

Are western spotted skunks vulnerable to predation by barred owls?

Barred Owl predation of Western Spotted Skunks

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Do invasive barred owls prey on western spotted skunks, a small native forest carnivore? Western spotted skunks (*Spilogale gracilis*) are small mostly nocturnal carnivores in Pacific Northwest forests. With low population densities and reproductive effort, their populations are sensitive to changes in predation. Barred owls (*Strix varia*) have invaded Pacific Northwest forests through natural range expansion and their densities are often higher than the native owls they displaced. As part of a larger study on western spotted skunks in the Willamette Forest, the researchers attempted to gather evidence of barred owl predation on western spotted skunks.

What sizes were the tracked skunks and were they nocturnal or diurnal? What potential predators are present in the ecosystem?

- The radio-collared skunks ranged between 325g and 855g were mainly nocturnal. Of the potential nocturnal predators in the area, the barred owl was the most prevalent.

What evidence was presented for owl predation of western spotted skunks?

- The researchers recovered one radio collar from a tall snag and collected carcass and avian fecal material nearby. DNA analysis of the fecal matter showed that the sample was from a barred owl and that western spotted skunk was present, along with Humboldt's flying squirrel (*Glaucomys oregonensis*) and Townsend's chipmunk (*Neotamias townsendii*).
- They collected three additional radio collars that had little carcass evidence or disturbance nearby. The authors noted that they considered these to be avian predations because skunks preyed by mammals had visible teeth marks and the predation areas were bloody and heavily disturbed.

What portion of the study animals were impacted by avian predation? What proportion of the mortalities were avian predation?

- The four predation events attributed to avian predators represented 16% of the individuals tracked in this study and 36.3% of all confirmed or suspected mortalities.

What are possible implications of barred owl predation for western spotted skunk populations?

- Avian predation likely has significant impacts on western spotted skunk populations. The authors mention both the direct effects of predation as well as the indirect effects of predation-associated stress, which may include altered foraging behavior and calorie intake.
- Predation and predation-associated stresses on western spotted skunks may increase if barred owl populations continue to increase in Pacific Northwest forests. This may result in changes to the vertebrate community and the food web on an ecosystem level.

Are other carnivorous forest species potentially vulnerable to predation by barred owls?

- Other small forest-dwelling carnivores may also be negatively impacted by barred owls, such as the short-tailed weasel (*Mustela erminea*), the long-tailed weasel (*Neogale frenata*), and the Humboldt marten (*Martes caurina humboldtensis*), which is threatened.

Research Approach/Methods

- The researchers tracked 25 radio-collared western spotted skunks in the Willamette Forest near Blue River, Oregon in the area of the HJ Andrews Experimental Forest from 2017 to 2019.
- The scientists investigated mortalities as soon as possible, typically within 24 hours of the collar emitting a mortality signal.
- They searched the signal area visually and with the use of carcass detection dogs. They identified carcass remnants identified morphologically and noted predation marks and ground disturbance. They collected any avian fecal samples and analyzed them using DNA metabarcoding.
- Scientists amplified mitochondrial DNA of the 12S gene with vertebrate primers and used an alignment search tool to assign the resultant sequences to species. All taxonomically assigned sequences comprised greater than 1% of the reads for a sample.

Keywords DNA metabarcoding, HJ Andrews Experimental Forest, mortality, Oregon, *Spilogale gracilis*, *Strix varia*, Willamette National Forest

Images

RANK 1

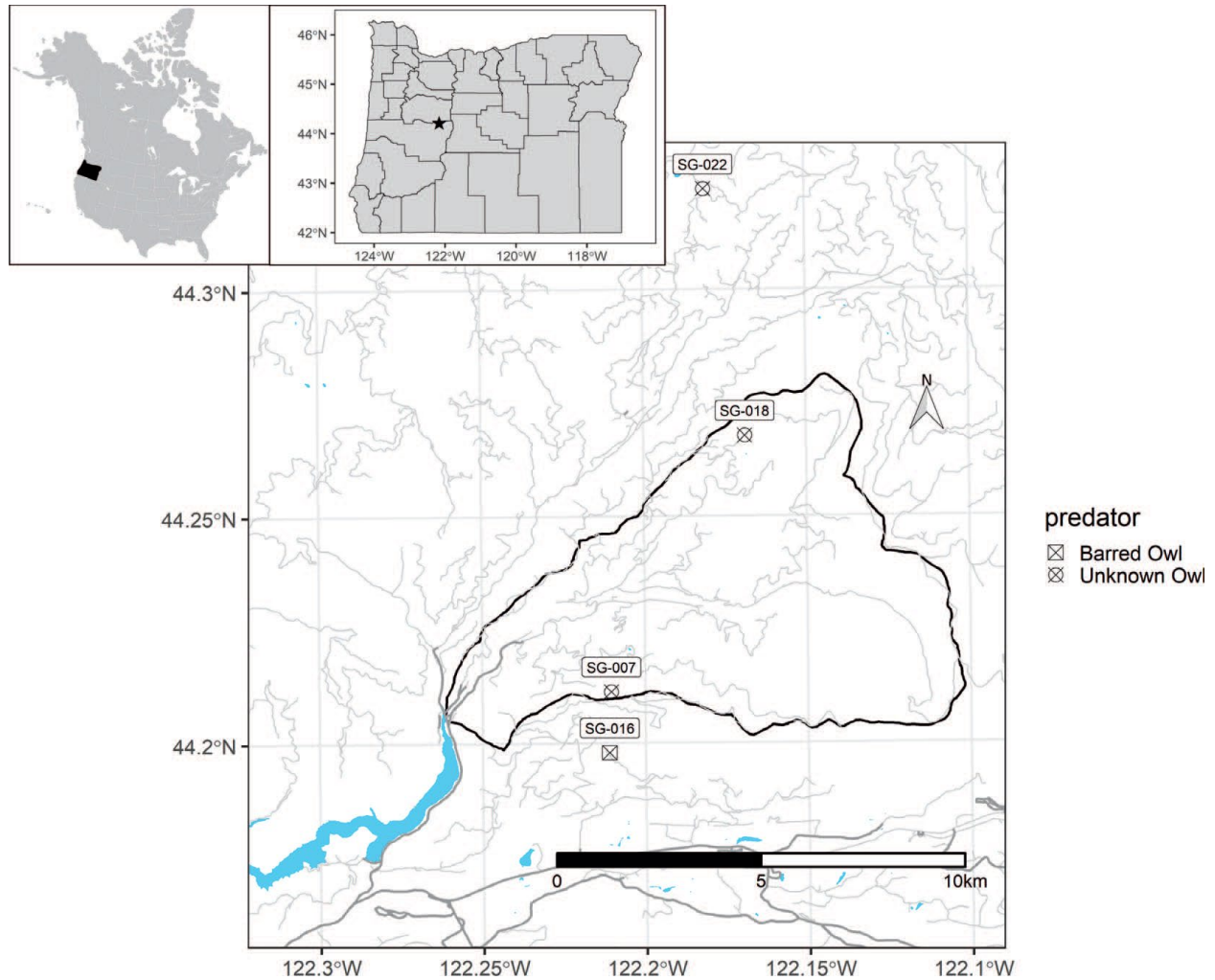


Figure 1 in Tosa et al. 2022. Study area located in the Willamette National Forest in western Oregon. Boundary of the HJ Andrews Experimental Forest shown in black lines. Roads are shown in grey lines, paved roads are shown in thicker grey lines. Radio-collar recovery locations of Western Spotted Skunk mortalities that were likely killed by owls shown with crosses. Confirmed Barred Owl predation represented by cross inside square.

RANK 2

Sample	Species	Sequence	Average number of reads
F38-164	<i>Spilogale gracilis</i>	TTAGCCGTAAACACAAACAATTAGTATAACAAAACCTG TTCGCCAGAGAACTACTAGCAACAGCCTGAAACTC AAAGGACTTGGCGGTGCTTTATATCCCT	65,636
	<i>Glaucomys oregonensis</i>	TTAGCCCTAAACACAAATATTTAACTAACAAAAATATT CGCCAGAGTACTACTAGCAATTGCTTAAAACTCAAA GGAAGTGGCGGTGCTTTATATCCCT	11,912
	<i>Strix varia</i>	CCGGCCCTAAATCCTGATATTCATCACCCTAGAACAT CCGCCAGGGTACTACGAGCACAAACGCTTAAAACC CTAAGGACTTGGCGGTGCCCCAAACCCAC	2950
F38-165	<i>Strix varia</i>	CCGGCCCTAAATCCTGATATTCATCACCCTAGAACAT CCGCCAGGGTACTACGAGCACAAACGCTTAAAACC CTAAGGACTTGGCGGTGCCCCAAACCCAC	8023
	<i>Neotamias townsendii</i>	TTAGCCCTAAACACAAATACTCAATAACAAGAGTAT TCGCCAGAGTACTACTAGCAATAGCCTAAAACCTCA AAGGACTTGGCGGTGCTTTACATCCCT	1161
	<i>Spilogale gracilis</i>	TTAGCCGTAAACACAAACAATTAGTATAACAAAACCTG TTCGCCAGAGAACTACTAGCAACAGCCTGAAACTC AAAGGACTTGGCGGTGCTTTATATCCCT	748

Table 1 in Tosa et al. 2022. Vertebrates identified through DNA metabarcoding of the 12S mitochondrial region from avian feces collected by detection dogs on 10 November 2018. Average number of reads is the mean number of identical sequences from the 3 replicates of each sample.

RANK 3

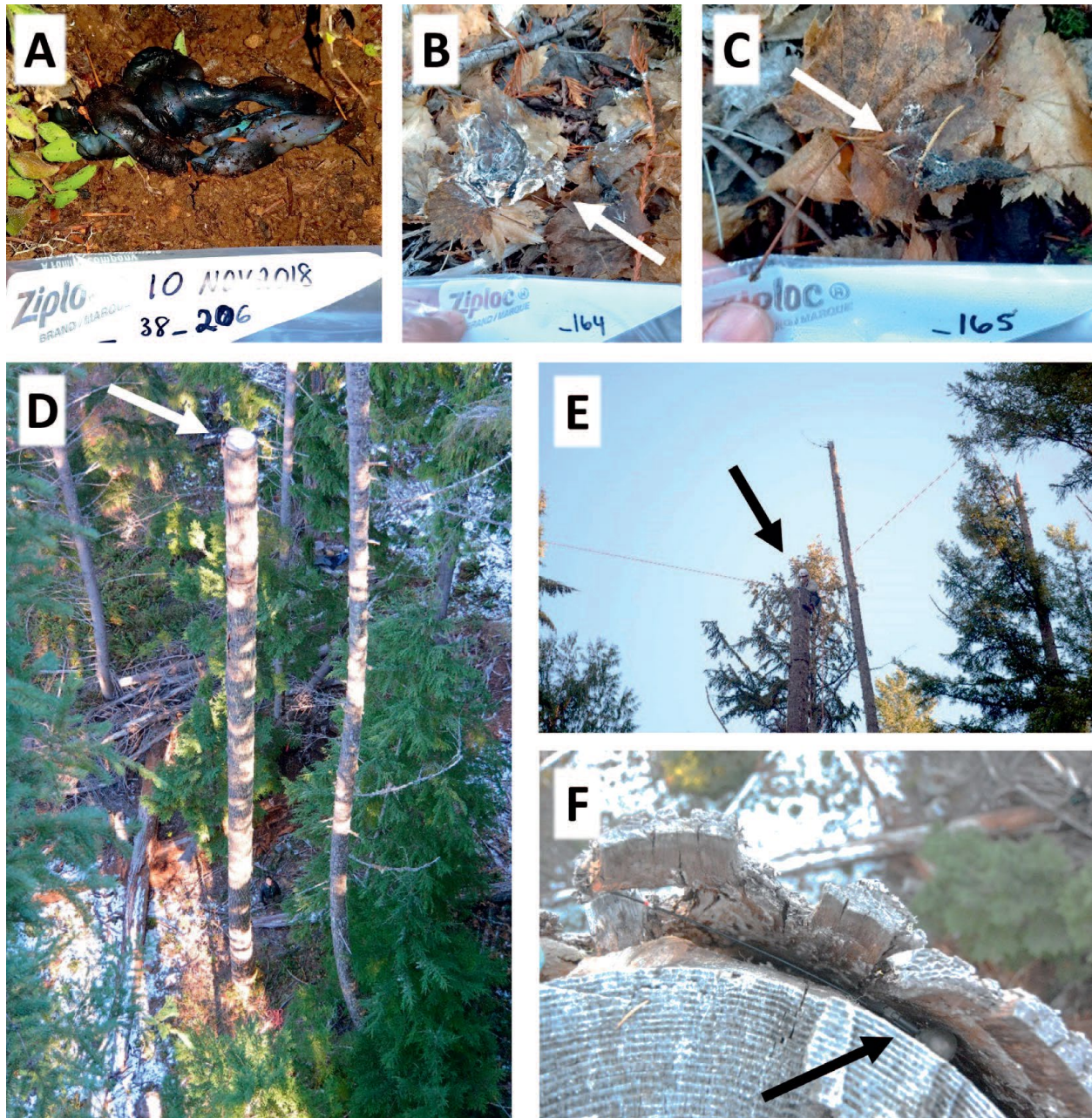


Figure 2 in Tosa et al. 2022. Evidence of Western Spotted Skunk predation. Evidence located by detection dogs near radio-collar recovery location on 10 November 2018: A) apparent Western Spotted Skunk intestines; B and C) avian predator feces. Recovery of Western Spotted Skunk radio-collar from snag on 05 December 2018: D) view of snag from above; E) view of collar retrieval from ground; and F) location of Western Spotted Skunk radio-collar, lodged inside bark on top of snag.