NATURAL HISTORY NOTES

CAUDATA — SALAMANDERS

***EURYCEA LUCIFUGA* (Cave Salamander). PREDATION.** Specific predator species have apparently not been reported for *Eurycea lucifuga* (Juterbock 2005. *In* M. J. Lannoo [ed.], Amphibian Declines: The Conservation Status of United States Species, pp. 750–753. University of California Press, Berkeley, California). Hutchison (1958. Ecol. Monogr. 28:1–20) speculated that *Diadophis punctatus* (Ring-necked Snake) may be an important predator of *E. lucifuga* because he observed these snakes at the openings of salamander-rich caves. *Diadophis punctatus* is known to prey upon salamanders (e.g., Blanchard et al. 1979. J. Herpetol. 13:377–402). On 09 July 2015 we observed a Cave Salamander hanging by its head that appeared stuck in a rock crevice within the twilight zone of Screech Owl Cave on Pigeon Mountain, Walker Co., Georgia, USA (ca. 34.6650°N, 85.3635°W; WGS 84). Upon lifting the salamander we observed a *D. punctatus* grasping the head of the salamander. As part of an on-going effort to monitor salamanders using caves in northwestern Georgia (Camp and Jensen 2007. Copeia 2007:594–604; Camp et al. 2014. Can. J. Zool. 92:119–127) we have seen *D. punctatus* on several occasions within twilight zones of caves. However, it is unclear whether this species of snake actively forages for salamanders within this habitat or if the observed incident represents a rare, coincidental event.

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***NOTOPHTHALMUS VIRIDESCENS* (Eastern Newt). DIET.** We studied the diets of adult *Notophthalmus viridescens* from three lakes to evaluate whether adult newt diets differ across ponds locally or if they exhibit prey preferences. We conducted macroinvertebrate surveys and collected a total of 67 *N. viridescens* adults using dipnet surveys from three ponds in Sewanee, Franklin Co., Tennessee, USA (Pond 1: 35.2139°N, 85.9130°W; Pond 2: 35.2128°N, 85.9190°W; Pond 3: 35.2212°N, 85.9354°W; WGS 84), from October to December 2014. Prey surveys were standardized to four dips at ten locations around each lake. All prey organisms were identified to class or family using a dissecting microscope. Salamander diets were assessed by conducting a non-lethal lavage on each individual using protocols identified in Cecala et al. (2007. J. Herpetol. 41:741–745). 89.3% of adults had stomach contents. We conducted chi-square tests to determine if diets differed among ponds or were distinct from macroinvertebrate availability. We extracted 204 food items including organisms from the following groups ranked by abundance: Gastropoda (42.6%), Diplostraca (22.5%), Odonata (15.2%), Tricoptera (5.9%), Oligochaeta (5.9%), Diptera (2.5%), Coleoptera (1%), Plecoptera (0.5%), Ephemeroptera (0.5%), and Arachnida (0.5%). Adult newts consumed prey items in proportion to their availability (Pond 1, χ^2 = 1.64, p = 0.98; Pond 2, χ^2 = 0.30, p = 0.99; Pond 3, χ^2 = 0.93, p = 0.97) despite availability of prey varying among ponds. Pond 2 and Pond 3 all had more human disturbance within their catchments than Pond 1 and had much higher densities of gastropods (Pond 1 = 0% Gastropoda, Pond 2 = 48% Gastropoda, and Pond 3 = 35% Gastropoda in prey item sampling). Because of variation in prey availability among ponds, newts also demonstrated diet variability between Pond 1 and Pond 3 (χ^2 = 20.30, p = 0.005) but not between any other pond pairing (Pond 1 and 2, χ^2 = 13.03, p = 0.16; Pond 2 and 3, χ^2 = 0.16, p = 0.99). In conclusion, *N. viridescens* appears to consume prey in proportion to their availability despite pond heterogeneity in prey availability.

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***NOTOPHTHALMUS VIRIDESCENS* (Eastern Newt). SIZE AT METAMORPHOSIS.** Body size at metamorphosis is an important determinant of future success in amphibians (e.g., Semlitsch et al. 1988. Ecology 69:184–192). Due to climate, resource availability, and regional variation, size at metamorphosis and growth can vary widely throughout the range of *Notophthalmus viridescens* (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, D.C. 587 pp.). We observed growth rates and size at metamorphosis of *N. viridescens* from a large constructed, permanent pond in an understudied region on the southern Cumberland Plateau near Sewanee, Franklin Co., Tennessee, USA (35.2095°N, 85.9317°W; WGS 84). This pond has served as a source population for previous studies on *N. viridescens* physiology (e.g., Berner et al. 2013. J. Herpetol. 47:466–470). Surveys were conducted approximately every 10 days beginning 28 May 2014 and included dipnetting and visual observations of the pond shoreline. We observed recent hatchlings on 9 June 2014 as small as 9 mm SVL. We collected 28 individuals on 09–12 June 2014 with SVL ranging from 9 to 19 mm suggesting wide variation in timing of hatching. We did a second collection on 19–21 June 2014 of 334 individuals with SVL ranging from 9 to 21 mm. Our first observations of a metamorphic *N. viridescens* individual occurred on 03 July 2014, and we captured 14 metamorphic individuals from 3 July 2014 – 1 September 2014. The SVL at metamorphosis of these individuals ranged from 15 to 20 mm with a mean of 17.6 ± 0.50 mm SVL. Nine individuals marked with visible implant elastomer on 19 June 2014 (334 marked in total) and recaptured from 15 July–01 September 2015 exhibited mean growth rates of 0.15 ± 0.072 mm/day. These values represent the smallest metamorphic *N. viridescens* described in the literature. In conclusion, *N. viridescens* in Sewanee, Tennessee, USA exhibit a distinct eft life stage, slow growth rates, and small sizes at metamorphosis.

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PLETHODON CINEREUS **(Eastern Red-backed Salamander). COLORATION.** The salamander *Plethodon cinereus* is an abundant species that exhibits two primary color variations (Redback and Leadback), which occur throughout eastern North America (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington D.C. 587 pp.). Erythrism, leucism, albinism, iridism, amelanism, and melanism are also known for this species, as are varying degrees of intermediacy for each morph (Moore and Oulett 2014. Can. Field Nat. 128:250–259). Herein, I report an observation of a poorly known color morph of *P. cinereus* that has only been mentioned in passing in the peer-reviewed literature, and for which a published image does not exist (Moore and Oulett 2014, *op. cit.*).

On 11 April 2015, at Buttermilk Falls State Park, Tompkins Co., New York, USA (42.4129°N, 76.5262°W; WGS 84), I found an adult *P. cinereus* of unknown sex that exhibited unusual coloration; the salamander was found under a stone on a steep WNW-facing hillside. The dorsal stripe of this specimen was white with occasional melanophores, uniform in shape, and clearly defined (Fig. 1.), while the sides and venter were normally colored. No red pigment could be found on the dorsal stripe upon close examination. This specimen can be distinguished from a partially leucistic individual by a lack of blotching of the white coloration, by the normally colored venter, and the presence of flecking on the sides. Thus, it seems to represent a variation of the abundant Redback morph. Subsequent surveys at this site failed to locate further specimens of *P. cinereus* with similar coloration, but typically patterned individuals of both the striped (Redback) and unstriped (Leadback) morphs were found in abundance.

Fig. 1. Dorsal view of the white-striped color variant of *Plethodon cinereus.*

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SIREN INTERMEDIA **(Lesser Siren). LIMB REGENERATION.** Current hypotheses regarding the evolution of epimorphic regeneration capacity in vertebrates include a variety of explanations as to why some taxa are capable of limb regeneration while others lack such restorative survival mechanisms. General phylogenetic trends in the distribution of regeneration capacity include a negative correlation between regeneration capacity and animal maturity/size as well as a positive correlation between regeneration capacity and theorized selective pressure (Goss 1969. Principles of Regeneration. Academic Press Inc., New York. 278 pp.; Reichman 1984. Am. Nat. 123:752–763). In a previous review of amphibian regeneration capacity, it was reported that one family of salamanders, Sirenidae, lacked this restorative mechanism. Moreover, this same review noted specifically that *Siren intermedia* exhibits "no apparent regenerative ability to the capacity to produce a heteromorphic regenerate" (Scadding 1977. J. Exp. Zool. 202:57–68). This conclusion fit nicely into the observed trends mentioned above; an aquatic species propelled by undulation would have little selective pressure to regenerate forelimbs and *S. intermedia* is well above the size boundary previously correlated to lack of regeneration.

Contrary to the initial study and general trends noted above, we provide the first report of epimorphic limb regeneration in *S.*

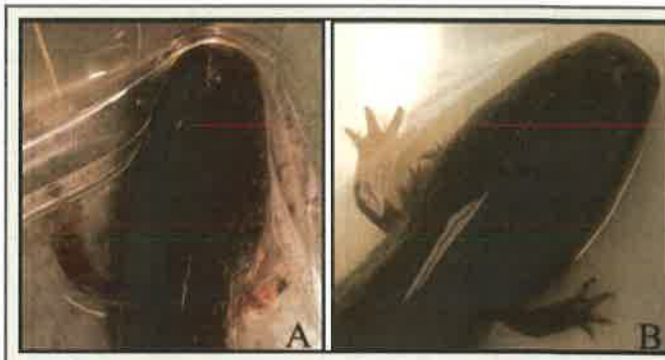

Fig. 1. Photographs of a Lesser Siren (*Siren intermedia*) right forearm regeneration progress at (A) 3 weeks and (B) 25 weeks after initial recorded observation

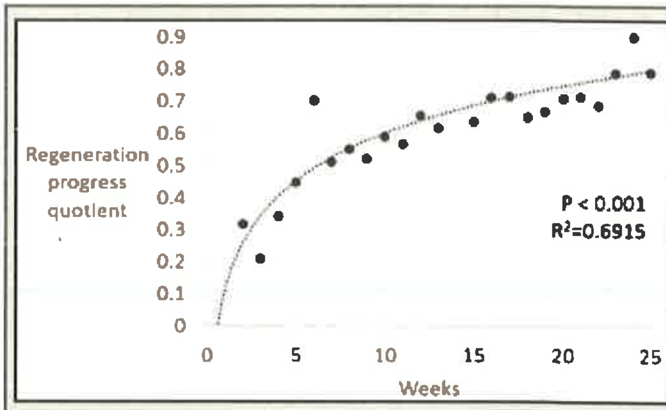

Fig. 2. Regeneration progress of an amputated forearm in a *Siren intermedia* over 25 weeks. Regeneration progress has been estimated by the quotient of the regenerating forearm area divided by the normal forearm area.