River Watchers: A Comparative Camera Trap Study Observing Riparian Species Richness

By: Edwin Medrano Jr., Armaan Gill, Kelvin Cleto, Joseph Svoboda, Conor Gilligan

Introduction

Performing routine species richness checks is one of the many ways ecosystems are monitored (Rejmanek, 1996). If a species richness change occurs, it alerts ecologists to a potential issue in the balance of an ecosystem that may need to be ameliorated.

Sustainable populations of native species may indicate a healthy ecosystem; sudden change in species richness such as a disappearance of a keystone species or appearance of an invasive can cause rapid changes within the ecosystem (Ripple et al. 2014). This is why it is vital for ecologist to perform routine species richness checks so they can try and combat sudden changes in the ecosystem that could potentially negatively affect other species as well.

In an urban setting species richness tends to be much lower due to factors such as habitat loss, fragmentation, and human activity that can drastically change the balance of an ecosystem. It is important to perform species richness checks in urban areas, as it can indicate a change that could be putting the balance of the ecosystem at risk.

Our group set up a riparian camera trap study along the urban portion of the Bronx River within the Bronx Zoo, measuring the influence of human activity, plants species richness, and day and night cycles on urban animal species richness.

Research Questions & Hypothesis

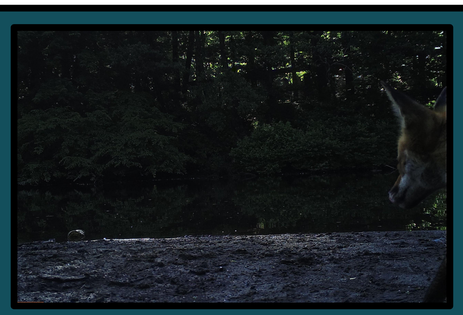
1. How does plant species richness influence animal species richness along the Bronx River?
As plant species richness increases, so does animal species richness

2. How does human activity influence animal species richness along the Bronx River?
Animal species richness along the Bronx River decreases in areas closer to human activity

3. How does nocturnal species richness compare to diurnal species richness along the Bronx River?
We expected a greater nocturnal species richness than diurnal species richness

Methods

- We placed 10 camera traps in different locations all varying in human activity & plant species richness levels
- We quantified human activity levels by measuring the distance to major roadways (close = <150 meters, far = >150 meters)
- We quantified plant species richness levels by the number of distinguishable plants in the vicinity of each camera.
  - To identify different plant species, we used both physical field guides as well as online resources, such as the app iNaturalist.
- We would switch out the memory cards of each camera on a weekly basis, and review the photos that were taken.
  - To Identify different animal species, we used field guides available to us on the internet and physical book copies of field guides.
- Along with camera traps, we also engaged in active spotting along the Bronx River, capturing photos of what we saw.



Red Fox (*Vulpes vulpes*)

Results

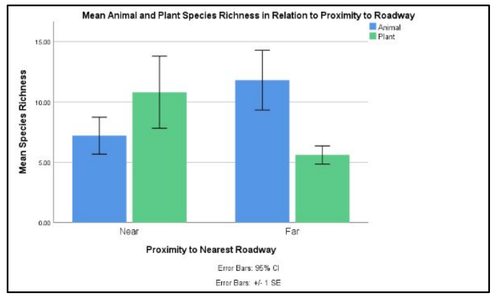


Fig. 1: The relationship between animal and plant species richness based on distance from roadways

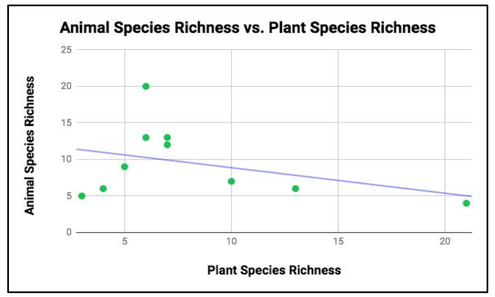


Fig. 2: The correlation between animal and plant species richness

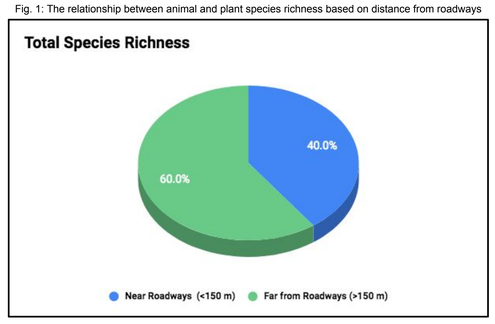


Fig. 3: The percentage of total species richness found at different camera locations

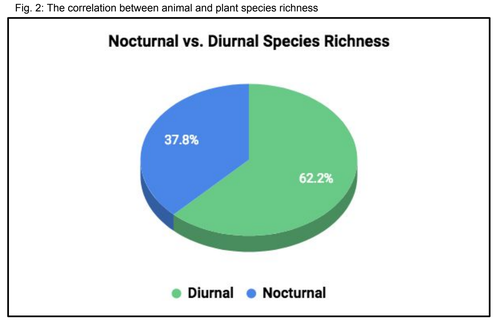
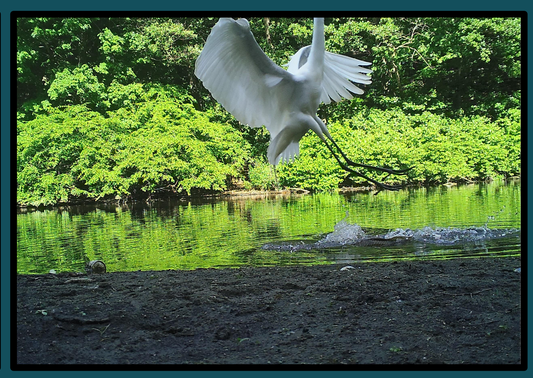


Fig. 4: The percentage of species richness found at night vs. day

Great Blue Heron (*Ardea herodias*)



Great Egret (*Ardea alba*)

Raccoon (*Procyon lotor*)

Large American Opossum (*Didelphis marisupialus*)

Discussion & Conclusion

- We hypothesized that the correlation between plant species richness and animal species richness would be positive. We came to this hypothesis because it has been shown that animal and plant species richness is found to be higher in areas with higher environmental energy (Currie, 1991). However, as seen in Fig. 2, we found the opposite. This could have to do with the presence of certain plants such as Japanese Knotweed and Porcelain Berry which tend to dominate a certain area, but provide lots of cover which many animals utilize for shelter.
- As predicted, the presence of human activity negatively affected the animal species richness (McKinney, 2008). The camera locations closer to major roadways had significantly fewer species compared to those further away. As seen in Fig. 1, the mean animal species richness of locations more than 150 meters from a roadway is almost double of those less than 150 meters. Also, a larger percentage of the total species richness was found at cameras further away from roadways, as can be seen in Fig. 3.
- We also hypothesized that nocturnal species richness would be greater than diurnal species richness. We hypothesized this because we believed that more animals would be active at night, as the dark helps avoid predators, especially along the river there is not as much plant coverage. However, as seen in Fig. 4, we actually saw a higher percentage of species richness during the day. We believe that one of the reasons for this result could be the limitations of the camera at night. The lack of light can significantly reduce the effective range of the motion sensor, influencing our results. Another reason for this result could be that more water-based species tend to be diurnal. One example of this is wading birds which, besides Black-Crowned Night Herons, were almost exclusively found during the day.
- *Potential Error in Experiment*: We unfortunately had a minor setback with three of our cameras breaking. Our replacement cameras were placed out a few weeks later than our original cameras, providing with less time to record data. Our cameras placed in areas with high plant species richness were negatively affected by this set back.

References

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Acknowledgments

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Muskrat (Ondatra zibethicus)