

## **An Erythristic Morph of Red-backed Salamander (*Plethodon cinereus*) Collected in Virginia**

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### **ABSTRACT**

Eight different color polymorphisms of the Red-backed Salamander (*Plethodon cinereus*) have been described throughout its range. Among them, the erythristic phenotype is a mimetic morph with coloration patterns similar to that of toxic Eastern Newt efts (*Notophthalmus viridescens*). We describe an erythristic morph of *P. cinereus* collected at Mountain Lake Biological Station, Virginia. To our knowledge, there are no prior published records of this morph in Virginia.

**Key words:** *Plethodon cinereus*, *Notophthalmus viridescens*, erythristic

The Red-Backed Salamander (*Plethodon cinereus*) is widely distributed throughout eastern North America, with a range reaching as far south as North Carolina and north into Maine and parts of Canada (Mitchell and Gibbons 2010). These terrestrial plethodontids most commonly occur in populations with two distinct phenotypic morphs: red-backed and lead-backed phases. The body of both phases is characterized as dark gray to black with white flecking, and the ventral surface is black with very small white spots. The red-backed phase is differentiated from the lead-backed by a broad, straight-edged stripe down the dorsal surface from snout to tail. This stripe can occur in orange, yellow, or red coloration. Although these two morphs are exceedingly predominant in Red-backed Salamander populations, a total of eight color polymorphisms has been described throughout its range (Moore and Ouellet 2014). The other six polymorphisms are albino, amelanistic, erythristic, iridistic, leucistic, and melanistic. The six rare morphs are reported mostly in the mid-north part of the species range.

The erythristic morph is characterized by a reddish-orange body lacking a defined stripe, with black mottling in varying degrees along the sides and dorsum. The coloration is similar to that of Eastern Newt efts (*Notophthalmus viridescens*), which contains small amounts of tetrodotoxin, a neurotoxin secreted from the skin (Brodie 1968). Although Lotter (1975) found no correlation between occurrence of erythristic morphs and number of efts in various localities in the northeastern United States, it has been hypothesized that the polymorphism is a form of Batesian mimicry (Lotter and Scott 1977). Among the rare color patterns, only this morph has

been demonstrated to be an adaptive color polymorphism. This notion was supported in a study by Brodie and Brodie (1980) in which *N. viridescens* efts, Allegheny Mountain Dusky Salamanders (*Desmognathus ochrophaeus*), and both red-backed and erythristic morphs were exposed to avian predators. Survival in eft newts was the highest, but survival in the erythristic morphs was significantly higher than that of Red-backed morphs and *D. ochrophaeus*. Currently, erythristic morphs are known from 10 states, the two most southern being Ohio and Maryland.

On 15 May 2017 we discovered an erythristic morph of a red-backed salamander at Mountain Lake Biological Station, Virginia. It was under a small decomposing log with mostly dry substrate on a north-facing slope approximately 50 m west of Spring Trail. Other terrestrial salamander species found within 100 m included Eastern Newt efts (*Notophthalmus viridescens*), Northern slimy salamanders (*Plethodon glutinosus*), and Gray-cheeked salamanders (*Plethodon montanus*), as well as both red-backed and lead-backed morphs of *P. cinereus*.

The erythristic morph was an adult male with a total length of 65 mm. The dorsum was solid red-orange with some black mottling (Figure 1). The erythristic coloration also covered the head and extended down the sides, becoming more broken towards the venter. The proximal portions of all four limbs were the same color as the dorsum until the first joint, after which they were mostly black. The red-orange coloration extended down the dorsal surface of the tail, with the sides and ventral surface of the tail being mostly black.



**Figure 1.** *Plethodon cinereus* from Mountain Lake Biological Station, Virginia, with erythristic phenotype.

To our knowledge, this is the first time that an erythristic morph of a red-backed salamander has been recorded in Virginia. Furthermore, this morph has never been reported south of Maryland (Moore and Ouellet 2014). Mitchell et al. (2003) described a red-backed salamander with an unusual color phenotype in northern Virginia, but the authors do not describe it as erythristic in the report. The authors also cited a personal communication with E. Lanham, who claimed to have observed an erythristic morph on Mountain Lake property in 2002. However, the salamander was not described or photographed. While the morph is most common in cooler climates of glaciated areas in the northeastern United States, Pauley et al. (2001) reported a population in Pennsylvania consisting of 47.4% erythristic morphs. The authors speculated that the high elevation and low air temperatures at the location might explain the occurrence and high frequency. Given that the elevation at Mountain Lake Biological Station exceeds 1,200 m, it is a likely habitat in Virginia to find a morph that is more typical of a northern location.

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