NORTHWESTERN NATURALIST 82:123–125 WINTER 2001

COURTSHIP BEHAVIOR OF THE WESTERN RED-BACKED SALAMANDER

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Key words: western red-backed salamander, *Plethodon vehiculum*, courtship, behavior, reproduction

The courtship behavior of the western red-backed salamander (*Plethodon vehiculum*) has not been described, but Petranka (1998) suggested that it includes a tail-straddling walk typical of other plethodontid salamanders. Here, we provide the 1st descriptions of courtship of this species in nature, augmented by observations in laboratory enclosures. Our 1st field observation occurred at 2158 hr on 24 September 1998, when one of us (LLCJ) observed courtship near an unnamed tributary of Matheny Creek in Jefferson County, Washington, about 17 km NW of Quinault. Two *P. vehiculum* were atop a large (diameter >50 cm), well-decayed, moss-covered log, 2 m upslope of the stream. When first sighted, a large individual (presumably female) was straddling the tail of a smaller male (presumably). The salamanders were axially aligned and facing the same direction, with the female's head about 1 cm behind the male's hind legs. Periodically, the male's tail swayed several mm both vertically and horizontally. The pair progressed slowly forward for about 0.5 m. At 2207 hr the pair crawled off the log and disappeared into woody debris and forest-floor vegetation. The observation was made on the 2nd rainy night following an exceptionally dry summer. Air temperature at 2000 hr was 16°C. Two other *P. vehiculum* and 1 Van Dyke's salamander (*P. vandykei*) were <1 m from the pair when first discovered, but there was no indication of sexual interference or other behavioral interactions (Arnold 1977; Gergits and Jaeger 1990).

The 2nd observation occurred on a wet night between 2100 hr and 2200 hr on 4 November 1990 when one of us (KO) saw a pair of *P. vehiculum* in a tail-straddling walk on the forest floor near a creek-bed about 15 km SW of Raymond, Pacific County, Washington. The female straddled the male's tail, with her snout pressed against his elevated tail-base. The pair walked a straight-line distance of about 1 m (and over the observer's boots) before being lost from sight in leaf litter. On the same night another male *P. vehiculum* was undulating his elevated tail in front of a female.

One of us (KO) has observed males performing tail-undulations near females many times in the laboratory. The undulations were produced by a circular motion of the male's raised tail-base while his rear end was raised. Typically, the male's trunk also swayed regularly up and down in concert with the tail undulations, and the hind feet were lifted off the ground, 1 after the other, and placed back down as in slow-motion. We believe the males were attempting to entice females to court. Behaviors by males that preceded tail-undulations included biting the female and sliding the snout along the female's back and flanks (Ovaska 1987).

We did not observe spermatophore transfer in nature, but one of us (KO) observed this behavior in an indoor enclosure (dimensions: 175 cm × 103 cm) on 21 October 1985. Spermatophore transfer occurred after a tail-straddling walk that lasted ≥65 min, during which the pair moved about 2.5 times the length of the enclosure. The male did not turn toward the female at any time during the walk, but slowed down or stopped if the female lagged behind or lost contact with his tail-base. After he deposited a spermatophore, the male stopped, pulled his elevated tail to 1 side at about a 90° angle, and remained motionless. The female approached slowly and stopped momentarily just behind the male. She then turned around and moved rapidly away. Upon examination, a spermatophore cap was lodged in her cloaca. The male remained motionless, with his tail raised for several more minutes.

On Vancouver Island, the mating season of *P. vehiculum* is primarily in the fall, based on ob-

servations of females with spermatophore caps protruding from their vent (Ovaska and Gregory 1989); in the central Oregon Coast Range, females can be found with spermatophores from fall to spring, with a peak in winter (Peacock and Nussbaum 1973). Individual females are capable of mating (defined as courtship leading to spermatophore transfer) many times within 1 mating season (Ovaska 1987). In the laboratory, of the 8 females that were paired with males and were inseminated, 3 mated twice and 2 mated 3 times within about a month; the remaining 3 females mated only once. The mean (±SD) number of days between matings of individual females was 5.7 ± 3.5 days (Ovaska 1987).

Although courtship has not been reported for many plethodontids, the tail-straddling walk has been documented in several genera and seems to be restricted to the family Plethodontidae (Arnold 1977). Further, Arnold (1977) suggested that the walk is an obligatory precursor to sperm transfer for all plethodontids, resulting in the proper alignment of the male and female for this mode of fertilization. Therefore, it is not surprising that this behavior also occurs in *P. vehiculum.* In addition to the tail-straddling walk, many plethodontids exhibit an array of courtship behaviors in the initial phases of the male's display, such as a ''foot dance'' (Organ 1958) or snout-to-snout contact (Lynch and Wallace 1987). Apart from tail-undulations, we observed surprisingly little display behavior by courting males or physical contact between the male and female in *P. vehiculum.*

In many species, male plethodontids have mechanisms, such as ''snapping'' and ''pulling'', for delivering pheromones from the mental gland to the female (Arnold 1977). The courtship pheromones are thought to increase the female's receptiveness and accelerate the courtship process (Houck and others 1998; Rollman and others 1999). Male plethodontids may use enlarged premaxillary teeth to deliver the pheromones into the female's bloodstream (Houck and Sever 1994). Although *P. vehiculum* has recurved premaxillary teeth, we did not observe a distinct pheromone delivery behavior in nature or the laboratory, although sliding of the male's snout and chin over the female's body during the initial stages of courtship might have delivered mental gland secretions.

The courtship behavior of *P. vehiculum* merits a more detailed investigation, particularly its initial phases and courtship pheromone delivery method. In fact, courtship is unreported for any species of western *Plethodon,* with the exception of *P. idahoensis* (Lynch and Wallace 1987; Petranka 1998). Detailed observations of courtship in *P. vehiculum* and other western species would help us understand the nature and evolution of courtship patterns of plethodontids in the Pacific Northwest and how these patterns compare with species from other regions.

Acknowledgments

We thank K. Aubry and M. Hayes for reviewing an earlier draft of the manuscript. J. Jones provided editorial assistance. Financial support was provided by the Pacific Northwest Research Station.

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NORTHWESTERN NATURALIST 82:125–126 WINTER 2001

OCCURRENCES OF THE WESTERN SKINK (*EUMECES SKILTONIANUS*) IN GRASSLANDS OF WESTERN MONTANA

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Key Words: *Eumeces skiltonianus*, western skink, Montana, Lolo National Forest, Calf Creek Wildlife Management Area, distribution, records

The western skink (*Eumeces skiltonianus*) was recently classified as a Montana Species of Special Concern due to its restricted range in the state (D. P. Hendricks, Montana Natural Heritage Program, Helena, MT, pers. comm.). Records of the western skink in Montana are limited to a few, scattered locations on the western edge of the state (Tanner 1988; Reichel and Flath 1995). Skinks have been documented in the Bitterroot Valley in Ravalli County (Rodgers and Jellison 1942) and on the Kootenai National Forest in Lincoln County (Werner and others 1998). In addition, there have been unconfirmed reports of their presence on islands of Flathead Lake in Lake County (Franz 1971), and Werner and others (1998) discuss unconfirmed records from the Flathead Indian Reservation within Lake and Missoula counties. We caught 65 skinks in pitfall traps at 8 grassland sites within Missoula, Mineral, and Ravalli counties in west-central Montana during a study of arthropod and small mammal communities. Except for 2 individuals, skinks died in traps and were collected, and species identification was confirmed in the lab (P. S. Corn, US Geological Survey, Missoula, MT, pers. comm.). These records represent a significant addition to information on the western skink in Montana, confirming their presence in Missoula County, documenting their occurrence in Mineral County, adding locations to Ravalli County, and providing evidence of local abundance within some grasslands.

During 116,480 trap nights tallied May through September in 1999 and 2000, we captured 59 skinks at 6 of 8 study sites located within the Lolo National Forest. Each site consisted of four 250-m transects, 50 m apart, with a total of 52 pitfall traps spaced at 20-m intervals. We caught 8 skinks at a site approximately 4.8 km SW of Clinton in Missoula County (T12N R17W S19SE) which represents the eastern-most record reported for the state. At 3 sites approximately 6.4 km SE of Alberton in Missoula County, we caught 48 skinks (1, 19, and 28 skinks, respectively, from T14N R22W S16NE, S20NW, and S30NE). In Mineral County approximately 4 km NE of Alberton, we captured 3 skinks at 2 sites (1 and 2 skinks, respectively, at T15N R22W S31SE and S31SW). The above study sites are classified as *Agropyron spicatum-Poa sandbergii* grasslands (Mueggler and Stewart 1980) and occurred on southwest aspects at elevations between 1310 and 1707 m. These were steep, rocky slopes (aver-