NATURAL HISTORY NOTES

CAUDATA — SALAMANDERS

***AMBYSTOMA LATERALE-JEFFERSONIANUM COMPLEX* (Unisexual *Ambystoma*). LONGEVITY.** Mole salamanders in the genus *Ambystoma* are long-lived amphibians with average estimated life spans ranging from 10 to 20 years in the wild (Petranka 2010. Salamanders of the United States and Canada. Smithsonian Books, Washington, D.C. 587 pp.) and individuals recorded as old as 32 years (Flageole and Leclair 1992. Can. J. Zool. 70:740–749). For several species of *Ambystoma*, information on longevity is sparse and limited to records from captivity or skeletochronology, and few species have any significant data on longevity. Obtaining empirical records of longevity in the wild from individuals is important for filling in natural history knowledge gaps and informing conservation. Herein, we present mark-recapture records that span 10 years as evidence of the longevity of the *Ambystoma laterale-jeffersonianum* complex, an all-female lineage of salamanders that reproduce with five different bisexual host species throughout northeastern North America.

The salamander was first captured on 9 May 2013, leaving a forested vernal pool surrounded by a drift fence and pitfall traps in Orono, Maine, USA (44.88°N, 68.69°W; WGS 84; 51.2 m elev.). Upon capture, the salamander had an SVL of 5.5 cm, a total length of 10.4 cm, and a weight of 6.8 g. A small tail clip was obtained for genetic analysis, which used microsatellite DNA at six loci to confirm the individual was a unisexual *Ambystoma* with the LLJ biotype. The salamander was then PIT tagged in the abdomen and not detected during surveys the following year. We recaptured this individual on 19 April 2023 in the same vernal pool during trapping for a separate study, in which we opportunistically scanned captured salamanders for PIT tags from three of the four previously trapped wetlands. The individual was captured in a deep-water funnel trap (Hoffmann et al. 2016. Herpetol. Rev. 47:205–206) in the center of the pool. Upon recapture, the salamander was photographed (Fig. 1), measured, and weighed (6.7 cm SVL, 13.6 cm total length, 13.8 g). Notably, it was the largest unisexual *Ambystoma* captured from this population during trapping in 2023; the next largest individual had a similar length but weighed one gram less. The salamander appeared to be in good health, without any obvious signs of disease or injury. No other PIT tags were detected in other animals captured in 2023. All handling and tissue collection was done under proper permits (UMaine IACUC permits 2013-03-03, A2023-02-02, Maine IF&W Scientific Collection Permits 2013-184, 2023-686).

PHOTO BY HARRISON B. GOLDSPIEL

FIG. 1. Image of recaptured 12–13-year-old female unisexual *Ambystoma* (LLJ biotype).

We speculate from published sizes and ages at reproductive maturity that this salamander was 2–3 years old at first capture, making it 12–13 years old at recapture and thus, to our knowledge, among the oldest documented unisexual *Ambystoma* of the LLJ biotype. In a Massachusetts population, Homan et al. (2007. J. Herpetol. 41:401–409) used toe clips and skeletochronology to estimate age ranges of 2–8 for females in the *A. laterale-jeffersonianum* complex (LLJ and LLLJ biotypes). We also note an observation of a much older unisexual *Ambystoma* (LJJ biotype) from Ontario, estimated to be approximately 30 years old (L.E. Licht, pers. comm., reported in COSEWIC. 2016. COSEWIC assessment and status report on the unisexual *Ambystoma*, *Ambystoma laterale*, Small-mouthed Salamander-dependent population, Jefferson Salamander-dependent population and the Blue-spotted Salamander-dependent population, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxii + 61 pp.). Our observation from Maine provides further evidence that unisexual *Ambystoma* display longevity similar to other *Ambystoma*. Unisexual *Ambystoma* differ from their host species in various demographic characteristics, including potentially elevated juvenile survival rates (Van Drunen et al. 2020. Amphibia-Reptilia 42:29–41) and reduced dispersal potential (Denton et al. 2017. Func. Ecol. 31:915–926). Moreover, early survivorship of unisexual *Ambystoma* varies among biotypes, with juvenile recruitment inversely related to level of ploidy (Teltser and Greenwald 2015. Herpetologica 71:81–87). More data are likely needed across different populations to better understand the life history of the *A. laterale-jeffersonianum* complex and accurately inform demographic models and conservation.

HARRISON B. GOLDSPIEL, Department of Wildlife, Fisheries, and Conservation Biology, 5755 Nutting Hall, Room 210, Orono, Maine 04469, USA (e-mail: harrison.goldspiel@maine.edu); **KRISTINE E. HOFFMANN**, Department of Biology, Saint Lawrence University, 23 Romoda Drive, Canton, New York 13617, USA (e-mail: khoffmann@stlaw.edu); **NOAH D.**

CHARNEY, Department of Wildlife, Fisheries, and Conservation Biology, 5755 Nutting Hall, Room 210, Orono, Maine 04469, USA (e-mail: noah.charney@maine.edu).

***AMBYSTOMA MACRODACTYLUM CROCEUM* (Santa Cruz Long-toed Salamander). HABITAT USE.** *Ambystoma macrodactylum croceum* breeds in ca. 23 ponds in Santa Cruz and Monterey Counties, California, USA. Natural history information on this U.S. federally endangered species is relatively scarce and there are no recent publications (e.g., Anderson 1966. Am. Midl. Nat. 77:323–355; Ruth and Bury 1972. Herpetologica 4:20–22; Ruth 1974. Herpetol. Rev. 5:27–28). Government and consulting firm reports exist, but some are not readily accessible. All considered, habitat requirements for the terrestrial life stages, which critically influence amphibian population dynamics (Hanski 1998. Nature 396:41–49; Biek et al. 2002. Conserv. Biol. 16:728–734), of this species remain relatively unknown except for juveniles in the summer months from two sites (Anderson 1966, *op. cit.*).

In June 2021, while building drift fences around vernal pools in Santa Cruz County, California, USA (locations withheld due to conservation concerns), we encountered two adult *A. macrodactylum croceum* that emerged from a ca. 15 cm deep trench (Fig. 1). The area around the trench was relatively mossy, steep, shaded by mid-level vegetation (including *Toxicodendron pubescens*, *Dryopteris arguta*, and *Rubus spp.*), featured loose soil and an extensive near-surface root system, and was ca. 1.5 m from the pond edge. Neither salamander was injured, and the building of the fence was completed with extreme caution. No adults were observed on the opposite side of the pond, which had less vegetation and shade with loose duff. To our knowledge, details of the habitat and microhabitat use of adult *A. macrodactylum croceum* in the non-breeding (summer) months have not been published. The discovery of these adults in this habitat supports the notion that the adults use moist areas underground, similar to juveniles (Anderson 1966, *op. cit.*). Further, it indicates that adults may settle very near their breeding ponds. A better understanding of the habitat requirements of all life stages of *A. macrodactylum croceum* is needed to properly protect and manage their habitat to increase population viability (Ruth 1974, *op. cit.*). Drift fence building and handling of endangered species was done in accordance with USFWS permit #8 1440-2008-B-O1 56 and CDFWS # S-192880001-19290-001.

PHOTO BY HUNTER J. HOWELL

FIG. 1 Adult *Ambystoma macrodactlyum croceum* on the surface near where it was found.

LEYNA R. STEMLE (e-mail: leynastemle@miami.edu), **ARIANNE F. MESSERMAN** (e-mail: messermana@gmail.com), and **HUNTER J. HOWELL**, Department of Biology, University of Miami, 1301 Memorial Drive, Coral Gables, Florida 33124, USA (e-mail: hunterhowell04@gmail.com).

***ANDRIAS JAPONICUS* (Japanese Giant Salamander). GASTROLITH.** *Andrias japonicus* is known to feed on a variety of prey items and often consumes small stones and plants (Okada et al. 2008. Herpetol. Conserv. Biol. 3:192–202). Stones and plants may be swallowed accidentally with a prey animal (Naitou 2018. Nat. Hist. Nishi-Chugoku Mtns. 18:19–34), but whether stones are consumed intentionally is unknown. On the night of 25 June 2023, we collected one *A. japonicus* in the Katsura River, Keihoku area, Kyoto City, Kyoto Prefecture, Japan, after heavy rain (35.196°N, 135.686°E; WGS 84; 273 m elev.). The individual was an adult male (970 mm total length; 110 mm head width; 6750 g) and judged to be a hybrid between *A. japonicus* and *A. davidianus* (Chinese Giant Salamander) genetically using microsatellite markers (Yoshikawa et al. 2011. Curr. Herpetol. 30:177–180). Five days after capture, we dissected the individual and found a large metamorphic rock in its stomach (Fig. 1). Along with the stone, unidentified shrimp and fish were also collected. The stone measured 75 mm in diameter at one end and 56 mm in diameter at the opposite end, it weighed 205 g and had a somewhat rounded shape. Okada et al. (2008, *op. cit.*) documented rocks consumed as a proportion of prey mass in *A. japonicus*, the average weight of stones found in *A. japonicus* stomachs was about 3.0 g (S. Okada, pers. comm., 29 August 2023). This was 0.2% of the average body weight for males and 0.3% for females in their study. Small-sized stones are considered to be accidentally consumed with prey items. However, the stone we document here is quite large compared to body weight (ca. 3.0%) and may have been swallowed intentionally. Although minerals in the stomach are thought to facilitate digesting prey (e.g., Davenport et al. 1990. J. Zool. 220:569–592) and/or to maintain negative buoyancy underwater in some vertebrates (Taylor 1993. Philos. Trans. R. Soc. London Biol. Sci. 341:163–175), more information is required to determine the role of this stone or the reason why the *A. japonicus* swallowed and retained the stone.

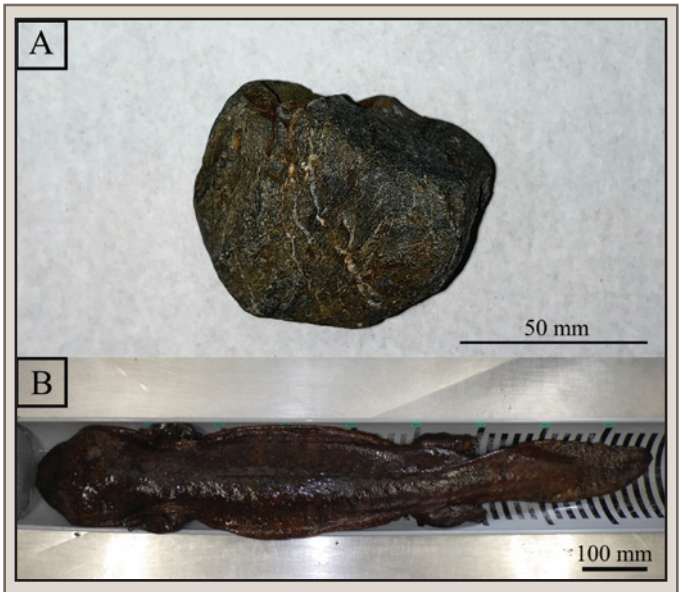

FIG. 1. A) Stone collected from the stomach of an *Andrias japonicus*; B) the *A. japonicus* that swallowed the stone.