Don't Worry Deer, Predators Are Not Real (No One Has Seen One Before)

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Introduction

- Prey recognition of and behavioral responses to **predatory odors** within ecological communities vary in extent and duration.
- Within our study of black-tailed deer (BTD) on Blakely Island, either cow or wolf urine were introduced near two tree saplings at different locations.
- Odors placed near the saplings can decrease foraging activity due to indication of predatory risk.

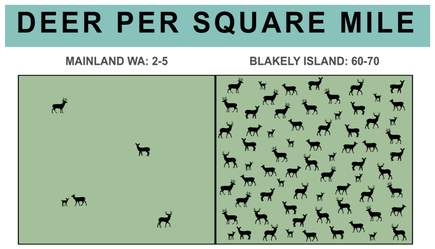


Figure 1. Density of populations of black tailed deer on Blakely island compared to the mainland (Long, et. al, 2019).

Risk of Predation

- Past research from Long and colleagues (2019) provides a look into the impact from a lack of **keystone species**, such as predators, can have critical effects to the **ecology**.
- The BTD population escapes top-down regulation and reaches high densities (Long et al., 2019). This may be caused by over or under fishing/hunting, which can have critical effects to the environment.
  - Relevant in facilitating understanding about long-term implications of human-facilitated changes.
  - Relevant to Washington and other at-risk regions.
- Blakely Island has provided a unique opportunity to view how the removal or extinction of keystone species affects the island ecology. For example, impact on the forest due to high density of BTD and competition for resources.
- We hypothesized that predator cues would influence BTD behaviors such as vigilance.

Methods

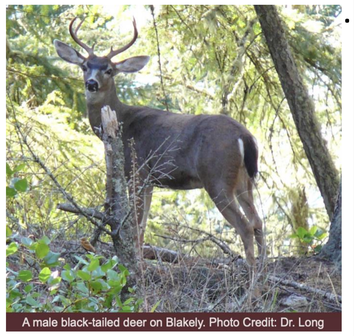
Subjects

- Dwarfed Black Tail Deer on Blakely Island, Washington

Apparatuses

- Ten trail cameras, one per site.
- Two Douglas Fir saplings, one caged
- Cow or wolf urine-soaked pad, per site
- MultiTimer App, "Count Up timer"
- Two Excel Master Spreadsheets

Figure 2. Black tailed deer on Blakely island (Long, et. al, 2019)



A male black-tailed deer on Blakely. Photo Credit: Dr. Long

Procedure

- Two Douglas fir saplings, one caged, placed to attract deer to ten trail camera locations.
- Due to high population density of BTD, the typically-ignored Douglas fir saplings became valuable foraging resource.
- Urine-soaked pads placed among the saplings to attempt to influence vigilance in BTD where the behaviors can be monitored.

Methods cont.

- Grey locations (1, 3, 5, 7, 9) had cow urine, and red sites (2,4,6,8, 10) had wolf urine (see figure 5.) Key to identify urine type at each location shared after data collection was completed.
- Videos ranged from nine, twenty-nine and fifty-nine seconds. Duration of visit, view or behavior was measured in seconds from the MultiTimer app.
- Duration the BTD are at a site was operationalized as "visit" (Table 1). "View" measured the duration of BTD presence in the video (Table 1). "Vigilance" was a particularly relevant behavior (Table 1).

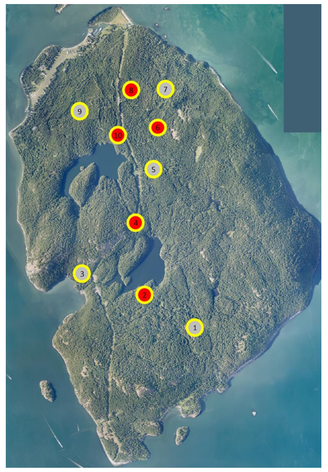


Figure 5. Ten plots on Blakey Island, WA. Grey & red denote cow & wolf urine plots with a trail camera urine, & two saplings. (Ferrer et al., 2023).

Table 1. *Behaviors Operationalized*

Variable	*Vigilance*	*Visit*	*View*
Definition	Head up, ears turn, focus, sniffing, scanning, freeze, running	Time deer is at site	Duration of view a deer is seen: Full V1, Partial V2, Hidden V3, Null V4
Measures: Variation, Duration (seconds)	NV: Neutral PV: Provoked VS1: Sniffing still VS2: Sniffing moving	Duration of deer in frame.	V1, The full deer. V2, ≤ 3/4 of the deer. V3, The deer is occluded by itself or an object. V4, no deer.

- Lab members were assigned to one of two groups each week. Four videos were uploaded to be coded and compared.
- Initial coding was done individually, collecting demographic, environmental, and behavior data for the locations.
- Comparison of coding occurred among pairs in each group to increase construct reliability, and control for consistency in behaviors recorded.
- Once consensus is reached, data is added to one of two Master Spreadsheets.
- Excel was used to clean, transform, and analyze the data, and R was used for data analysis. Descriptive statistics and independent *t*-tests were run.

Results

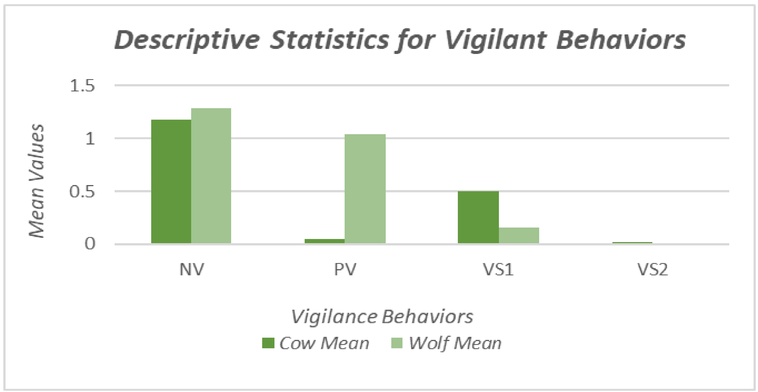
Figure 3. Descriptive Statistics for Vigilant Behaviors.

	Odor	N	Mean	Standard Deviation
NV	Cow	60	1.18	2.51
	Wolf	68	1.29	4.46
PV	Cow	60	0.05	0.29
	Wolf	68	1.04	4.45
VS1	Cow	60	0.50	2.35
	Wolf	68	0.16	1.03
VS2	Cow	60	0.02	0.123
	Wolf	68	0.00	0.00

Results cont.

- Descriptive statistics collected for vigilance behaviors (see figure 3).
- **Preliminary** independent samples *t*-tests conducted to investigate whether vigilance behaviors were influenced by olfactory cues.

Figure 4. Bar chart of Descriptive Statistics for Vigilant Behaviors.



- Overall, vigilance behaviors at locations with cow urine were **not significantly different** from vigilance behaviors at locations with wolf urine.
- Provoked vigilance was the only slightly significant difference between cow urine and wolf urine ($t(126) = 1.71$, $p = .089$).
- No significant differences between cow urine and wolf urine:
  - Neutral vigilance ($t(126) = 0.17$, $p = .87$)
  - Vigilant sniffing while still ($t(126) = -1.07$, $p = .28$)
  - Vigilant sniffing while moving, ($t(126) = -1.07$, $p = .29$).

Discussion

- Hypothesized that predator cues would influence vigilance behavior of BTD, and results of preliminary analysis indicated **no statistically significant differences** between vigilance behaviors at locations with cow and wolf urine.
- The only slightly significant difference between the urine locations is with **provoked vigilance**, not for any other vigilance behaviors.
- It is possible, but not strongly supported, that predator cues influence behaviors of BTD. A larger sample size might assist in determining this.
- This study seems to support idea that BTD approach the two urine patches while showing the same type of behavior, indicating that deer might not be sensitive to predator odors when there is a lack of predators over many generations.
- We aim to further understand the cascading effect on forest ecology and BTD's decision-making in a resource-competitive environment by continuing this research.

Note: a complete list of references is available upon request.