



Foraging Site Selection in Prairie Kingsnakes: An Experimental Examination

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Abstract

A critical component to a predator's survival is the choice of foraging sites that yield enough predatory success to meet energetic demands. To elucidate cues used to select foraging sites, we examined foraging site selection in prairie kingsnakes (*Lampropeltis c. calligaster*), a generalist species whose foraging mode is phenotypically plastic. Our objectives were to determine: the pattern of foraging site selection; the importance of certain cues that kingsnakes use when selecting foraging sites; and, whether or not kingsnakes adjust their foraging patterns in response to alterations in the microhabitat. We tested subjects in a large experimental arena under several treatment conditions that simulated various components of a natural habitat setting: presence/absence of chemical cues from prey; presence/absence of physical structure that could be used as either a shelter or ambush site; presence/absence of both chemical cues and physical structure. After subjects acclimated to treatment conditions where both chemical and physical cues were present, we also quantified changes in subject behavior in response to repositioned objects (i.e., interrupted chemical trails or altered ambush sites). Most snakes maintained an active foraging strategy under different treatment conditions, but our results indicate inter-individual variation in foraging behavior in similar microhabitats. Plasticity in foraging behavior appears to facilitate continued predatory success in kingsnakes, even when confronted with an altered microhabitat.

Introduction

- Predators must use reliable cues to find prey in order to survive.
- Snakes rely primarily on chemosensory information to detect their prey [1].
- Other cues (e.g., visual, tactile [2]) are also used, but less is known about their roles in snake foraging ecology.
- We examined the foraging strategies of Prairie kingsnakes (*Lampropeltis c. calligaster*) locating rodent prey under a variety of conditions.

Objectives

- To determine the importance of certain cues that Prairie kingsnakes use when selecting foraging sites.
- To determine if Prairie kingsnakes adjust their foraging pattern in response to alterations in the microhabitat.

Methods

- Adult snakes (n=5) were hand caught in Spring 2007 in Coles County, Illinois.
- Subjects were tested in a large experimental arena (200 x 200 x 75 cm; Fig. 1) under several treatment conditions.
- Treatments consisted of the arena set-up offering choices between control conditions and treated conditions that included: presence of chemical cues from prey; presence of physical structure that could be used as either a shelter or ambush site; presence of either chemical cues and/or physical structure.
- Wild-type mice were used to scent the substrate for 20 h in the treatments 3 - 5. Mice were dusted with fluorescent powder after 16 h to visualize movement patterns within the arena prior to the introduction of snake subject.
- The times that subjects spent performing different foraging behaviors were assessed via scan sampling [6].
- Transformed data from 2 replicates of all trials (n=50) were analyzed using multi-way ANOVA with Tukey's HSD post-hoc tests [3].



Fig. 1. Photos of different treatment conditions.

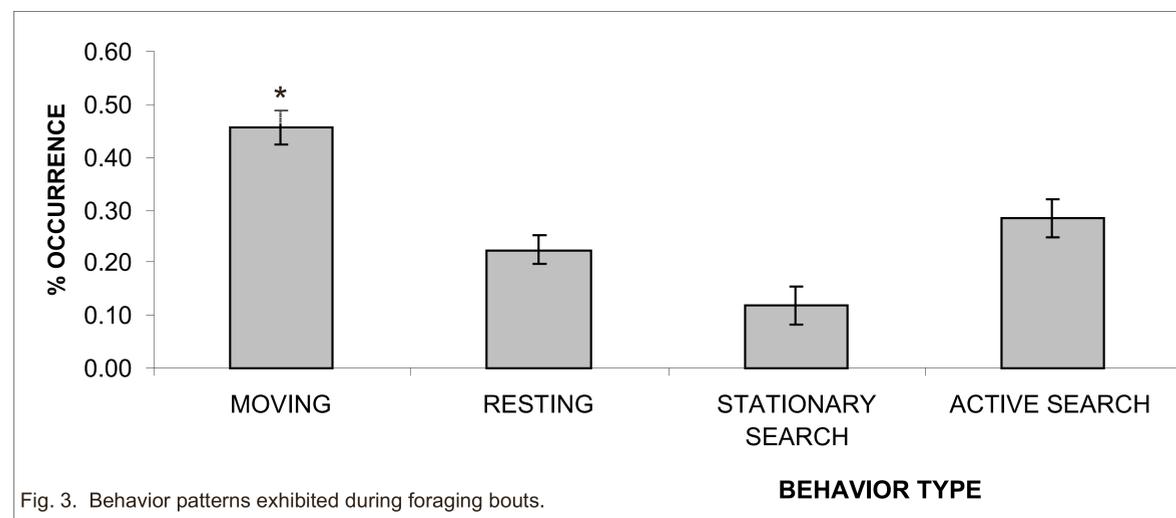


Fig. 3. Behavior patterns exhibited during foraging bouts.

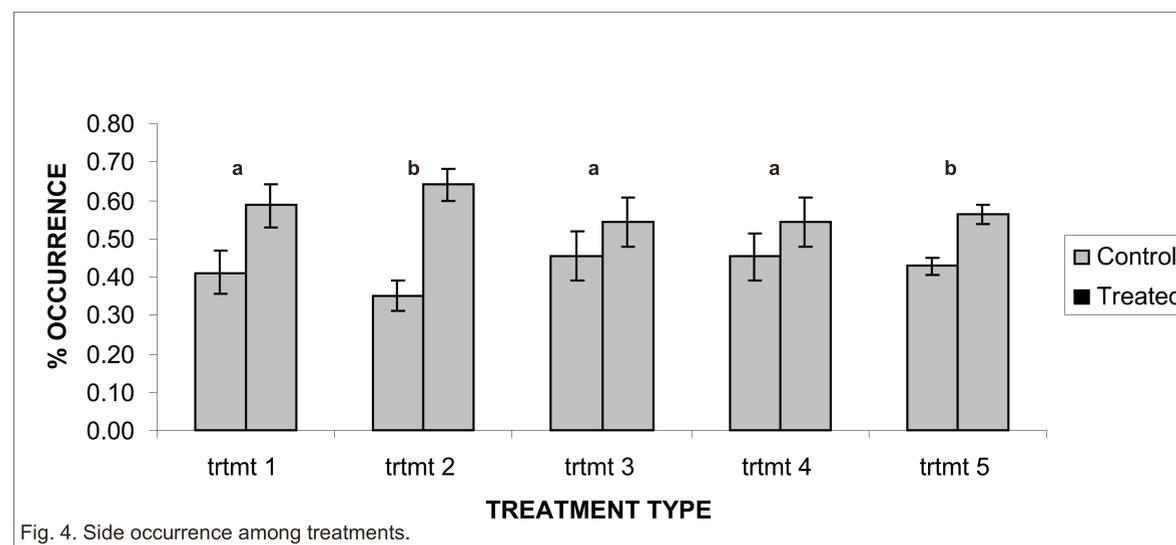


Fig. 4. Side occurrence among treatments.

Results

- Differences in any dependent variable as a function of gender ($F = 2.59$, $p = 0.21$) or replicate ($F = 0.49$, $p = 0.53$) were not apparent (no effect of experience).
- Snakes spent more time moving than performing other behaviors during foraging bouts ($F = 4.43$, $p = 0.04$; Fig. 2). Differences in foraging behaviors as a function of treatment were not apparent ($F = 0.66$, $p = 0.63$).
- Snakes preferred the treated side of the arena ($F = 5.67$, $p = 0.008$; Fig. 3), especially during treatments 2 and 5.
- Snakes tended to associate with the edge of the arena instead of the middle of the arena ($F = 7.30$, $p = 0.07$; Fig. 4).

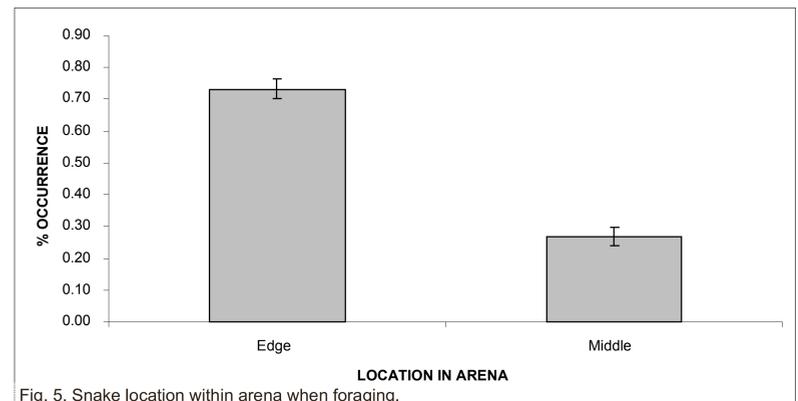


Fig. 5. Snake location within arena when foraging.

Discussion

- Male and female subjects appeared to exhibit foraging behaviors with similar frequency. Similarly, there was no effect of subject size on behavioral performance.
- Subjects tended to move frequently, consistent with an active foraging strategy [5,7].
- Prairie kingsnakes discriminated between the control side and the treated side of the arena, indicating that are using chemosensory information to locate rodent prey.
- Our findings are consistent with assessments of foraging ecology in other kingsnake species [4].

Literature Cited

- Burghardt, 1993, Brain Behav. Evol. 41:138-146.
- Burghardt & Denny, 1983, Z. Tierpsychol. 62:329-347.
- Dowdy & Wearden, 1991, Statistics for Research. Wiley & Sons, New York.
- Greene & Rodriguez-Robles, 2003, Copeia 2003:308-314.
- Mullin & Gutzke, 1999, Herpetologica 55:18-28.
- de Ruiter, 1986, Behaviour 98:240-258.
- Scharf et al., 2006, Am. Nat. 168:350-357.

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