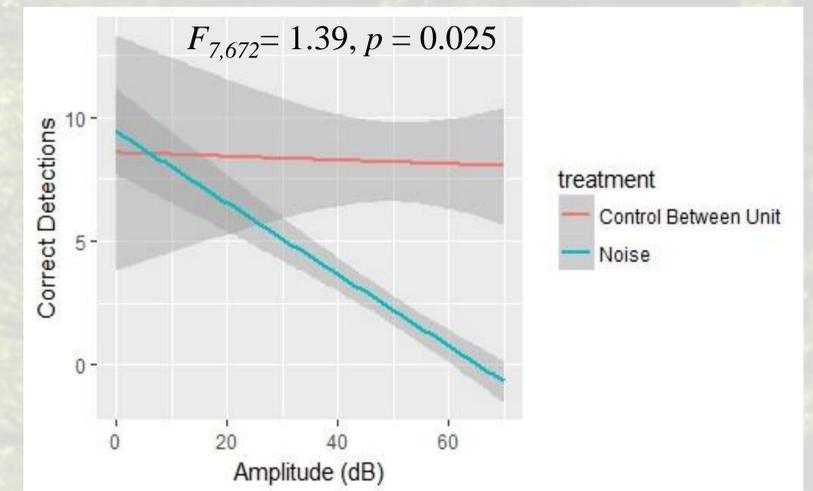


Figure 2. Number of correct detections for all species in noisy and control treatments at varying decibel levels.

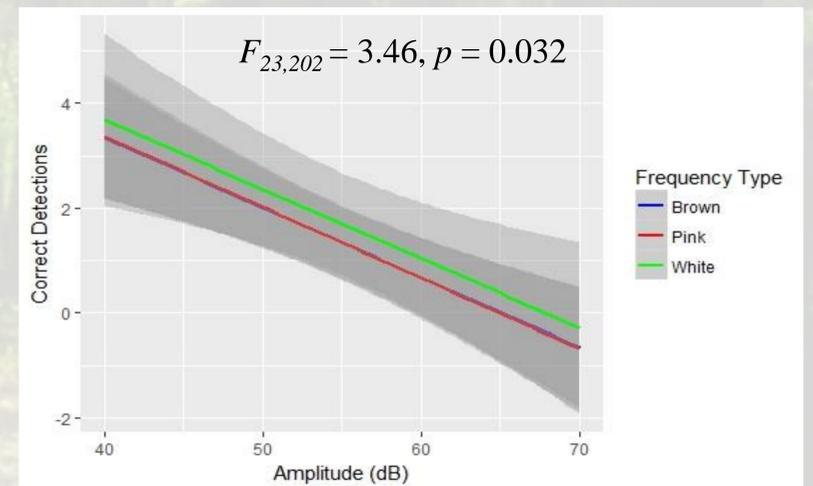


Figure 3. Number of correct detections for all species plotted by type of noise.

Conclusions

- Ambient noise impacts the ability to automatically detect vocalizations in acoustic recordings
- The impact is exacerbated by higher amplitudes and the dominance of lower frequencies in ambient noise
- Biologist must consider the impact of noise on acoustic recordings

Acknowledgement

Thanks to Wildlife Acoustics, Inc. for funding all acoustic equipment through a Scientific Product Grant