Habitat Use of Red Cornsnakes (*Pantherophis guttatus*) in the New Jersey Pine Barrens

Patricia H. Nguyen and Howard K. Reinert
Department of Biology, The College of New Jersey, PO Box 7718, Ewing, NJ 08628-0718

Abstract

The red cornsnake (*Pantherophis guttatus*) in the New Jersey Pine Barrens is thought to be facing an increasing risk of population decline due to forest changes and habitat fragmentation. *Pantherophis guttatus* is also prized in the international pet trade, resulting in increased illegal poaching in the region. To provide information to support conservation management programs, a multi-year study was conducted to examine the habitat preference of P. guttatus. From 2016 to 2019, 35 *P. guttatus* (18 female/17 male) were tracked using radio telemetry to assess habitat use. We measured 11 structural environmental variables at snake-selected sites and at comparative, randomly selected locations within the study area. Analysis of variance (ANOVA) indicated that male and female *P. guttatus* did not differ in their structural habitat use for any of the measured variables. However, both sexes differed from randomly selected locations for most of the measured habitat parameters. A principal components analysis (PCA) illustrated the similarity and broad overlap of the structural habitat used by males and females. This analysis also showed that snakes generally used habitat with a more open canopy and surface structure than the more heavily wooded habitat measured at random sites. PCA also illustrated that large fallen logs in open habitat were potentially important environmental features for these snakes.

Introduction

- **The red cornsnake (*Pantherophis guttatus*) in the New Jersey Pine Barrens is thought to be facing an increasing risk of population decline due to forest changes, habitat fragmentation, and illegal poaching in the international pet trade.**
- **To support its conservation, it is essential to study *P. guttatus* habitat selection behavior to protect the regions it inhabits.**

Methods

- **From 2016 to 2019, we examined the habitat use of 35 radio-tracked individuals (18 female/17 male) for 11 structural environmental variables.**
- **Principal components analysis (PCA) was performed to compare the overlap of the habitat gradient of the cornsnakes to the randomly available environment.**
- **An Analysis of Variance (ANOVA) was performed on the primary principal component scores for each group to assess differences in the orientation of snakes to the primary habitat gradients.**
- **A Tukey's a posteriori test was performed on the primary principal component scores to compare male and female cornsnakes against the randomly available environment.**

Figure 1. A radio-tracked cornsnake (*P. guttatus*)in selected habitat

Results

Figure 2.Results of a Principal Components Analysis for 11 structural environmental variables showing that female and male snakes used similar habitats that differed from the generally available habitat by having more open structure and a greater amount of fallen log cover .

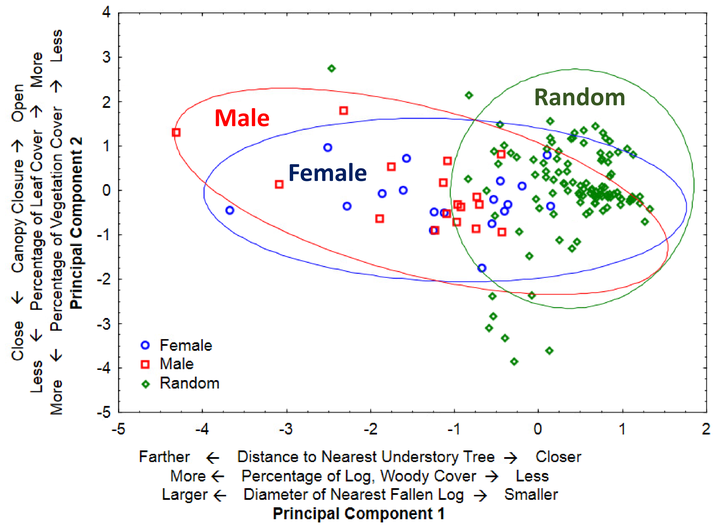

Table 1. Analysis of variance (ANOVA) results showing that snake habitat and random habitat differed only on the first principal component.

Principal Component 1

Effect	DF	SS	MS	F	p
Group	2	73.09	36.546	73.711	**<0.001**
Error	141	69.91	0.496		
Total	143	143			

Principal Component 2

Effect	DF	SS	MS	F	p
Group	2	0.98	0.491	0.487	0.615
Error	141	142.02	1.007		
Total	143	143			

Table 2. The results of Tukey's a posteriori test showing that male and female cornsnakes both differed from randomly available habitat but not from each other on the first principal component habitat gradient .

Group	Female	Male	Random
	-1.112	-1.398	0.40173
Female		0.461786	**0.000022**
Male	0.461786		**0.000022**
Random	**0.000022**	**0.000022**	

Results

Figure 3. Habitats available to *Pantherophis guttatus* in the New Jersey Pine Barrens.

A. Typical random habitat in the Pine Barrens.

B. Habitat preferred by cornsnakes.

Discussion

- **Protection of *P. guttatus* populations relies on conservation of open spaces that include those with ample leaf and log cover.**
- **These open spaces likely provide warmer habitats for shedding and nesting.**
- **Logs and leaf litter may provide shelter for concealment during foraging and ample availability of small mammals and birds, key diet items for red cornsnakes(Rush et al. 2014).**
- **Shedding, nesting, and foraging in areas away from dense forests is potentially a critical part of the habitat niche of *P. guttatus.***
- **Competition with other snake species may also play a role in the observed habitat preference of *P. guttatus* (Steen et al. 2014), but this factor has yet be examined.**

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