Using Python and R to Generate Diel Pattern Figures and Species Co-occurrence Linear Regressions

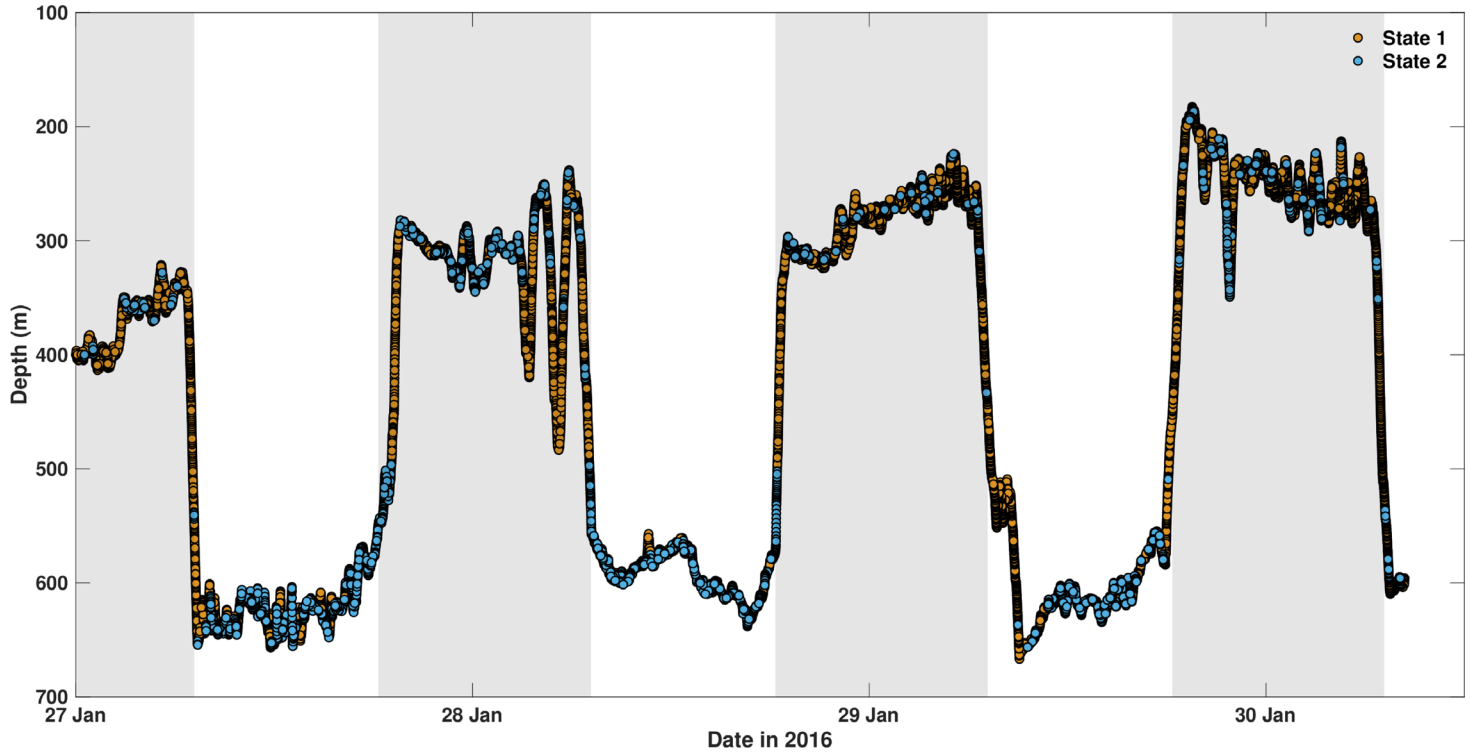
By Adam Sanjar

Road Ecology in South Texas

- Goals:
  - Reduction of wildlife road mortalities
  - Maintain permeability of roads to wildlife
- Wildlife Crossing Structures (WCS) and Wildlife Guards (WG) constructed in 2015.

Diel Patterns

- Activity patterns over a 24-hour period.
- Example is the diel pattern of the vertical migration of a bluntnose sixgill, a deepwater shark.
- Important for understanding animal spatio-temporal ecology.
- Relevant to road ecology due to road effects potentially impacting wildlife behavior.

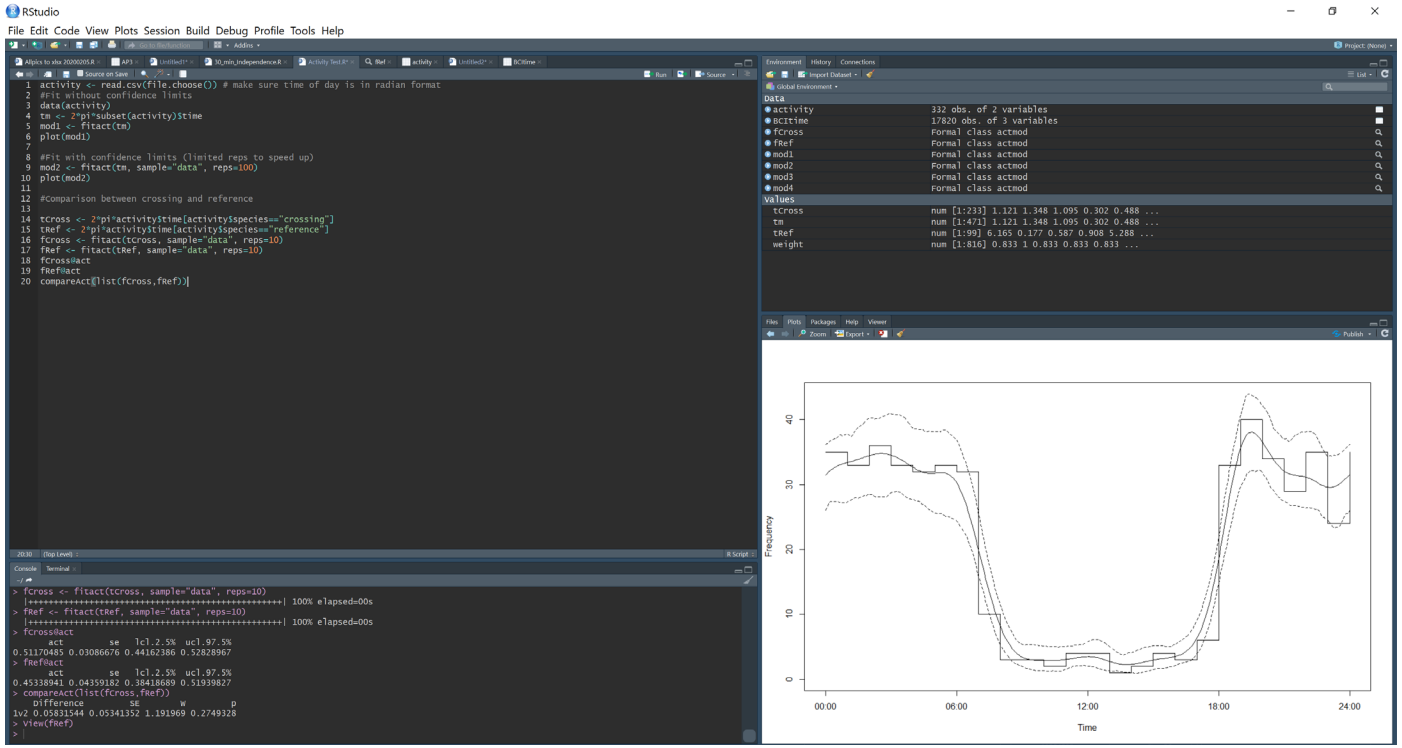


Co-occurrence Linear Regression

The goal is to establish if there are correlations between structure use of different species.

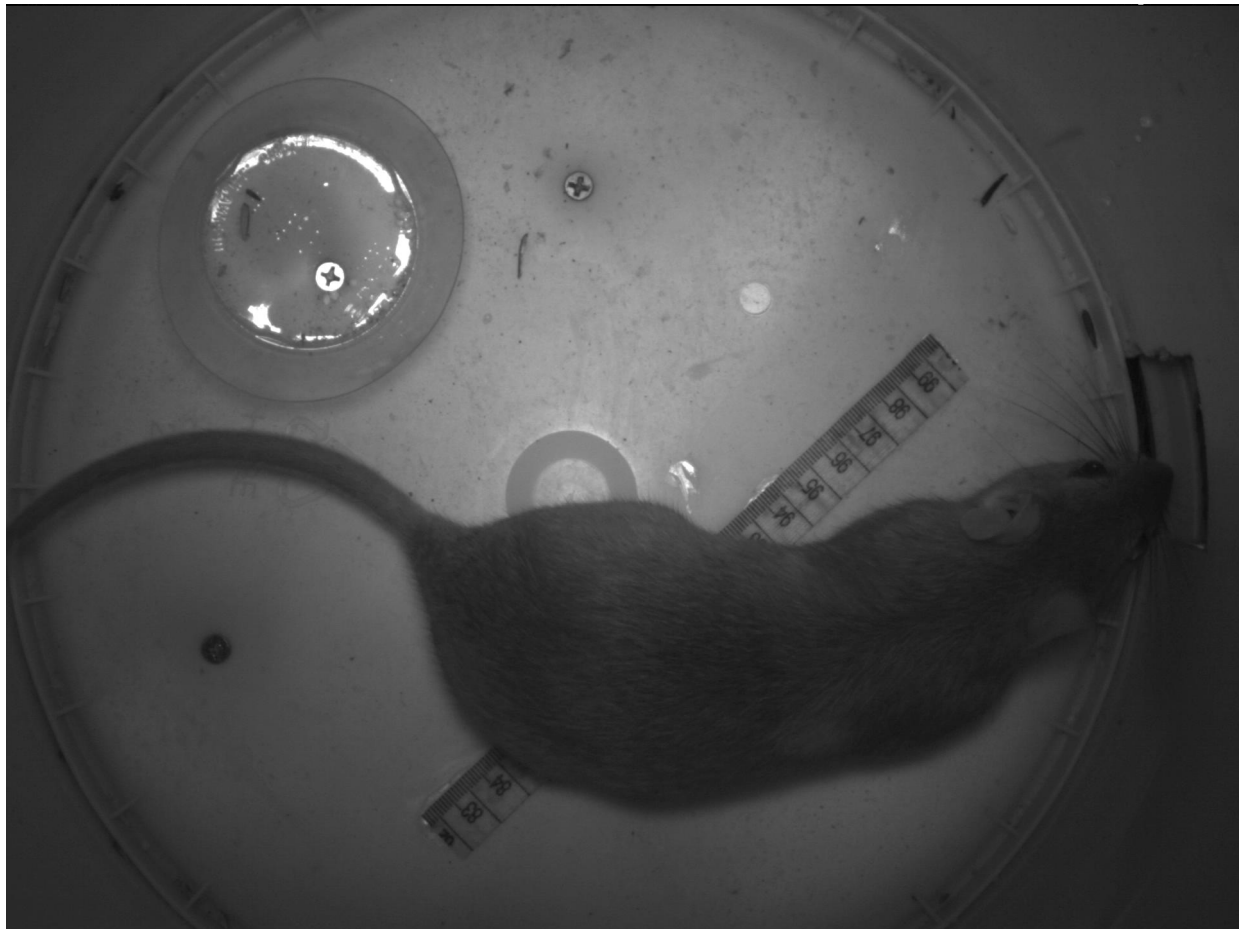
Methods (Diel Pattern Analysis)

- Diel Pattern Analysis in Python
  - Utilized matplotlib and pandas packages
  - Stacked bar plot divided by species, with one bar per hour.
- Activity library in R
  - Premade library that can statistically analyze activity time data



Methods (Co-occurrence Linear Regression)

- Python packages matplotlib, pandas, numpy, and scipy were used.
- Data was cleaned up using R to generate interactions with 30-minute independence periods.



Rodent Diel Pattern Results from Python

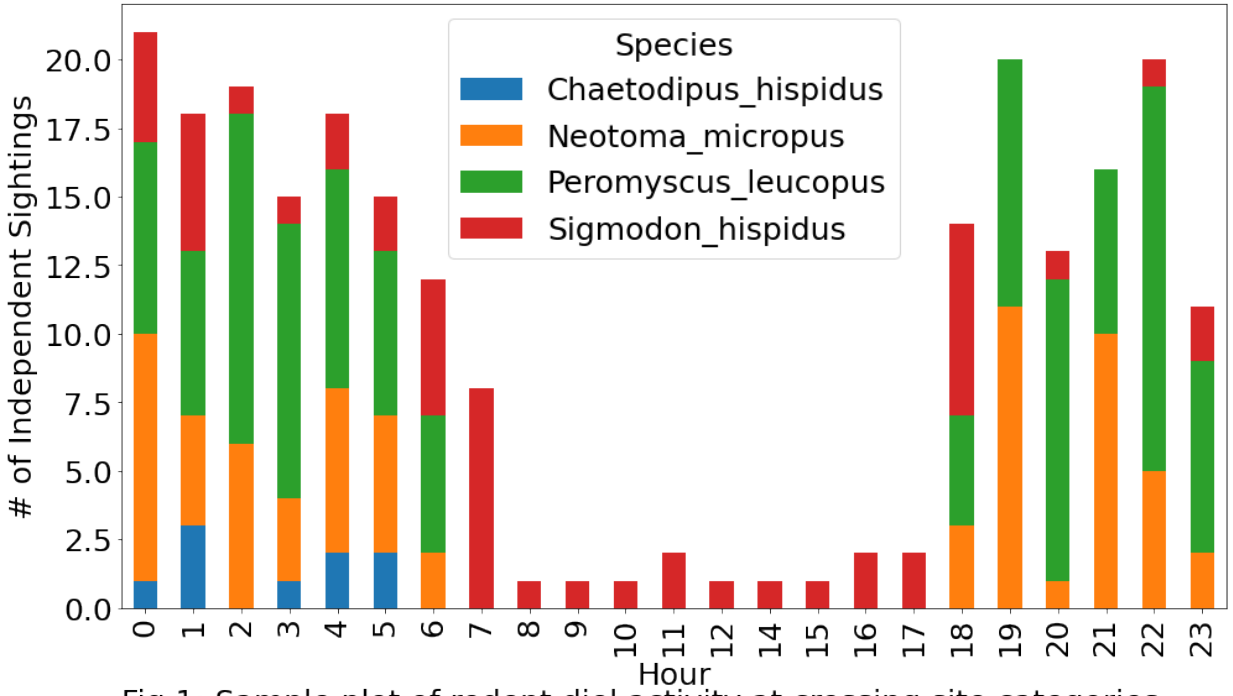


Fig 1: Sample plot of rodent diel activity at crossing site categories

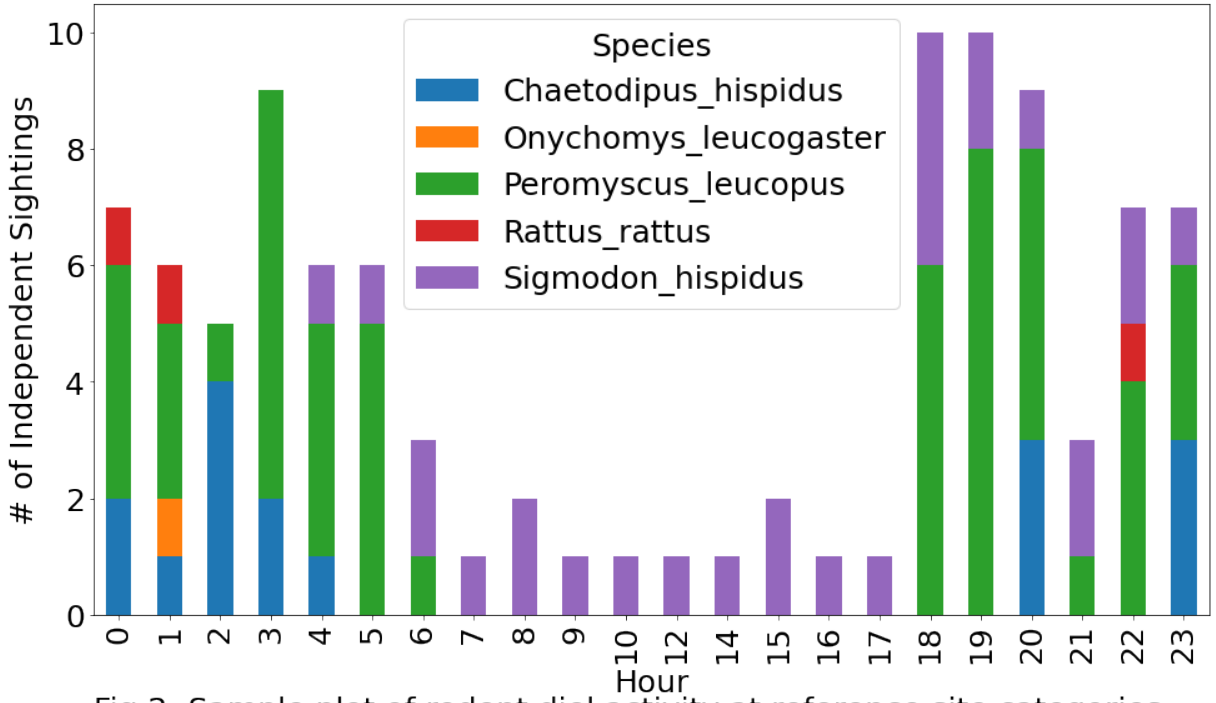


Fig 2: Sample plot of rodent diel activity at reference site categories

Predator Diel Pattern Results from Python

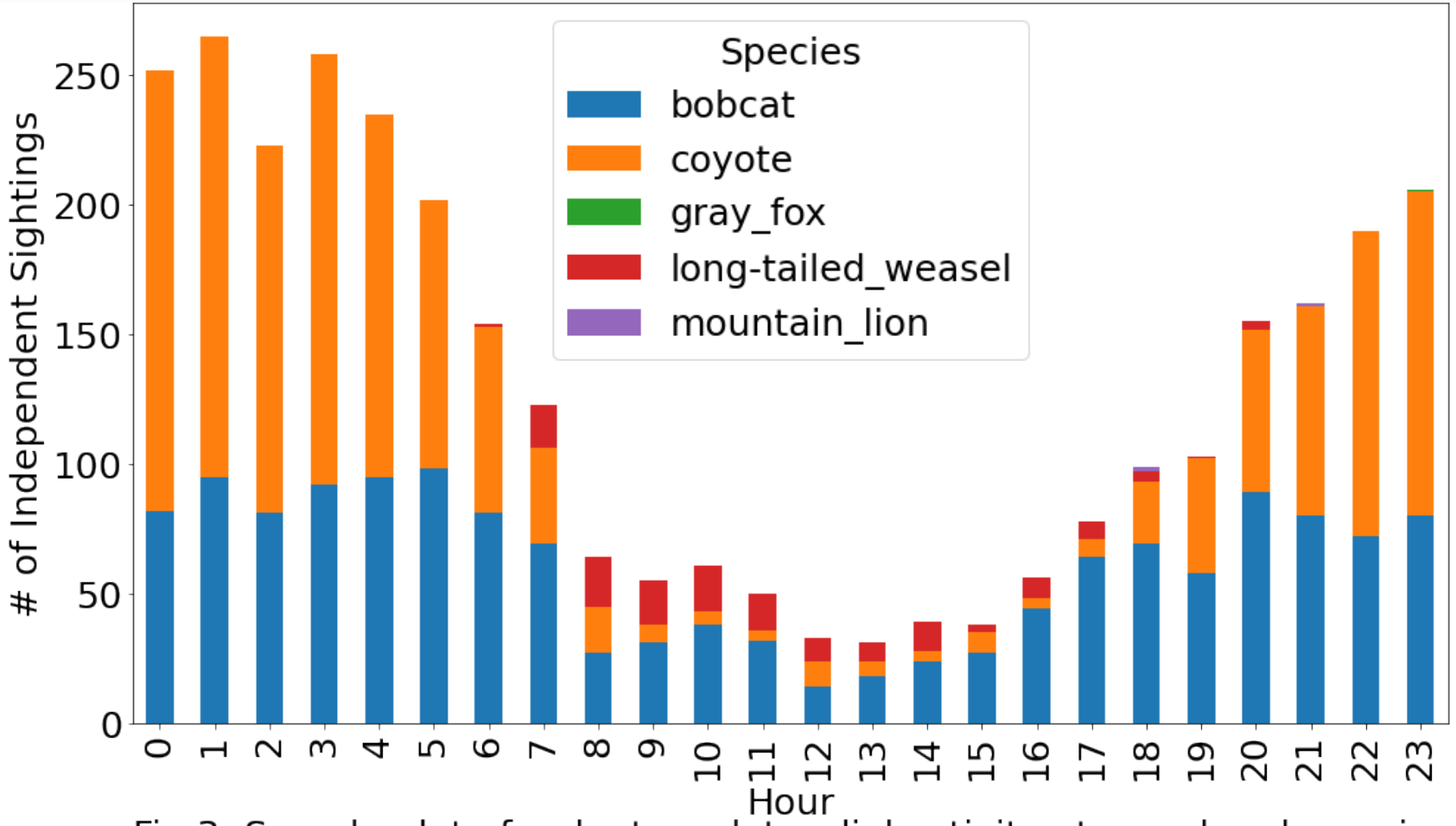


Fig 3: Sample plot of rodent predator diel activity at guard and crossing site categories

Rodent Diel Pattern Results from Activity in R

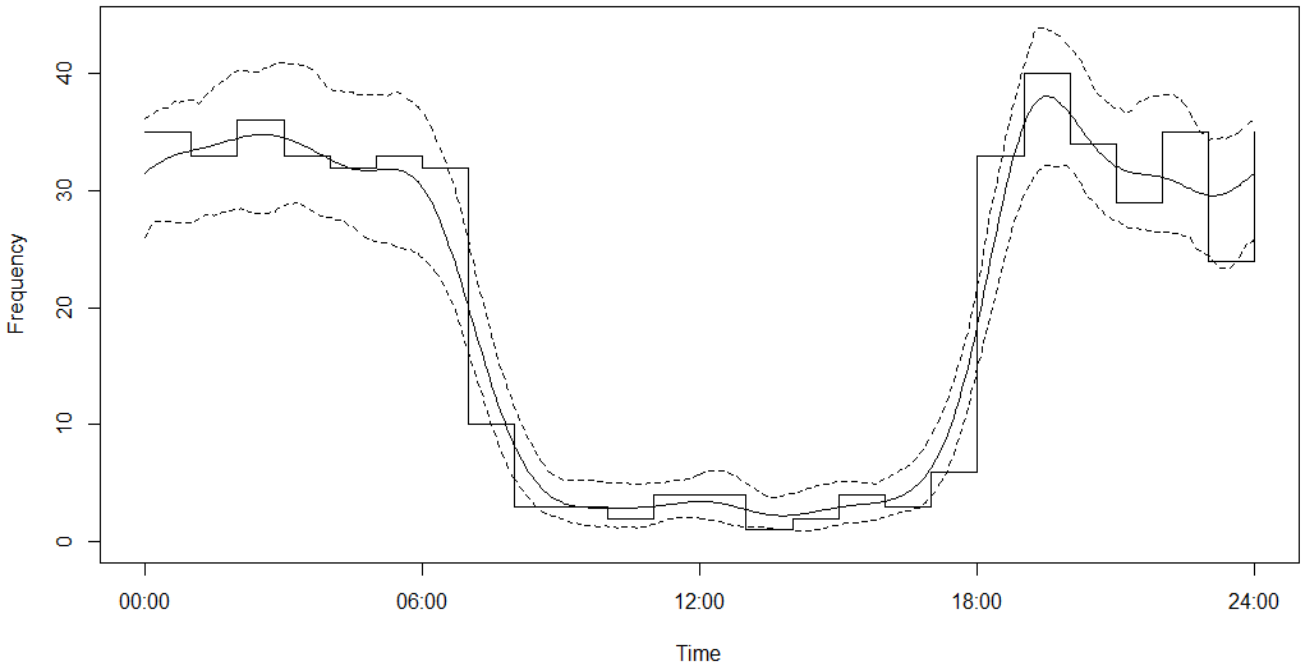


Fig: Rodent diel activity figure for all sites generated in R using Activity library

- P-value for a difference existing between diel patterns at crossings and in reference habitat is 0.2749.

Co-occurrence Linear Regressions for Rodents

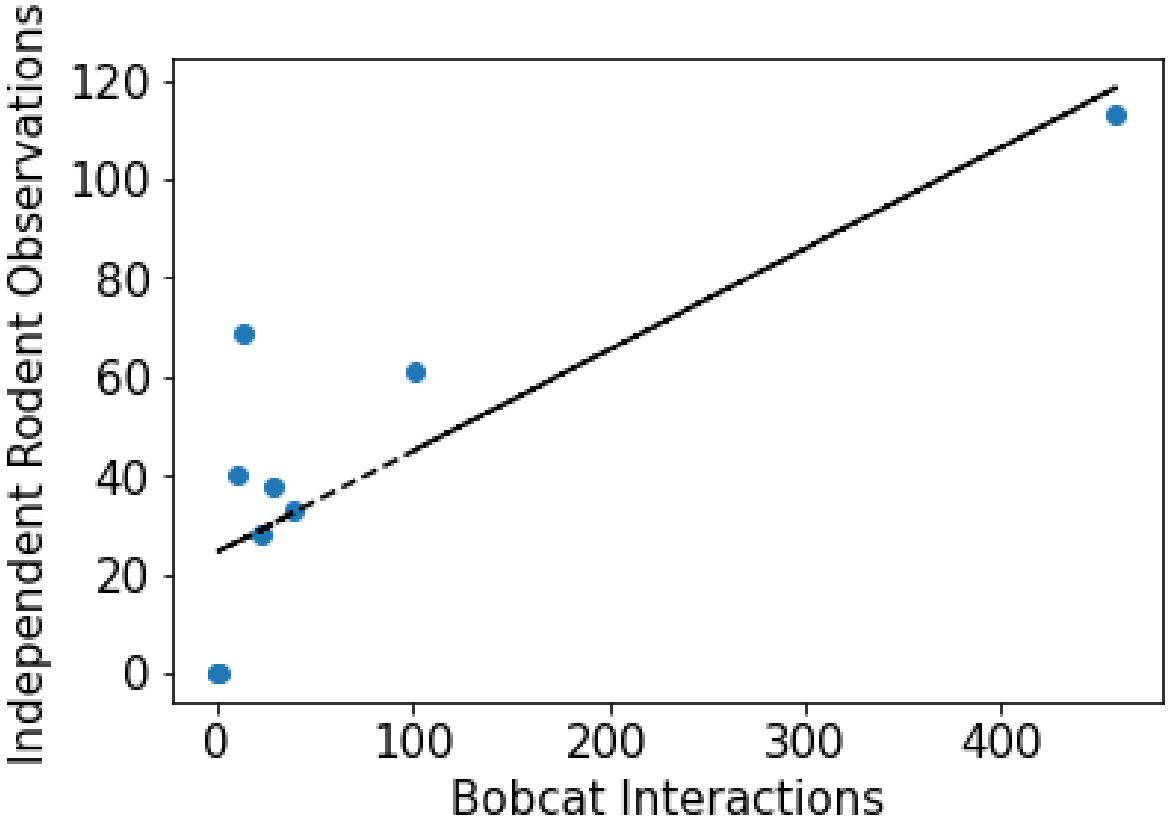


Fig 4: R value = .805, P value = .0049

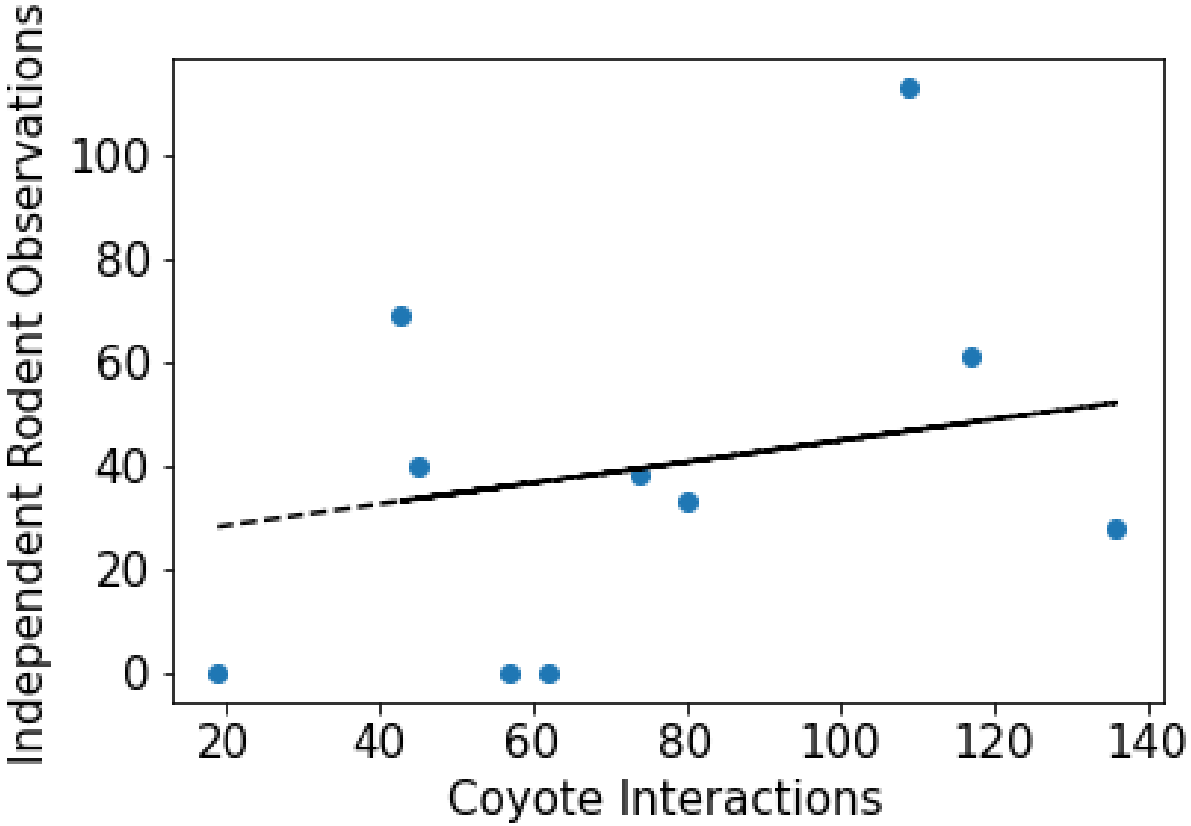


Fig 5: R value = .432, P value = .2125

Co-occurrence Linear Regressions for Lagomorphs

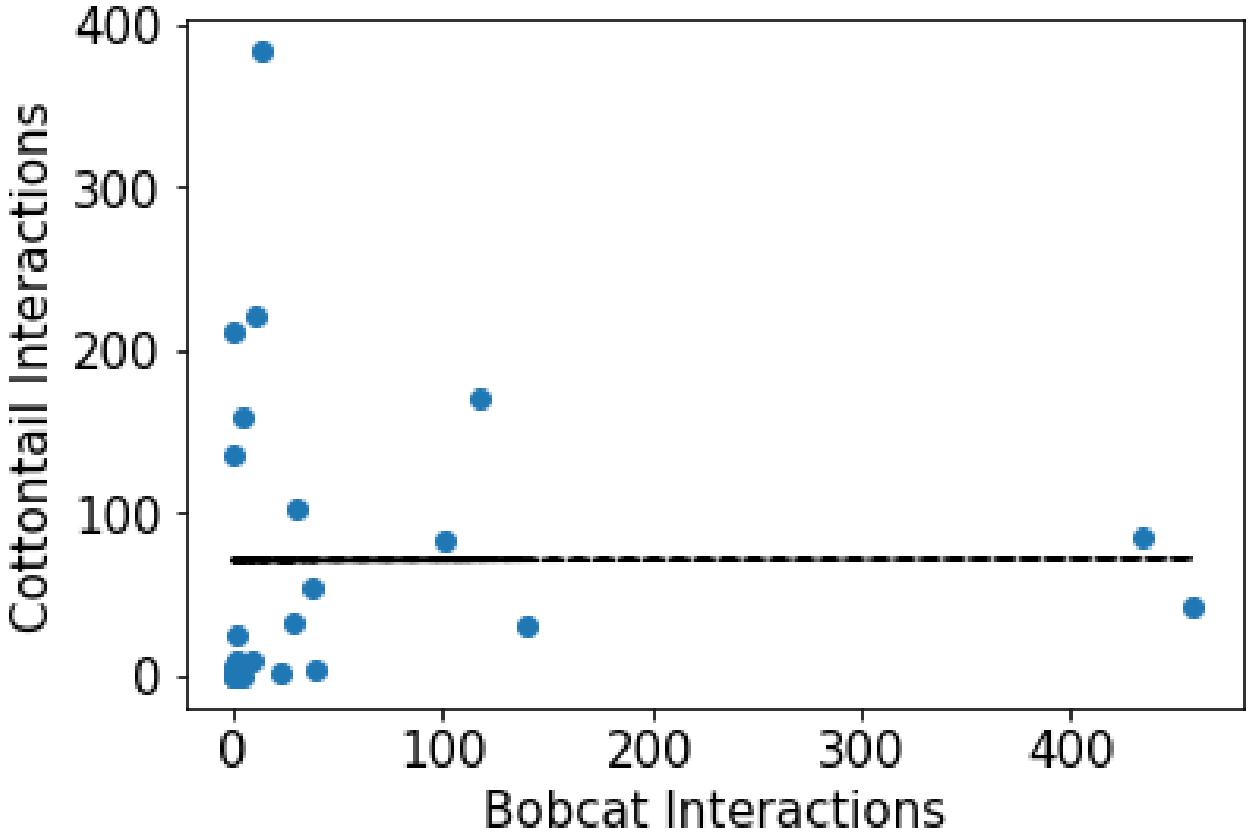


Fig 5: R value = .0032, P value = .988

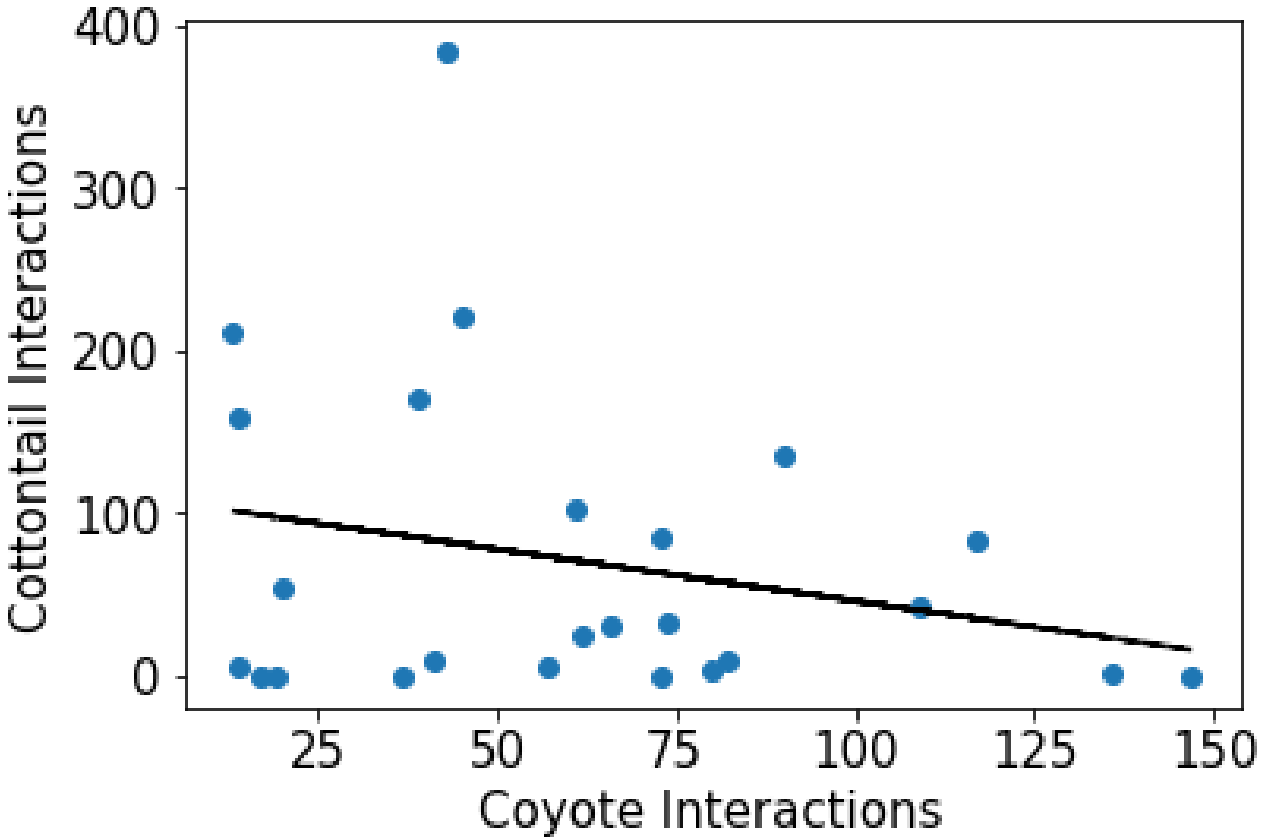
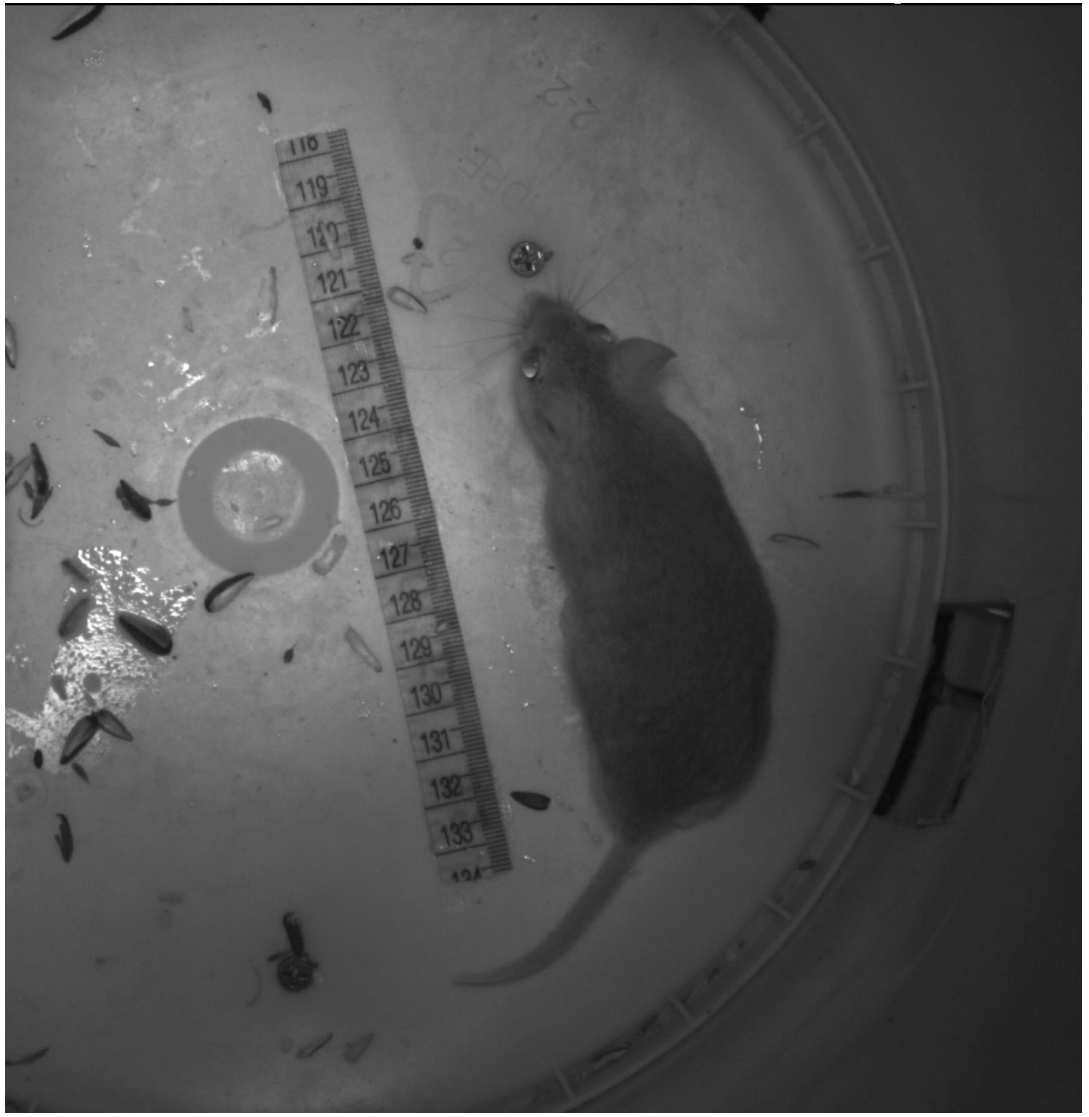


Fig 5: R value = -.253, P value = .222

Discussion

- No significant differences found between diel patterns for rodents at different site categories.
- More information is conveyed in the python stacked bar plot, and the stats can then be generated in R using Activity.
- Significant correlation between rodent and bobcat activity.
- Coyotes may be negatively correlated with lagomorphs, but the difference is currently not significant.



Questions?