Northern cardinals learn avoidance behaviors within their local environment

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Question

Are cardinals learning avoidance behaviors in the moment or over the course of their life?

Hypothesis

Foraging behavior differs between areas of high and low human disturbance because cardinals learn to avoid humans

Predictions

1. Cardinals learn to **forage farther away** from trails with higher disturbance levels to avoid humans
1. Cardinals in **highly disturbed** areas will spend **less time foraging** because they learn to be risk-averse

Background

- Human disturbances can disturb bird breeding, nesting, and foraging (Clucas & Marzluff, 2011)
- Recreational trails have microhabitat types (Morelli et al., 2018), including areas with high human disturbance (popular trails) and areas with low human disturbance (covert trails).
- Perception of predation risks can alter foraging behavior of birds
  - Trade-offs between foraging efficiency and low predation risk control feeding locations (Bonter et al., 2013)

Methods

- We walked trails in Brackenridge, once a cardinal was spotted, location and behavior were recorded until it flew out of sight (n=54 birds)
- Recorded measures:
  - Time on ground
  - Time in or out of foraging zone (2m from ground)
  - Distance from closest trail and distance from main trail (Wilderness Loop)
  - No. people who walk past for 10 minute interval after bird was spotted (disturbance unit)
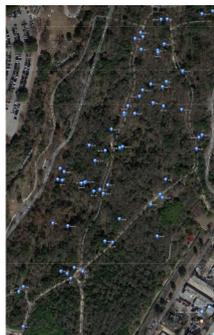
49 GPS coordinates were recorded for birds encountered at Brackenridge Park, San Antonio Texas. Image taken from Google Maps

Disturbed trails are characterized by **high human traffic**

Undisturbed trails are characterized by **low human traffic**

Results

p = 0.32
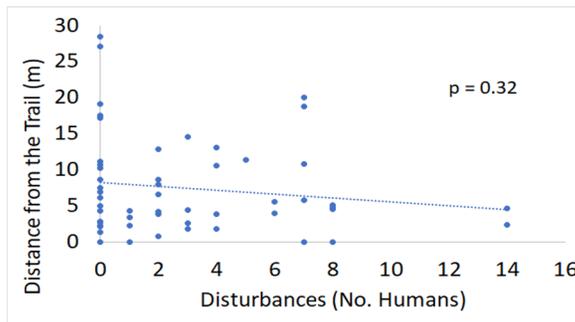
Figure 1. Distance from the trail versus number of human disturbances. The p-value is 0.3210 (n = 53; R² = 0.0193).

There is no individual difference between the distance that cardinals forage from the trail and the number of people encountered at the moment


p = 0.038
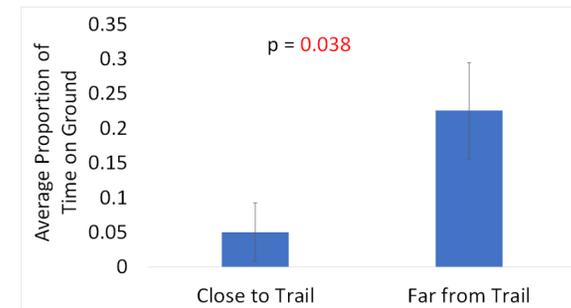
Figure 2. Average proportion of time cardinals spent on the ground per observation. A two-tailed t-test between the birds closest to the Wilderness Trail (n = 27, mean = 0.05 m, SE = 0.0042 m) and birds farthest from the trail (n = 27, mean = 0.22 m, SE = 0.069 m) gave a p-value of 0.038.

Cardinals avoid foraging on the ground in areas of the park closest to the main trail

Discussion

- Northern Cardinals at Brackenridge Park do not adjust their foraging distance (avoidance behavior) based on immediate human disturbance on the recreational trails [Fig. 1].
- Northern Cardinals do avoid the ground while foraging in highly disturbed areas of the park [Fig. 2].
- **Cardinals perceive risks within their local environments, rather than in the moment.**
- **Avoidance behavior may be learned from cardinals discerning predation risks in the overall environment**

Acknowledgements

We would like to thank Mirjam Borger and Dani Freund for their assistance on statistical analyses and mentorship throughout this project, Dr. David Ribble for giving us his time and advice, and Dr. Troy Murphy for his pertinent lessons and guidance.

Citations

Bonter, D. N., Zuckerberg, B., Sedgwick, C. W., & Hochachka. 2013. Daily foraging patterns in free-living birds: exploring the predation–starvation trade-off. Proceedings of the Royal Society B, 280, doi:10.1098/rspb.2012.3087.

Clucas, B. & Marzluff, J. M. 2011. Attitudes and actions toward birds in urban areas: Human cultural differences influence bird behavior. The Auk, 129, 1-8. doi: 10.1525/auk.2011.11121.

Morelli, F., Mikula, P., Benedetti, Y., Bussiere, R., Jerzak, L. & Tryjanowski, P. 2018. Escape behaviour of birds in urban parks and cemeteries across Europe: Evidence of behavioural adaptation to human activity. Science of the Total Environment, 631-632, 803-810. doi: https://doi.org/10.1016/j.scitotenv.2018.03.118.

Images:
1. Brewer, DW. *Northern Cardinal.* (2006) Illinois. Web. *Nikon Café.* April 10 2018.
2. Rivard, Robert. *Brackenridge Park: San Antonio's Neglected Crown Jewel.* (2012) San Antonio. Web. *Rivard Report.* April 19 2018.