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## Substrate and cover object choice by the Red-Backed Salamander (*Plethodon cinereus*)

Deciduous and coniferous forests differ in several characteristics such as microclimate (Cunnington et al. 2008), soil (Quideau et al. 1996; Scholes and Nowicki 1998), light (Nilsen 1985), and leaf litter (DeGraaf and Rudis 1990; Waldick et al. 1999). Such characteristics have the potential to influence the distribution and abundance of Red-backed Salamanders, *Plethodon cinereus* (e.g., DeGraaf and Yamasaki 2002; deMaynadier and Hunter 1998; Harper and Guynn 1999; Sugalski and Claussen 1997). Indeed, Red-backed Salamanders are frequently more common in forests made up of deciduous trees than forests with coniferous trees or pine plantations (e.g., DeGraaf and Rudis 1990; Harper and Guynn 1999; Pough et al. 1987; Waldick et al. 1999), but this does not always appear to be the case (e.g., Mathewson 2009). It may be that the observed distributions and relative abundances of Red-backed Salamanders in deciduous and coniferous forests may be the result of differences in population dynamics between habitats or behavioral responses to the habitats or both. Little is known about the behavioral responses of *P. cinereus* to deciduous and coniferous habitats. We conducted a field mesocosm experiment to examine whether *P. cinereus* behaviorally respond to deciduous and coniferous leaf litter habitats. We predicted that the salamanders would avoid the coniferous habitat and prefer the deciduous habitat. We also examined cover object and substrate choice.

Experimental arenas were constructed using plastic tubs (86 cm x 56 cm x 21 cm), each with soil and leaf litter collected from deciduous and coniferous forests found in the Denison University Biological Reserve (DUBR), Granville, Ohio. Each tub was divided in half with the soil and leaf litter of one habitat placed on one half, and the other habitat on the other half. Two cover objects, one made of wood (14.5 cm x 14.5 cm x 2 cm) and another of rock (concrete paver: 14.5 cm x 14.5 cm x 4 cm), were positioned in the middle of each half. Half of the arenas were placed under a deciduous canopy, while half were placed under a coniferous canopy. Salamanders were collected from under cover objects from throughout the DUBR and for each trial a single salamander was placed in the middle of the arena on the border of the substrates. After 60 minutes, we recorded their location in the arena (i.e., under the wood cover object, under the rock cover object, hidden in the leaf litter, or on the surface; and deciduous or coniferous habitat). Trials occurred during the afternoon to evening hours during late April and early May 2006. No salamander was used in > 1 trial. We used chi-square tests to compare salamander choices among habitat types and among microhabitat types.

The salamanders sampled did not prefer either substrate when canopies were pooled (Table 1;  $\chi^2_1 = 1.58$ ,  $P = 0.21$ ). When each canopy treatment was examined individually, we again found no significant preferences (Table 1; Deciduous canopy:  $\chi^2_1 = 0.25$ ,  $P = 0.62$ ; Coniferous canopy:  $\chi^2_1 = 1.67$ ,  $P = 0.20$ ). Salamanders showed clear preferences for particular cover objects, with more salamanders being found under leaf litter or the wood cover object, and only a very few being found under the rock cover object or on the surface (in leaf litter: 17, under wood cover object: 12, under rock cover object: 1, on surface: 1;  $\chi^2_3 = 25.13$ ,  $P = < 0.0001$ ).

In our experiment, Red-backed Salamanders showed no preference or avoidance for either deciduous or coniferous leaf litter, although there was a slight tendency to use the deciduous leaf litter more. These results do not support our hypothesis that the salamanders would avoid the coniferous litter. Our results suggest that the distribution and abundance of Red-backed Salaman-

ders in deciduous and coniferous forests may not be the results of behavioral responses. However, it may be that the results reflect the timing of our observations. Due to logistic constraints, we conducted our observations during the day and did not allow the salamanders to spend the night in the experimental arenas. Since Red-backed Salamanders are primarily active on the surface at night (Petraska 1998), their primary behavioral response might have been to find cover, regardless of the habitat type, as is suggested by the high proportion of salamanders found under the wood cover object and in the leaf litter.

**Table 1.** Choice of deciduous or coniferous habitats by *Plethodon cinereus* in the experimental arenas.

	<b>Deciduous</b>	<b>Coniferous</b>
Pooled	19	12
Under Coniferous Canopy	10	5
Under Deciduous Canopy	9	7

Our results also showed that Red-backed Salamanders strongly preferred the wood cover objects to the rock cover objects. Our results contrast with the observations made by Richmond and Trombulak (2009) that more Red-backed Salamanders are found under rocks than woody cover objects. However, our results are consistent with the several studies that have found a positive relationship between coarse woody debris and salamander abundance (e.g., Hicks and Pearson, 2003; Morneault et al., 2004; Waldick et al., 1999; Young and Yahner, 2003).

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