NATURAL HISTORY NOTES

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CAUDATA

AMBYSTOMA MACULATUM (Spotted Salamander). **MORTALITY.** *Ambystoma maculatum* are winter breeders in the southeastern United States. Individuals are often subjected to unpredictable environmental conditions, such as partial freezing of aquatic habitats, during their breeding activities. Adult mortality from partial freezing of aquatic habitat is known (Harris 1980. Copeia 1980:719–722), but has rarely been described. We report here on observations of *A. maculatum* mortality during reproduction after a partial freeze of a wetland in Mecklenburg County, North Carolina, USA during the winter of 2005.

Warm air temperatures (up to 20°C) and precipitation from 25–27 January proceeded and apparently initiated *A. maculatum* breeding activity. On 28 January, a cold front moved through the area and maximum air temperatures remained below freezing (-6°C) until 30 January. A thin (< 2 cm) layer of ice formed over the majority of the wetland, and remained until 8 February. We surveyed the wetland between 2–10 February 2005 and observed 27 dead *A. maculatum*; 21 females (mean SVL = 103.6 mm, SD = 3.82 mm; TTL = 192.3 ± 7.25 mm; N = 19), and 6 males (mean SVL = 99.2 ± 12.77 mm; TTL = 190.33 ± 28.12 mm). Seventeen of the females contained eggs (mean = 65.47 ± 48.59; range 11–182). Nine individuals had various body injuries such as missing pieces of the head and torso, or punctures in the ventral side. We also collected dead individuals of *Rana sphenocephala* (3), *R. catesbeiana* (2), *Pseudacris ferairum* (1), *Acris crepitans* (1), and *Chrysemys picta* (1).

Our observations confirm those of Harris (1980, *op. cit.*), which suggest that freezing of aquatic habitats can lead to mortality in *A. maculatum*, and that mortality is skewed towards females, even though males are often more numerous in breeding ponds (Stenhouse 1985. Copeia 1985:631-637). The reason females are more susceptible than males to freezing is unknown, however, we speculate it might be the result of egg-depositing behavior, sensitivity to reduced oxygen levels, or the reluctance to leave the wetland when gravid. Although we did find several individuals with injuries, we believe it is likely these injuries were induced postmortem by aquatic invertebrates or other scavengers inhabiting the wetland. This research was supported by the Davidson College Department of Biology, Duke Power and National Science Foundation grant (DEB – 0347326) to MED.

Submitted by **YURII V. KORNILEV, STEVEN J. PRICE, EMORY P. HILL**, and **MICHAEL E. DORCAS**, Department of Biology, Davidson College. Davidson, North Carolina 28035-7118, USA (e-mail [SJP]: sjprice@davidson.edu).

AMBYSTOMA TALPOIDEUM (Mole Salamander). **DIET**. On 18 March 2003, JGP removed a drowned terrestrial morph adult female *Ambystoma talpoideum* (51.5 mm SVL) from a plastic minnow trap set in a 0.3 ha seasonal wetland on Moody Air Force Base, Lowndes County, Georgia, USA. Upon dissection, the following aquatic invertebrates were removed from the salamander's stomach: nine clam shrimp (Lynceidae: *Lynceus*), three isopods (Asellidae: *Caecidotea*), two unidentifiable mosquitoes (one larva, one pupa; Culicidae), one beetle (Dytiscidae: *Uvarus*), and one beetle larva (Dytiscidae: *Agabus*).

Previous reports of metamorphosed *A. talpoideum* adults feeding while in breeding habitats include Cliburn and Carey (1975. J. Mississippi Acad. Sci. 20:49–52) and McCallister and Trauth (1996. Southwest. Nat. 41:62–64). Conspecific ova were consumed exclusively by the specimens examined by McCallister and Trauth (*op. cit.*). In addition to unidentified amphibian ova, Cliburn and Carey (*op. cit.*) observed aquatic invertebrates in *A. talpoideum* stomachs. Collectively, these three reports of aquatic feeding by metamorphosed adult *A. talpoideum* suggest that this behavior might not be uncommon. Moreover, aquatic feeding by adults might be an important strategy to recover energy reserves expended during the breeding season.

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Submitted by **JOHN G. PALIS**, P.O. Box 387, Jonesboro, Illinois 62952, USA (e-mail: jpalis@yahoo.com); and **MATT R. WHILES**, Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901, USA (e-mail: mwhiles@zoology.siu.edu).

ANEIDES AENEUS (Green Salamander). **DISPERSAL.** *Aneides aeneus* inhabits cliffs and rockface outcrops at elevations <1340 m in mountainous forests from southwestern Pennsylvania to extreme northeastern Mississippi (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington D.C. 587 pp.). Populations are largely confined to deep crevices within sandstone, granite, and schist formations but occasionally are found under loose bark of fallen trees (Petranka, *op. cit.*). The extent to which *A. aeneus* disperses between isolated rock outcrops is unknown. Individuals are rarely observed in adjacent forest floor habitats even when collecting around rock outcrops with large populations (Snyder 1991. J. Tennessee Acad. Sci. 66:165–169). Although *A. aeneus* has been recorded crossing roads during April–June (Cupp 1991. J. Tennessee Acad. Sci. 66:171–174; Williams and Gordon 1961. Copeia 1961:353), disturbance to forest habitats is thought to limit dispersal between rock outcrops (Petranka, *op. cit.*). Here we report dispersal of *A. aeneus* across an open, disturbed habitat in southern West Virginia.

On 1 October 2004 we discovered a single adult *Aneides aeneus* under an artificial coverboard in an actively grazed livestock pasture at Reba Farm (37°47'31"N, 80°58'30"W), a USDA Appalachian Farming Systems Research Center site near Beaver, Raleigh County, West Virginia, USA. All woody vegetation, coarse woody debris, and rocks had previously been removed from the pasture (884 m elev) to facilitate grazing. Natural ground cover within the pasture was limited to Orchardgrass (*Dactylis glomerata*) and

White Clover (*Trifolium repens*). The coverboard (30 cm × 46 cm × 5 cm), installed flush against the topsoil, was one of 20 white oak boards within the pasture. The coverboard was 54.9 m from the nearest rock outcrop and 45.7 m from the nearest woodland habitat. Surface temperature under the coverboard was 12.7°C. Searches of all habitat within a 150-m radius of the coverboard and all other boards within the pasture revealed no additional *A. aeneus*. Additionally, no *A. aeneus* were found when all coverboards in the pasture were re-sampled on 15 October 2004.

Although mating in West Virginia populations of *Aneides aeneus* occurs primarily during May–June, the timing of our observation coincides with a secondary breeding period that is thought to occur in September–October (Canterbury and Pauley 1994. J. Herpetol. 28:431–434). Our observation is significant as it documents dispersal of *A. aeneus* across non-forested, repeatedly disturbed habitat previously considered unsuitable for the species. Our observation also suggests the possibility that artificial cover objects might facilitate dispersal of *A. aeneus* between rock outcrops by providing suitable microenvironments or refugia within otherwise harsh, open habitats.

Submitted by **BREANNA L. RIEDEL** (e-mail: briedel@uwsp.edu), **KEVIN R. RUSSELL** (e-mail: krussell@uwsp.edu), College of Natural Resources, University of Wisconsin – Stevens Point, Stevens Point, Wisconsin 54481, USA; **W. MARK FORD,** USDA Forest Service, Northeastern Research Station, Parsons, West Virginia 26287, USA (e-mail: mford@fs.fed.us); and **H. W. GODWIN**, USDA-ARS Appalachian Farming Systems Research Center, 1224 Airport Road, Beaver, West Virginia, USA.

DESMOGNATHUS MONTICOLA (Seal Salamander). **ARBOREAL BEHAVIOR.** On 15 August 2004, ca. 1345 h, an adult male *Desmognathus monticola* was found under the bark of a Yellow Buckeye tree (*Aesculus flava*) ca. 1 m above the ground and 4 m from the water of Indian Creek, Unicoi, Unicoi County, Tennessee, USA (N36°10.572', W82°17.884'). *Desmognathus monticola* is generally associated with streams and is known to ascend wet rocky stream banks (Dodd 2004. The Amphibians of Great Smoky Mountains National Park. University of Tennessee, Knoxville. 283 pp.). Nocturnal climbing, especially during rain, has been noted for other *Desmognathus* species (Hairston 1949. Ecol. Monogr. 19[1]:47–73; Hairston 1986. Am. Nat. 127:266–291; Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, DC. 587 pp.). However, to our knowledge, this is the first record of arboreality in this species and the first record of any *Desmognathus* using an arboreal diurnal retreat. The individual was collected under Tennessee permit number 1920 issued to Maxim Shpak and is deposited at Yale Peabody Museum of Natural History (YPM 10037).

Submitted by **GREGORY J. WATKINS-COLWELL**, Yale Peabody Museum of Natural History, 170 Whitney Avenue, New Haven, Connecticut 06520, USA (e-mail: gregory.watkins-colwell@yale.edu); and **TWAN A. LEENDERS**, Department of Biology, Sacred Heart University, 5151 Park Avenue, Fairfield, Connecticut 06532, USA (e-mail: leendersa@sacredheart.edu).

EURYCEA CIRRIGERA (Southern Two-lined Salamander). **GILL MORPHOLOGY.** Because larval two-lined salamanders (*Eurycea bislineata* complex) typically inhabit lotic environments (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Inst. Press. Washington, D.C. 587 pp.), little is known about interdemic variation in larval morphology. Herein we report on interdemic variation in gill morphology for *E. cirrigera* larvae from southern West Virginia, USA. Larvae were collected seasonally (April 1994–January 1995) from Fitzpatrick's Branch, an intermittent, first-order stream in Cabell County, West Virginia (Brophy and Pauley 2002. Maryland Nat. 45:13–22) and Trump-Lilly Pond, a small farm pond in Raleigh County, West Virginia (Brophy and Pauley 2001. Herpetol. Rev. 32:98–99).

Captured larvae were anesthetized in chloretone, fixed in a 4% formalin solution, and preserved in 70% ethanol. The following measurements were made on the left side of each larva using a dissecting microscope and ocular micrometer: Fimbria length (FimL) – length (mm) of longest fimbria on 3rd gill arch; Fimbria width (FimW) – width (mm) midway along FimL; Rachis length (RachL) – length (mm) of rachis on 3rd gill arch; and Number of fimbriae (NumFim) – total number of fimbriae on 3rd gill arch. All characters were standardized for body size by regressing each variable against SVL and using the residuals in statistical procedures (Atchley et al. 1975. Am. Zool. 15:829; Atchley et al. 1976. Syst. Zool. 25:137–148). Larvae within each site were grouped across seasons ($N = 95$ for each site) and two-tailed Student's t-tests on the residuals were used to determine whether differences in gill morphology occurred between larvae from different habitats.

Differences in gill morphology were very apparent between larvae from pond and stream habitats. In general, pond larvae had relatively larger gills and a greater number of fimbriae than their stream counterparts. Mean values of the residuals for FimL, FimW, RachL, and NumFim were significantly different between pond and stream larvae ($p < 0.0001$ and $df = 188$ in all cases; FimL: $t = 10.01$; FimW: $t = 9.67$; RachL: $t = 9.62$; NumFim: $t = 5.78$). Mean residual values of pond larvae (positive) were greater than those of stream larvae (negative) for all gill characters. Causes of interdemic variation in gill morphology are unknown in this case, but future studies should investigate dissolved oxygen levels (Bond 1960. Dev. Biol. 2:1–20; Timmerman and Chapman 2004. J. Fish Biol. 65:635–650), temperature (Smith 1990. Ecology and Field Biology, 4th ed. Harper Collins Publ. New York), larval activity rates (McFarland et al. 1979. Vertebrate Life, 1st ed. Macmillan Publ. Co. New York. 875 pp.), and ion concentrations (Timmerman and Chapman, *op. cit.*) as potential causal factors.

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Submitted by **TIMOTHY R. BROPHY**, Department of Biology and Chemistry, Liberty University, Lynchburg, Virginia 24502-2269, USA (e-mail: tbrophy@liberty.edu); and **THOMAS K. PAULEY**, Department of Biological Sciences, Marshall University, Huntington, West Virginia 25755-2510, USA.