

Comparing bat activity and fatality rates at wind facilities in Canada

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NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists



15th Wind Wildlife Research Meeting
November 13, 2024

Natural Resource Solutions Inc.

- Biological specialty firm
 - Several areas of disciplinary expertise (bats, migratory birds, raptors, etc.)
- Extensive wind energy experience
 - Assessments of more than 250 wind projects across Canada
 - > 140 project-years of post-construction data collection
 - Largest private data set of fatality information in Canada



Background

- Migratory bats are common bat fatalities at wind energy facilities and have been assessed as endangered by COSEWIC
- Operational acoustic data can be a reliable indicator of operational bat fatalities (Peterson et al., 2021; Voigt et al., 2022)
- Pre-construction acoustic data is often used to inform bat fatality risk during regulatory review and permitting
- Limited published research suggests pre-construction acoustic rates are a poor predictor of operational fatality rates (Hein et al., 2013; Solick et al., 2020)

Methods

Study Area

- Acoustic and fatality data from 12 wind projects across Alberta and Ontario totalling 107 bat acoustic monitoring stations
- Wind projects in Alberta and Ontario concentrated in each province's Southern region
- Focusing on three commonly occurring migratory species:
 - Silver-haired Bat (SHB)
 - Hoary Bat (HB)
 - Eastern Red Bat (ERB)



Methods

Data Collection

- Acoustics Data
 - Ground-based detectors from May – October
 - Auto-classified to migratory/non-migratory (pre-construction), or to species (operational)
 - Standardized by dividing by # of detector nights
- Operational Fatalities
 - At least once weekly searches following agency protocols
 - Corrected using Ontario's regulatory formula accounting for searcher efficiency, scavenger removal, and proportion of area searched, often referred to as the OMNR formula.



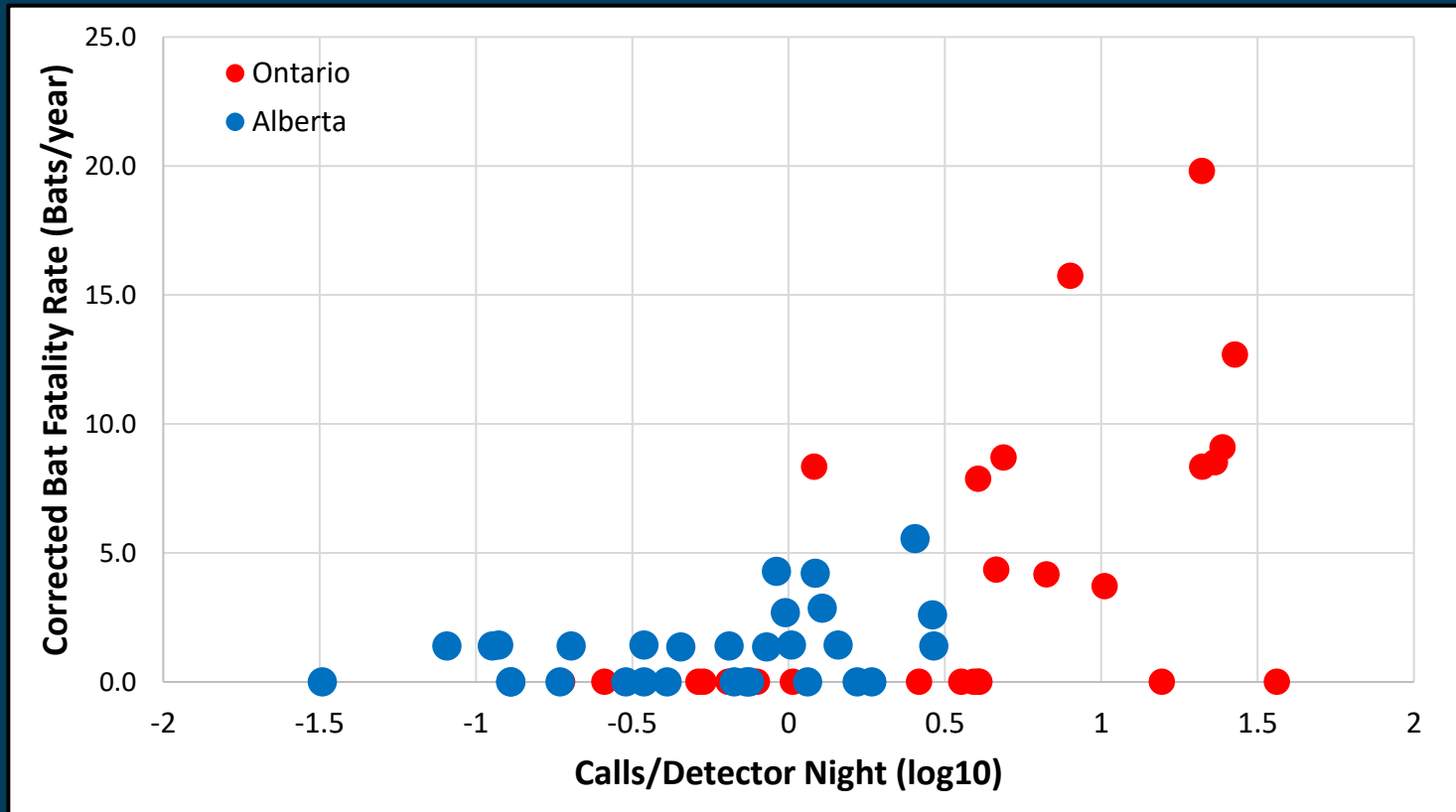
Methods

Statistical Analysis

- Acoustic call rates log-transformed to account for non-linear relationships
- Linear regression analyses performed on each relationship at 95% confidence interval
 - 1) Operational acoustics vs. corrected fatality rates
 - 2) Pre-construction acoustics vs. corrected fatality rates
 - 3) Pre-construction vs. operational acoustics

Results

Operational Acoustics and Fatalities



Linear Regression Results (n = 57)

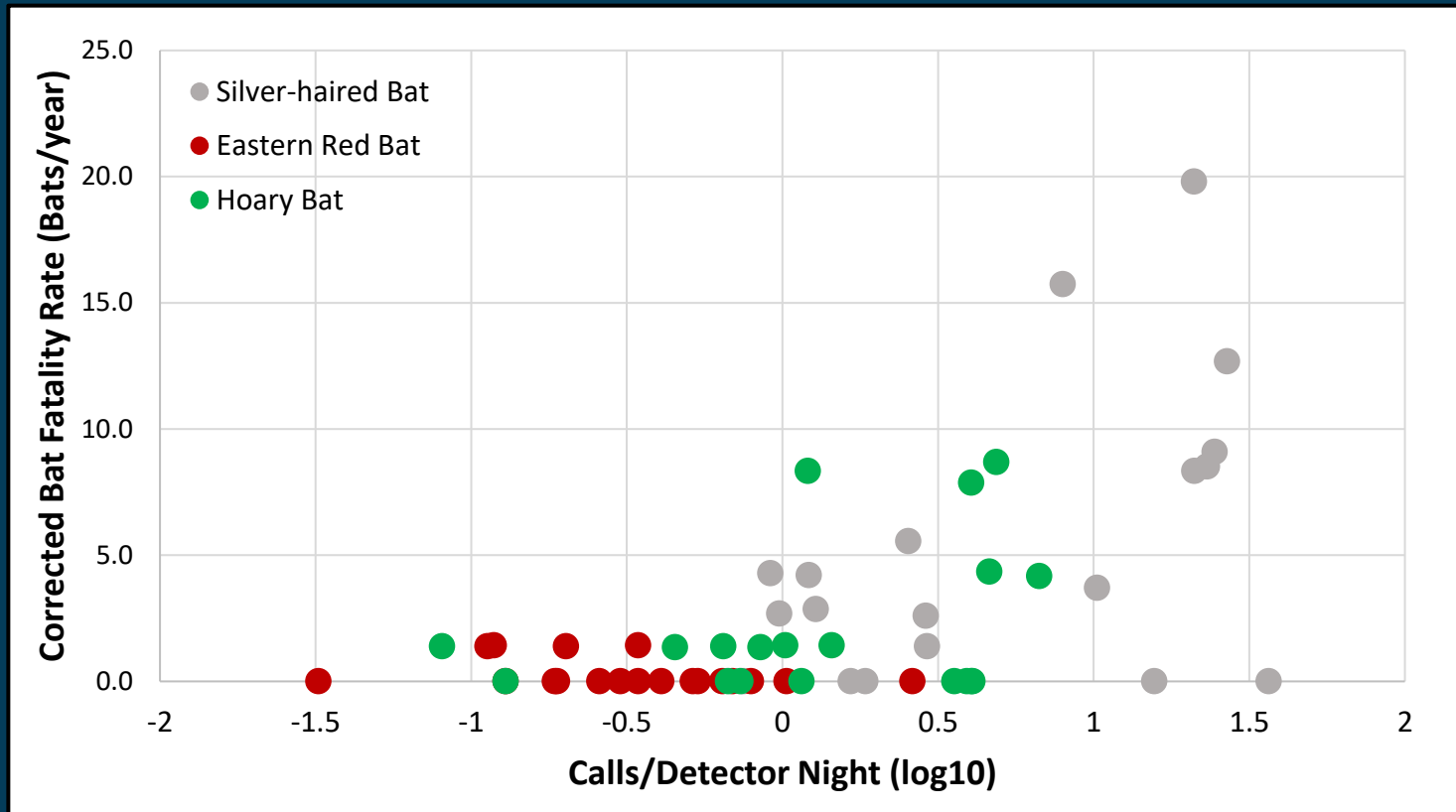
Multiple r: 0.57

R squared: 0.325

F < 0.001 (p = 0.05)

Results

Operational Acoustics and Fatalities



Linear Regression Results (n = 57)

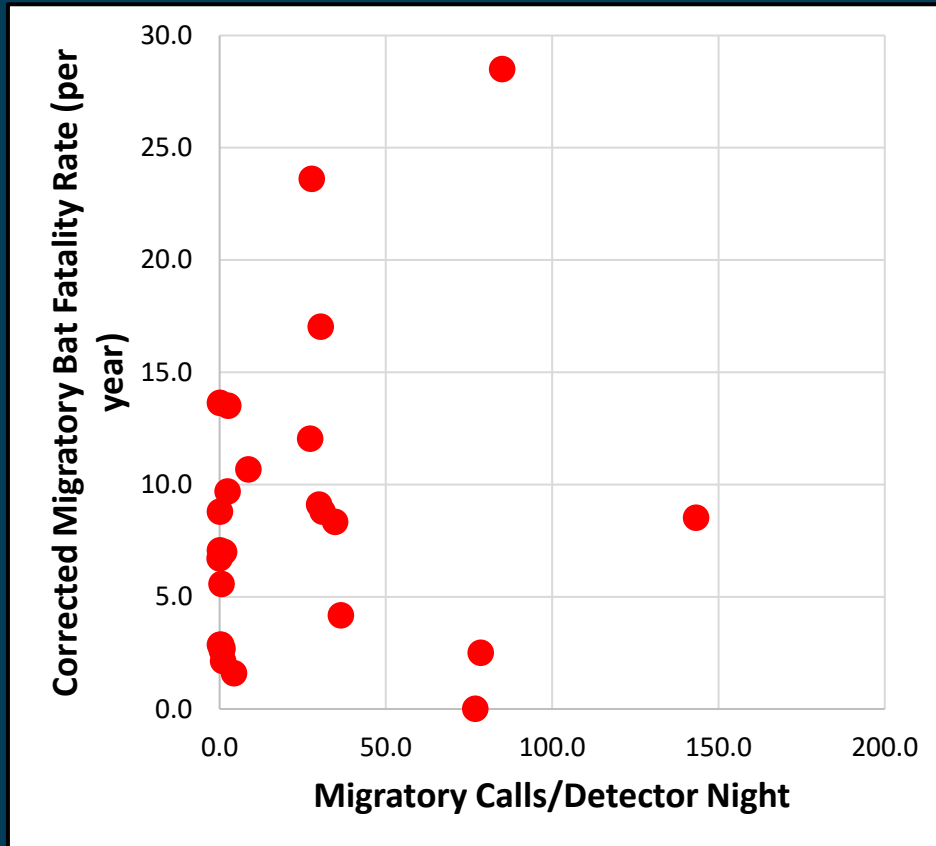
Multiple r: 0.57

R squared: 0.325

F < 0.001 (p = 0.05)

Results

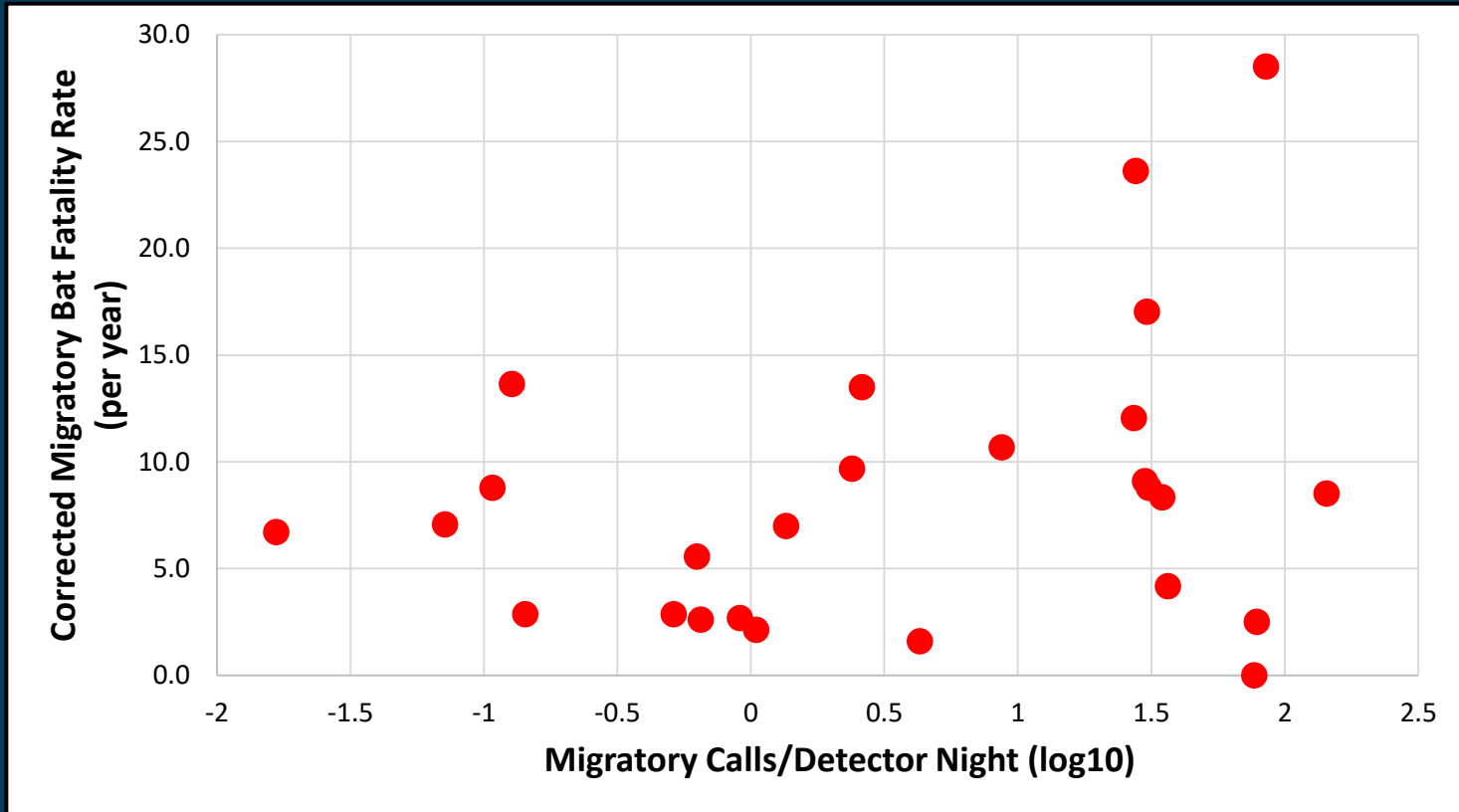
Pre-construction Acoustics and Fatalities



- 26 paired acoustic detectors and wind turbines; 13 in AB, 13 in ON
- Corrected bat migratory bat fatalities ranged from 0 – 28.5 bats/year
- Acoustic rates varied from 0.02 – 143.3 migratory calls/detector night

Results

Pre-construction Acoustics and Fatalities



Linear Regression Results (n = 26)

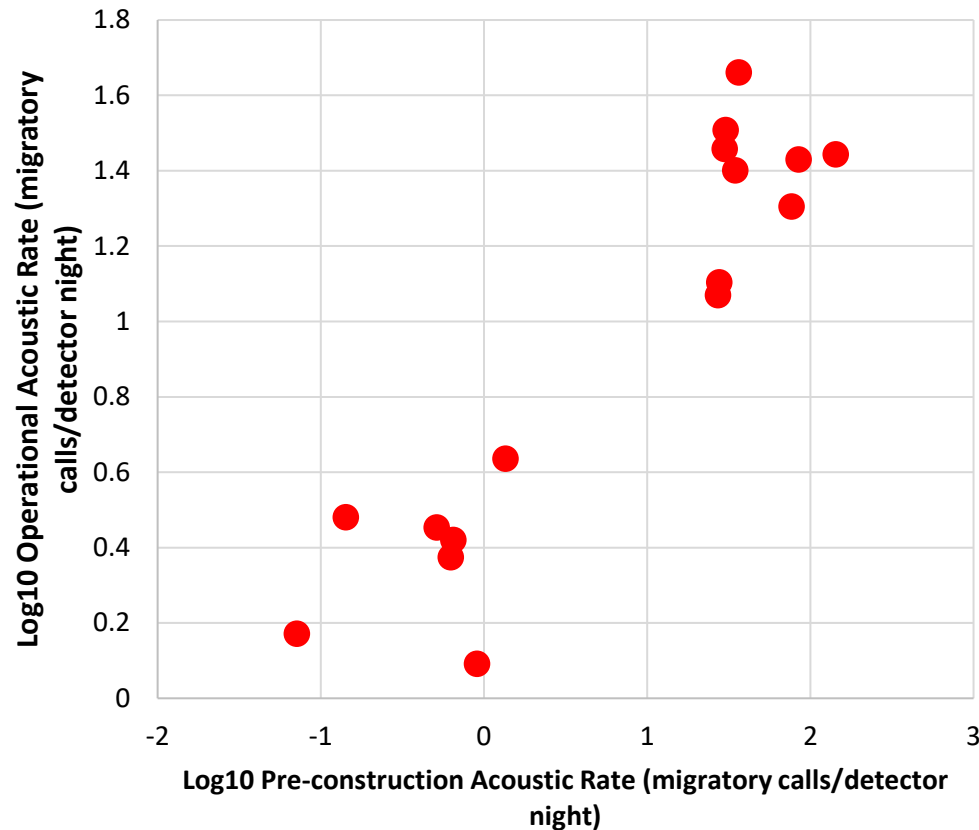
Multiple r: 0.2835

R squared: 0.0804

F = 0.1604 (p = 0.05)

Results

Pre-construction Acoustics and Operational Acoustics



Linear Regression Results (n = 16)

Multiple r: 0.9218

R squared: 0.849

F < 0.001 (p = 0.05)

Results Summary

- Operational acoustics (by species) and operational fatalities show a **moderate and significant** relationship
- Pre-construction acoustics (all migratory species grouped together) and operational fatalities show a **weak and non-significant** relationship
- Pre-construction acoustics and operational acoustics (migratory species grouped) shows a **very strong and significant** relationship

Presentation Take-aways

- **Take-away:** Ground detectors show promise for predicting migratory bat species fatality rates at operational turbines
 - **Additional thoughts:** Acoustic data effectively predicts fatality rates when placed at the turbine nacelle (Behr et al., 2023)
 - Operational acoustics may be more valuable for smart curtailment than pre-construction acoustics
- **Take-away:** Strong relationship between pre-con and operational acoustics suggests there is value to pre-con acoustics if identified to species
 - **Additional Thoughts:** More before-and-after studies to properly evaluate methods for bat fatality risk assessment (Katzner et al., (2016)
 - Will require consistent species ID across monitoring studies for meaningful comparisons
 - Detector placement is key to compare to turbine fatalities

Thank You!

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