

The Effects of the COVID-19 Pandemic on Human Behavior and Wildlife Populations along the Gradient of Urbanization

INTRODUCTION

- Humans can greatly affect wildlife populations and behavior through structural and behavioral disturbances, which are particularly pronounced along the gradient of urbanization.
- Importantly, although anthropogenic structural characteristics are relatively static along the gradient of urbanization for a given period, the presence of humans in recreational settings can be dynamic on daily and seasonal scales.
- The onset of the COVID-19 pandemic created a unique opportunity to evaluate how a rapid change in human behavior can affect wildlife populations and behavior along the urbanization gradient.

RESEARCH OBJECTIVES

The overall objective of our study is to use a before-after-control-impact (BACI) study design to:

- Evaluated how human activity (Fig. 1) changed due to the COVID-19 pandemic along the gradient of urbanization.
- Analyzed wildlife's response (Fig. 2) to changing human behaviors by evaluating wildlife habitat use and daily activity patterns.



Fig 1. Humans walking in suburban area



Fig 2. Coyote along human trail in wildland area

STUDY AREA

- Fifty remote wildlife cameras (yellow dots) were placed across the gradient of urbanization within the Phoenix Valley, AZ (Fig. 3).

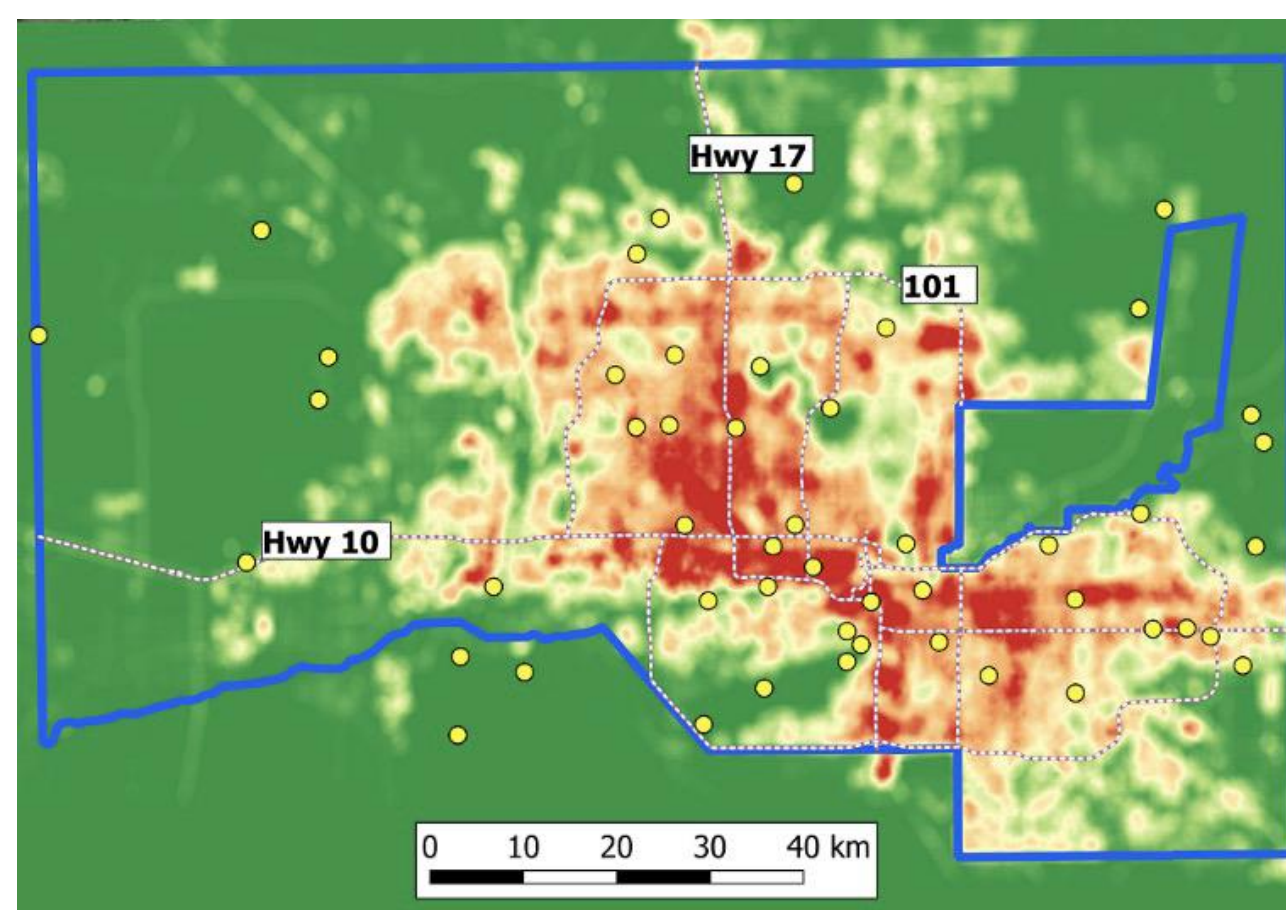


Fig 3. Remote wildlife cameras (yellow dots) were placed across the gradient of urbanization, ranging from high (red) to low (green). The CAP LTER study area is outlined in blue, and roads are shown with the dashed lines.



Fig 4. Bushnell remote wildlife camera

METHODS

- Wildlife camera data captured along the urbanization gradient was utilized to evaluate a suite of wildlife species (e.g., bobcat, coyote, and Harris antelope squirrel).
- Camera sites were reclassified into two categories: (1) wildland and low urbanization (n = 27) and (2) high urbanization (n = 23).
- Additionally, the City of Phoenix and City of Scottsdale human and vehicle counter datasets were used to measure human activity.
- We then used a BACI study design to evaluate how wildlife responded to changes in human behavior before and after the onset of the COVID-19 pandemic (Table 1).

Table 1. The before-after-control-impact (BACI) study design

	Before	After
	January - March	April - May
2019 (Control)	Pre	No treatment
2020 (Impact)	Pre	Start of COVID-19 pandemic

- We compared the same periods of 2020 (the impact year) to the same periods the year prior in 2019 (the control year).
- Occupancy modeling and daily activity pattern analysis are utilized to study wildlife's response to human behavior.

RESULTS

- Human activity in wildland areas was higher in the "after" season of 2020 compared to the "after" season of 2019 (Fig 5).

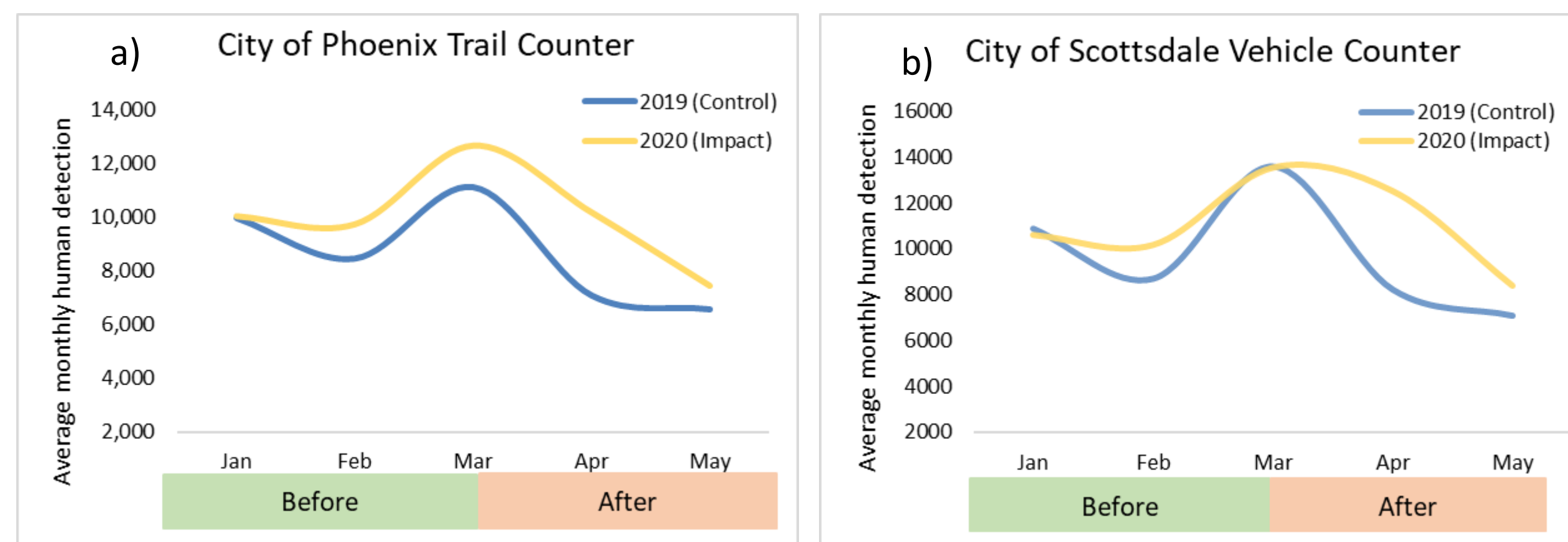


Fig 5. Results of human activity (measured by average detections per month) in wildland areas across the BACI study seasons among (a) the City of Phoenix trail counter dataset and (b) the City of Scottsdale vehicle counter dataset

ACKNOWLEDGEMENTS

This research was supported by the National Science Foundation grant: Central Arizona-Phoenix Long-Term Ecological Program (CAP LTER), no. DEB-1832016. Special thanks to Clare Miller, Scott Hamilton, and Sally Wittlinger.

RESULTS CONT.

- Wildlife species did not alter their habitat use during the "after" 2020 season compared to the after 2019 season (Fig 6).

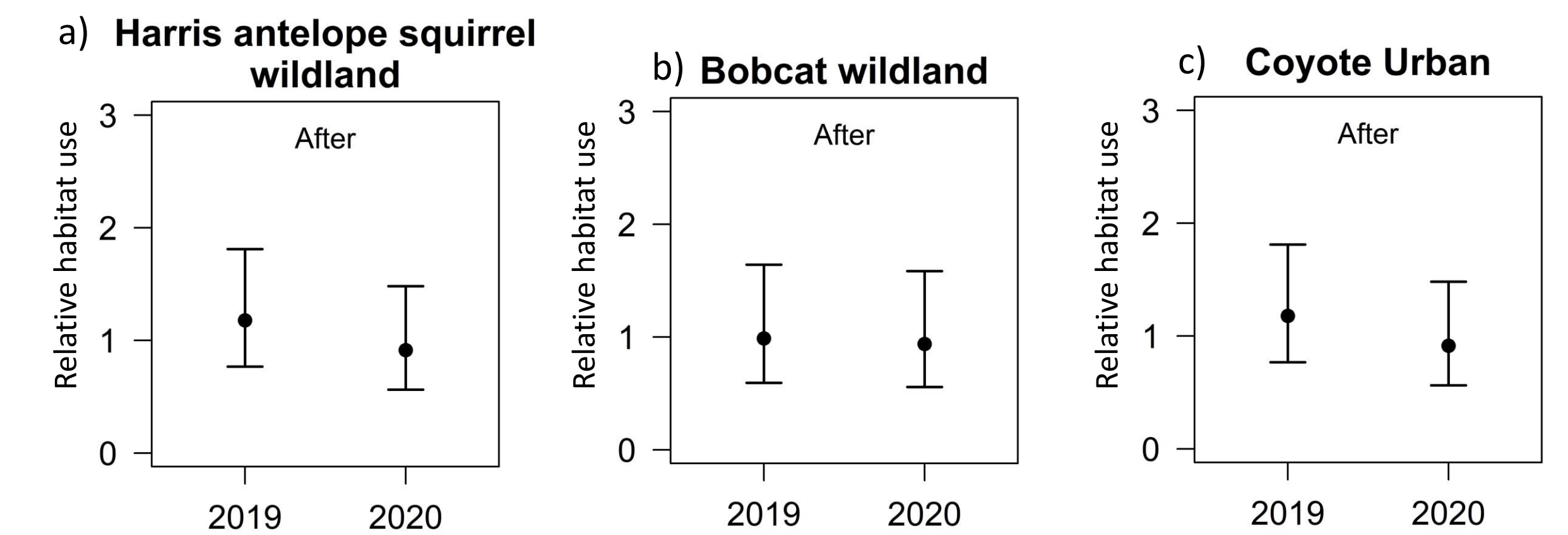


Fig 6. Relative habitat use estimates between 2019 and 2020 before "after" seasons of (a) Harris antelope squirrel, (b) bobcat, and (c) coyote.

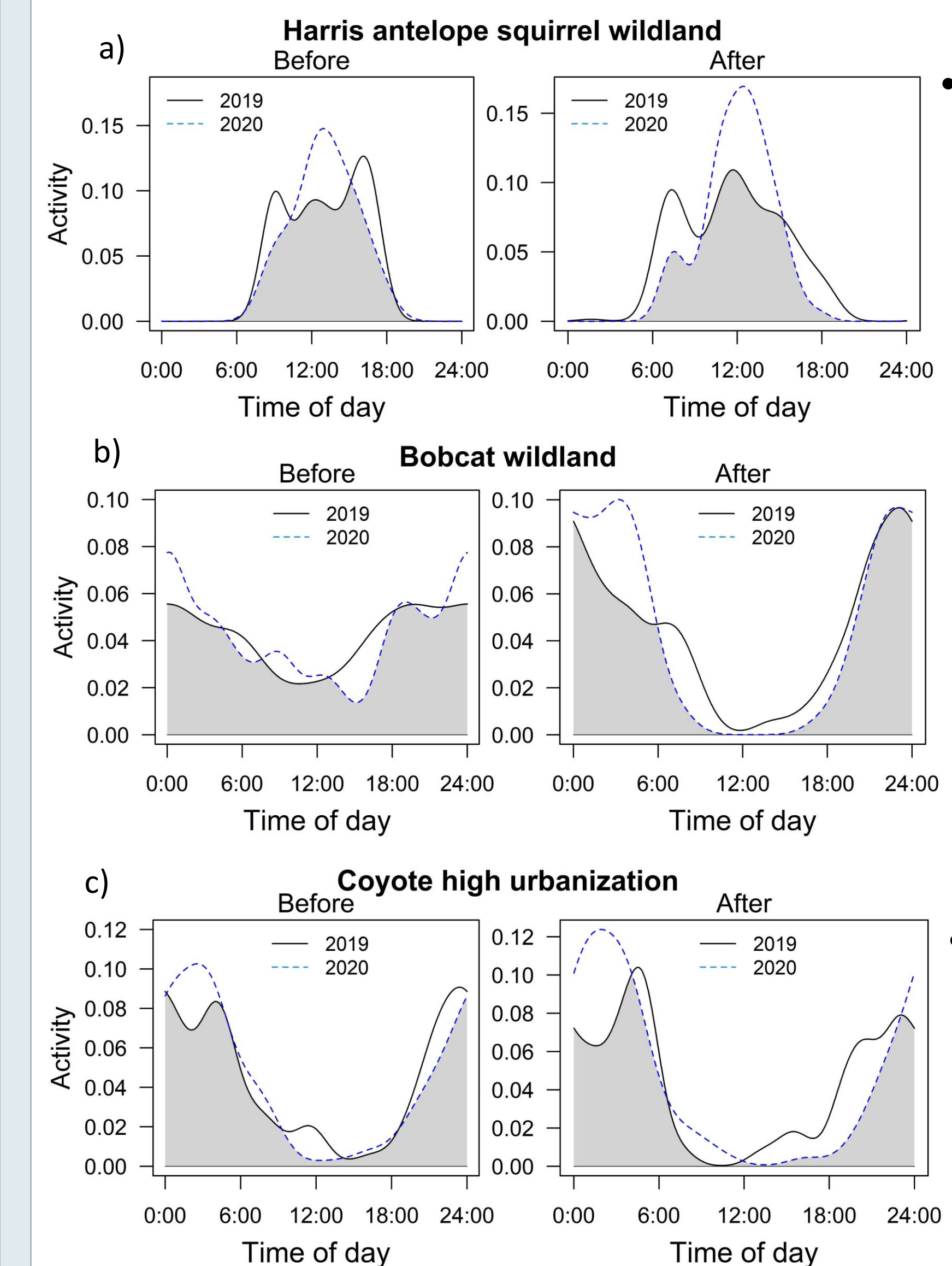


Fig 7. Results of daily activity patterns overlap between 2019 and 2020 before and after seasons of (a) Harris antelope squirrel, (b) bobcat, and (c) coyote.

CONCLUSIONS

- Human activity increased in wildland areas after the COVID-19 pandemic.
- Wildlife habitat use was unchanged despite an increase in human activity.
- Daily activity patterns varied for some species during the after season.
- Results are preliminary and additional analyses are ongoing.