

Note

The use of an anthropogenic structure by Eastern Red-backed Salamander (*Plethodon cinereus*)

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Abstract

Eastern Red-backed Salamanders (*Plethodon cinereus*) are abundant in much of eastern North America. Although they typically live on the forest floor, individuals may venture off the ground while foraging. An adult salamander was observed using a backcountry privy as cover; after being displaced, it returned to the original location within 9 h. Furthermore, the salamander scaled a 50-cm vertical height to return to that location. The salamander may have been using the privy as part of its territory and feeding on flies attracted by the faecal matter inside.

Key words: Eastern Red-backed Salamander; *Plethodon cinereus*; homing; climbing; foraging; territoriality; Algonquin Provincial Park; Ontario

Lungless salamanders (Plethodontidae) are a diverse group of small forest- and stream-dwelling salamanders (Petranka 1998). Most species are strongly associated with forest floor habitats and cover, such as rocks and woody debris. Cover provides foraging opportunities and moist refuges that prevent evaporative water loss from the body (Spotila 1972; Jaeger 1980; Feder and Londos 1984).

Eastern Red-backed Salamander (*Plethodon cinereus*) is a common salamander in eastern North America and has been the subject of numerous ecological studies (reviewed by Petranka 1998 and Anthony and Pflugsten 2013). Jaeger *et al.* (1993) note its homing behaviour after being displaced, and many authors have documented its ability to climb (Jaeger 1978; reviewed in McEntire 2016). Here, I present an observation of a single Eastern Red-backed Salamander that used artificial cover, quickly returned to the location after being displaced, and climbed a vertical wooden surface to do so.

On the morning of 15 July 2017, I arrived on a small island in McCraney Lake, Algonquin Provincial Park, McCraney Township, Ontario (45°33'N, 78°61'W) to camp for the night. The maximum daily air temperature was 26°C (minimum 14°C, mean 20°C). Of the 15 days leading up to the observation, precipitation fell on 10 days for a total of 55.6 mm, recorded at the weather station located at the East Gate of Algonquin Provincial Park (near Whitney, Ontario), ~50 km away (Environment Canada 2017). After inspecting the campsite, I proceeded to locate the privy, about 20 m away. At 1130 I lifted the lid and observed an adult Eastern Red-backed Salamander sheltering under the lid where the wood was in close contact with the seat. I moved the salamander to the forest floor, 1.5 m away. The following morning, at 0840, I returned to the privy to find that the salamander had returned to its exact original location.

The salamander was an adult, of the red-striped morph (Figure 1). I did not measure the snout-to-vent length or determine sex. I compared photos of the salamander from both days and used the pattern of small white head spots and markings on the tail to confirm that it was the same individual. Several slugs (*Dusky Arion*, *Arion subfuscus/fuscus* (Draparnaud, 1805)) and many flies were also found under the privy lid.

An Algonquin Provincial Park backcountry privy measures 82.5 cm (length) by 61 cm (width) by 51 cm (height), and has a hinged lid to allow the user to open and close it. The privy is constructed of Eastern White Cedar (*Thuja occidentalis* L.). Park maintenance crews inspect and repair privies regularly, and this unit was in good condition. No vegetation, sticks, or branches were touching the privy and, therefore, not aiding the salamander's climb.

Eastern Red-backed Salamanders have a relatively small home area, typically 0.16–0.33 m² (Petranka 1998). In addition, they have a well-developed homing ability; when moved distances of 30 m most individuals are able to return, some even over distances of 90 m (Jaeger *et al.* 1993). Therefore, it is not surprising that the salamander was able to quickly (within 9 h, and presumably less time, if activity is largely nocturnal) find its way back to its shelter; however, it also had to climb the vertical surface (51 cm) of the exterior of the privy.

Many lungless salamanders can make use of arboreal habitats and will climb vegetation and rock faces (McEntire 2016). Opportunistically, arboreal species, such as Eastern Red-backed Salamander, climb vegetation for several reasons. For example, Eastern Red-backed Salamanders that climbed vegetation had more food and larger prey items in their stomachs compared with those found foraging on the ground, suggesting

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FIGURE 1. a. Algonquin Provincial Park backcountry privy with open lid. Note the Eastern Red-backed Salamander (*Plethodon cinereus*) found under the lid (arrow) returned to this location, after being moved the previous day. b. Close-up of *P. cinereus* as found. The salamander was taking cover under the lid and possibly feeding on the abundance of small flies. 15 July 2017, Algonquin Provincial Park, Ontario. Photos: D. LeGros.

that climbing offers better foraging opportunities (Jaeger 1978). Salamanders may also climb vegetation to reduce predation risk or avoid dominant conspecifics on the ground (Roberts and Liebgold 2008). Although the extent of arboreal habitat use by temperate plethodontid salamanders is not well known, a growing body of work suggests that many species are using vertical habitats, such as plants, trees, and rock faces, more often than previously thought (McEntire 2016). Arboreal activity, like surface activity, in lungless salamanders is linked with wet conditions (LeGros 2013; McEntire 2016). Although the list of species and types of climbing continues to grow, little information is available regarding salamanders climbing human-made structures.

Adult Eastern Red-backed Salamanders are highly territorial and will aggressively defend territories from conspecifics to maintain access to quality food sources and mates (Jaeger 1982a; Jaeger and Forester 1993; Mathis *et al.* 1995; Petranka 1998). As the salamander in this observation was found under the privy lid during the day and quickly returned after being displaced, it likely included this cover as part of its territory (Mathis *et al.* 1995).

This observation is unique because the salamander established a territory 50 cm above ground, under artificial cover, which may have provided regular access to prey. An abundance of small flies emerged from the opened lid of the privy, most likely attracted to the human faecal matter contained inside. Although none of the flies was collected or identified, they were small and easily consumed by salamanders.

Dipterans are consumed by Eastern Red-backed Salamanders (Petranka 1998) and may make up as much as 10% of the diet of wild individuals (Jaeger unpubl. data, as cited in Jaeger and Barnard 1981). Eastern Red-backed Salamanders are capable of assessing prey quality and density and learn to forage optimally. In the laboratory, salamanders will use different foraging strategies when presented with low and high densities of two species of flies: for example, specializing in larger flies and ambushing them, rather than indiscriminately pursuing smaller flies (Jaeger and Barnard 1981; Jaeger *et al.* 1982b). Although it appears possible for Eastern Red-backed Salamanders to learn to take advantage of prey in high densities, they are not efficient patch foragers (Hill *et al.* 1982). Structurally simple environments with few obstacles and cover, such as the seat surface of the privy, improve the ability

of the salamander to locate prey (Jaeger and Barnard 1981).

Although plethodontid diversity may be high in some regions of Appalachia, in central Ontario, Eastern Red-backed Salamander is the only representative of its genus (Petranka 1998). The lack of species diversity may allow this salamander the opportunity to expand its ecological niche in this region. In addition, the presence of privies throughout Algonquin and other provincial parks that offer backcountry camping opportunities may serve as an unintentional resource that concentrates invertebrate prey that feed on randomly distributed resources like dung. There are approximately 1900 similar privies located throughout Algonquin Provincial Park. According to several backcountry staff, who have checked thousands of privies over a span of many years, none has ever noted a salamander under the lid (three Algonquin Provincial Park staff members pers. comm. 11 November 2017). Although Eastern Red-backed Salamanders will defend a territory to access prey and mates, if the cover object is disturbed frequently, they may abandon the territory (Marsh and Goicochea 2003); thus, it is likely that salamanders do not occupy privies at regularly used campsites. Despite the lack of observations, privies could be a significant source of concentrated foraging opportunities for salamanders and other predators of insects.

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