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Habitat mediated raccoon response to an artificial increase in coyote activity

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Abstract

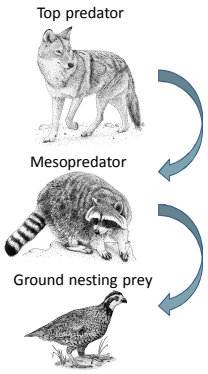
Most predator control programs treat species in isolation, never considering how competition between predators as predicted by the mesopredator release hypothesis (MRH) can result in indirect benefits to ground nesting prey. Understanding these dynamics will be especially important in the southeastern United States, where recent coyote (*Canis latrans*) invasions may provide systems with a new top predator capable of suppressing booming mesopredator populations. This project indirectly tests the MRH by examining the spatial avoidance of raccoons (*Procyon lotor*) to areas with artificially increased coyote activity. Radio-collared raccoon home ranges were intensely mapped for one week before and after test plots were treated with coyote urine (impact) or walked but not treated (control). Trials were conducted inside both 50 and 95% fixed kernel contours to test for differential raccoon responses based on potentially habitat mediated tradeoffs between resource availability and predation risk. Habitat variables (habitat type, vegetation density, etc.) were measured at five randomly selected points within each plot as soon as possible after trials ended. No statistically significant differences between treatments were found. This suggests that raccoons do not avoid areas of artificially inflated coyote use, potentially implying that coyotes are not an important source of mortality for raccoons in this system.

Introduction

The concept of top down control of mesopredators indirectly benefiting prey populations is called the **mesopredator release hypothesis (MRH)**.

There is strong support for the MRH in a variety of systems, and MRH relationships are particularly robust inside the canid family. However, **it is still not clear whether the MRH applies to systems involving coyotes and non-canid mesopredators**.

The strongest tests of the MRH are from population level studies. However, **prey behavior** may also be used to infer the strength of a potential predatory relationship.



Objectives and hypothesis

This study uses raccoon behavior as an indirect test of the potential predatory relationship between coyotes and raccoons. **If coyotes are a significant predator of raccoons, we expect raccoons to avoid areas of high coyote use.**

Study site

Located in Georgetown County, SC, the **Tom Yawkey Wildlife Center (TYWC)** is a 31 mi^2 wildlife heritage preserve managed by the SC Department of Natural Resources as a waterfowl refuge. Major habitat types include **longleaf pine savannah, freshwater bog, saltwater marsh, maritime forest, and waterfowl impoundments. The first coyote was recorded on the TYWC in 2006.**

Methods

Study design

- **Before-After-Control-Impact design**
- **Before treatment**
  - Locations taken 8x/24hr
  - 1 week prior to treatment
- **Treatment**
  - "Before" home ranges calculated
  - High use = inside 50% contour
  - Low use = outside 50% contour
- **After treatment**
  - Locations taken 8x/24hr
  - 1 week after treatment

Impact: Coyote urine sprayed every 10-15m along a transect covering the majority of the subplot

Active control: Transect walked but no urine applied

Passive control: No transect walked and no urine applied

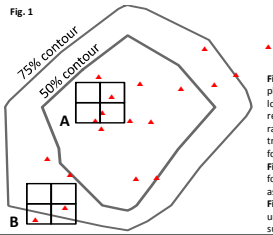
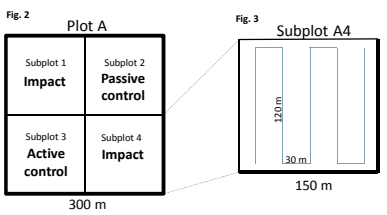


Figure 1. Typical plot placements inside high and low use areas (A and B respectively) for one focal raccoon treatment cycle. Red triangles represent before focal raccoon locations.
Figure 2. Plot divided into four subplots with randomly assigned treatments.
Figure 3. Transect path for urine application on impacted subplots.



Radio telemetry

- **8 total raccoons radio-collared**
  - 5 in January 2011
  - 3 in June 2011
  - Telonics equipment
- **Locations triangulated**
  - Bearings taken within 15 min
  - LOAS software
- **Home ranges computed**
  - Locations > 1hr apart
  - Harmonic mean
  - BIOTAS software

Habitat characteristics

- **5 random points/subplot**
- **Visibility**
  - 4 cardinal directions
- **Major habitat type**
- **Distance to five nearest trees**
- **% cover, % bare, % water**
  - Meter square plot

Statistical analysis

- **Test for differences in proportions (Before%-After%) between treatments**
- **SAS proc mixed**
  - Fixed effects = treatment
  - Random effects = plot, raccoon, period, subplot

Results

Table 1. Number of individual raccoons used, plots tested, and focal plots (one plot used to test the response of one raccoon) in each treatment cycle.

Cycle	Individuals	Plots	Focal plots
1	4	4	4
2	2*	4	4
3	5**	4	8

* No new individuals
** Three new individuals

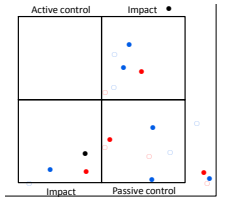
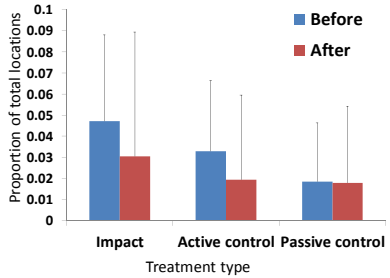


Figure 5. Typical before and after locations for a plot used for multiple focal raccoons. Each color represents one individual; filled and open dots represent before and after locations respectively.



There were **no statistically significant differences** between any of the three treatments (F=.68, p=.5309).

Figure 6. Proportion of focal raccoon locations inside subplots before and after treatment.

Discussion

There were **no statistically significant differences** between any of the three treatments, which suggests that **raccoons do not avoid areas of artificially increased coyote use.**

This, coupled with an ongoing coyote diet analysis showing a lack of raccoons in coyote diet on the TYWC, suggests that **coyotes may not be significant predators of raccoons in this system.**

Figure 7. Coyote colonization of the Eastern US[1]

Confounding factors:

- Coyotes as a new predator in the SE
- Commercially available coyote urine may not represent wild coyotes
- Behavioral responses other than avoidance

References : [1] Parker, G. 1995. Eastern Coyote: The Story of Its Success. Nimbus Publishing Limited, Halifax, N.S. p. 21, [2] US Fish and Wildlife Service, [3] SC DNR unpublished data. **Acknowledgements:** Artwork provided by Roger Hall www.inkart.net©. Thanks to : C. Brig, B. Holt, B. Phalen, S. Miller and A. Chesky Smith for fieldwork. Project funded by SC DNR SWG and assistance provided by the Yawkey Foundation.