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# Eurycea longicauda (Long-tailed Salamander). Color Aberration.

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# NATURAL HISTORY NOTES

## CAUDATA — SALAMANDERS

**EURYCEA BISLINEATA (Northern Two-lined Salamander).** **NEST GUARDING.** On 21 April 2017, we discovered two nests belonging to *Eurycea bislineata* in streams adjacent to Eastern Kentucky University's Lilley Cornett Woods Appalachian Ecological Research Station in Letcher County, Kentucky, USA. The first nest was located on the underside of a submerged rock in Island Branch (37.08632°N, 82.98456°W, WGS 84). It contained 38 eggs and was attended by a single male (SVL = 47.27 mm; 1.2 g) (Fig. 1). The second nest was on the underside of a submerged rock in Whitaker Branch (37.08876°N, 82.99012°W, WGS 84). It contained 47 eggs and was attended by a female (SVL = 45.81 mm; 1.6 g) and a male (SVL = 48.66 mm; 1.8 g) (Fig. 2).

PHOTO BY JACOB M. HUTTON



FIG. 1. Male Northern Two-lined Salamander (*Eurycea bislineata*) with a nest.

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FIG. 2. Female (left) and male (right) Northern Two-lined Salamanders (*Eurycea bislineata*) with a nest.

Attendance of nests by females is commonly observed in members of the *E. bislineata* species complex, but published observations of males with nests are thus far limited to *E. junaluska* and *E. aquatica* (Bruce 1982. *Copeia* 1982:755–762; Graham et al. 2010. *IRCF* 17:168–172). Although the species observed here is traditionally classified as *E. cirrigera*, molecular phylogenetic data suggest that this name is inappropriate (see 'Lineage D' in Kozak et al. 2006. *Mol. Ecol.* 15:191–207; Pierson et al., unpubl. data). Instead, we refer to them conservatively as *E. bislineata*. To the best of our knowledge, these observations represent the first evidence of nest attendance by males in this species and suggest that the behavior might be more widespread in the *E. bislineata* species complex.

We thank Rebecca Leloudis for field assistance. This field research was conducted with permission of the Department of Natural Areas (DKFWR Permit # SC1611150).

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**EURYCEA LONGICAUDA (Long-tailed Salamander).** **COLOR ABERRATION.** *Eurycea longicauda* patterning is typically characterized by black spotting across the dorsum of the body, and can vary in spot size, number, and presence on the head and tail (Behler and King 1979. *The Audubon Society Field Guide to North American Reptiles and Amphibians*. Alfred A. Knopf, Inc., New York. 744 pp.). Two dorsolateral lines of spotting are present, generally consisting of larger spots that form a broken line across the body, and extend to cover the lateral sides of the tail as chevrons (Behler and King 1979, *op. cit.*). The lateral region of the body and limbs are covered by heterogeneously sized spots, but are often small (Behler and King 1979, *op. cit.*).

We observed and photographed an adult female *E. longicauda* at 2137 h on 4 May 2016 in Huntingdon County, Pennsylvania, USA (40.538408°N, 77.882875°W; WGS 84) with an aberrant pattern (Fig. 1). The specimen was discovered as it crossed a public road (State Rt. 1005) through mature deciduous forest during a light rain. The individual lacked dorsal spotting and distinct dorsolateral lines or spotting. Further, the individual lacked lateral and limb spotting, but black flecking was present across both; the toes are particularly well pigmented and black. As the pattern progressed posteriorly it began to form small bands, which developed into light and poorly developed chevrons with flecking between each chevron. While melanin-based dorsal patterning appeared to be greatly reduced, the underlying skin coloration (yellow-orange) seemed typical. One previous report on aberrant coloration in *E. longicauda* described an individual that was 45.9% unpatterned, particularly lacking on the lateral sides, hind limbs, and the anterior region of the tail (McCallum et



FIG. 1. Adult female *Eurycea longicauda* with an aberrant pattern found in Huntingdon County, Pennsylvania, USA.

al. 2008. *Herpetol. Rev.* 39:334). To our knowledge, this aberrant pattern we describe here has not been previously reported in *E. longicauda*, and appears to be rare.

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**EURYCEA LUCIFUGA (Cave Salamander). COLORATION.**

*Eurycea lucifuga* is characterized by its bright orange dorsum flecked with random black spots (Fig. 1A). The function of this particular pattern in this species is unknown, but may be related to aposematic coloration or mimicry. Aberrations of this typical pattern in *E. lucifuga* include leucism (Smith 1985. *Herpetol. Rev.* 16:78) and a condition known as piebald (Neff et al. 2015. *Herpetol. Notes* 8:599–601), in which pigmentation is absent in some areas. This results in individuals having random patches of light gray/white skin interspersed with the typical orange with black spot pattern. An additional color morph, previously undocumented to our knowledge, is found in individuals with the characteristic bright orange dorsum that lack the black spot pattern (Fig. 1B). Four individuals with this ‘spotless’ morph have been observed in Sauerkraut Cave (a.k.a. Tom Sawyer, Central State, or Lakeside Cave) in E.P. “Tom” Sawyer State Park, Jefferson County, Kentucky, USA (exact location withheld to reduce potential disturbance and/or vandalism to the cave). The ‘spotless’ morph is relatively rare in our study population, representing only four out of 1092 individuals, or 0.4% of the population. We are confident that these are in fact *E. lucifuga* individuals because morphologically they look the same, the orange coloration is present on the dorsum, and no other species of similar looking salamanders, e.g., *Eurycea longicauda* (Long-tailed Salamander), have been found in or around this cave over the course of 23 months (March 2015–February 2017) during a study on *E. lucifuga*. The only other species of salamander that have been found in this cave are the Zig-zag Salamander (*Plethodon dorsalis*) and the Streamside Salamander (*Ambystoma barbouri*), both of which occur in very low numbers (<10 individuals have been observed) and are easily distinguished from *E. lucifuga*.

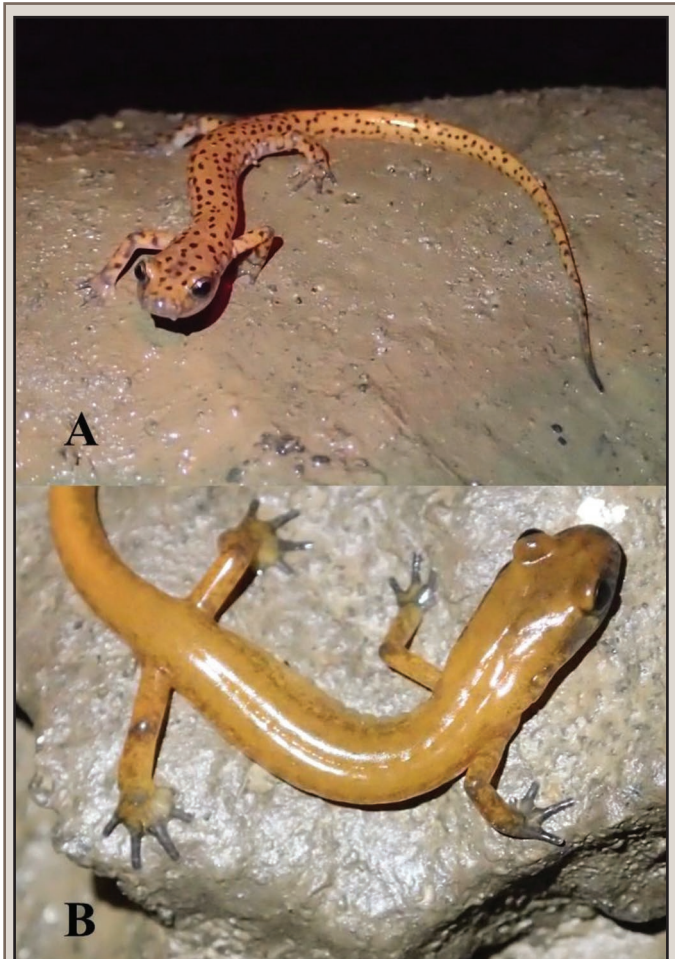


FIG. 1. Two *Eurycea lucifuga* individuals from a cave in Kentucky, USA. A) Typical color and pattern; B) ‘Spotless’ individual.

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**NOTOPHTHALMUS MERIDIONALIS (Black-spotted Newt).**

**HABITAT USE.** Subterranean microhabitat use has been well documented in amphibians including certain salamander species (*Plethodon cinereus*, Jaeger et al. 1986. *Anim. Behav.* 34:860–864; *Ambystoma californiense*, Loredo et al. 1996. *J. Herpetol.* 30:282–285). Notably, a field study tracking *Notophthalmus viridescens* (which occurs in more mesic environments) with fluorescent powder did not find adults or juveniles using underground microhabitats such as fissures or burrows (Roe and Grayson 2008. *J. Herpetol.* 42:22–30). *Notophthalmus v. louisianensis* individuals have been found in karst environments, although these instances are considered accidental (Myers 1958. *Herpetologica* 14:35–36; Briggler and Prather 2006. *Am. Midl. Nat.* 155:136–148).

Two *Notophthalmus meridionalis* were observed underground in clay fissures on 18 November 2016 at 1002 h at a dried ephemeral pond in Cameron County, Texas, USA (26.03524°N, 97.47375°W; WGS 84). This observation was made using a borescope with an 8 mm camera (PVBOR15, Pyle Audio Inc., Brooklyn, New York.). Individuals were found 15 cm and 20 cm deep, respectively, by measuring the length of the fiber optic stalk in the fissure. This observation is the first documented use of fissure microhabitats by any *Notophthalmus* species.