

HERPETOCULTURE

HERPETOCULTURE NOTES

CAUDATA — SALAMANDERS

EURYCEA RATHBUNI (Texas Blind Salamander). **CANNIBALISM.** In the artesian zone of the Edwards Aquifer of west-central Texas, obligate aquatic-subterranean organisms (stygofauna) face a unique challenge when searching for food. In this environment, devoid of light, typical photo-dependent processes like vision and photosynthesis are not possible. The food web is based on an influx of organic matter from the surface flowing in through recharge features like sinkholes and cracks in the limestone, as well as on the productivity of chemolithoautotrophs (Hutchins et al. 2016. Ecology 97:1530–1542). In this extreme environment, it may be surprising that a diverse food web persists which includes filter feeders, grazers, and predators (Hutchins et al. 2016, *op. cit.*). A top predator in the aquifer is *Eurycea rathbuni*. These salamanders prey on a variety of invertebrates, but the relative frequency at which they encounter prey items is thought to be low. Given the expected paucity of prey encounters, *E. rathbuni* is thought to be opportunistic in its feeding habits, which may include cannibalistic behavior.

Cannibalism has been recorded among captive populations of *E. rathbuni* at the San Antonio and Audubon Zoos. For example, captive *E. rathbuni* have been reported consuming eggs and larvae (Mendyk et al. 2018. Herpetol. Rev. 49:485–486) as well as adults (Lee et al. 2021. Herpetol. Rev. 52:567–568). It is unclear if this is a natural behavior since observing this salamander in the wild is nearly impossible; however, at least one case of adult cannibalism has been documented in a trap in the wild by Lee et al. (2021, *op. cit.*). These observations may support the idea that *E. rathbuni* exhibit an opportunistic diet that would be beneficial for a predator living in a food-scarce environment.

On the afternoon of 7 January 2022, at the San Marcos Aquatic Resources Center, we observed the head and forelimbs of an adult female *E. rathbuni* protruding from the mouth of another female (Fig. 1). The cannibal regurgitated its prey when a net was introduced to the tank to remove them. It was noted that the prey's heart was still beating. Upon examination, it was evident that the tail of the prey had been partially digested. The SVL of each salamander was recorded, the cannibal was returned to the tank, and the prey was salvaged under TPWD permit number SPR-0119-004. The SVLs of the cannibal and its prey were 47 mm and 45 mm, respectively, making the prey's length 96% of the cannibal's. Of the previous observations where SVLs were given, the prey that was most similar in size to its cannibal was 65% of its length. Diffusible iodine-based contrast enhanced computed tomography (diceCT) scans of the prey's head, rendered in Dragonfly ORS (Fig. 2), illuminate details of the skin that otherwise would be difficult to see. This 3D model shows several abrasions on the dorsal surface

of the snout and head, indicating aggressive interactions with other individuals. After closer examination of the diceCT scan, the prey's dental structure is evident. We observed several rows of developing teeth and associated soft tissue. This individual may exhibit polyphyodonty, a morphology typical of most amphibians in which teeth are shed and replaced throughout the life of the individual (Hariharan et al. 2016. Cold Springs Harb. Perspect. Biol. 8:a019174). Tooth arrangement may change through ontogeny in salamander species that undergo metamorphosis (Pederson 1991. Amphib. 12:1-14). Given the paedomorphic life history of *E. rathbuni*, past investigations of the mouth suggest polystichy, in which multiple rows of teeth coexist (Clemen et al. 2009. Vertebr. Zool. 59:157-168). Diet can also influence dental structure. In the case of *Ambystoma tigrinum*, dental differences are noted between cannibalistic larvae and larvae that have not engaged in cannibalism; the former exhibit larger, more curved teeth (Pedersen 1991, *op. cit.*). It is difficult to disentangle what might be reflected in the dental structure of the individual pictured here, but we hope to compare diceCT scans of wild and captive bred individuals in the future and test hypotheses about the relationship between diet and dentition.

In captivity at the U.S. Fish and Wildlife's San Marcos Aquatic Resources Center, adult *E. rathbuni* are fed a variety of food items, including blackworms, earthworms, amphipods,



FIG. 1. *Eurycea rathbuni* cannibalism in progress. The head and forelimbs of the prey are left protruding from the mouth of the cannibal.

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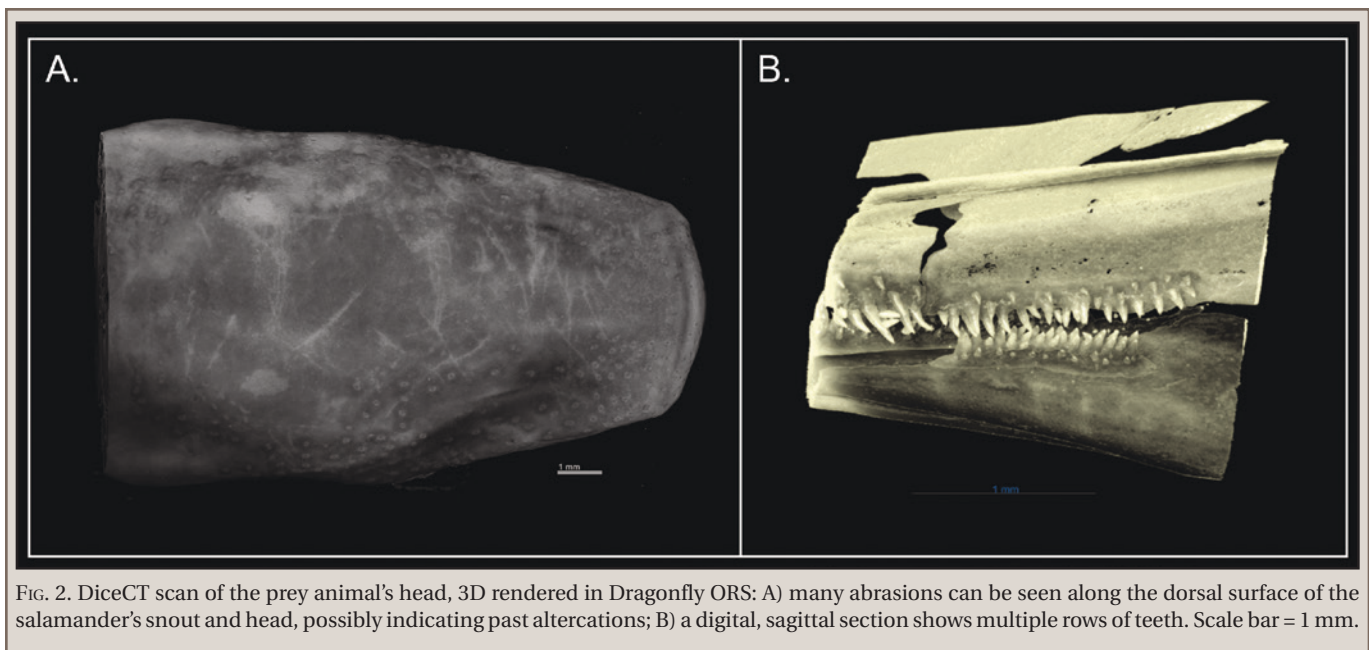


FIG. 2. DiceCT scan of the prey animal's head, 3D rendered in Dragonfly ORS: A) many abrasions can be seen along the dorsal surface of the salamander's snout and head, possibly indicating past altercations; B) a digital, sagittal section shows multiple rows of teeth. Scale bar = 1 mm.

and *Mysis* shrimp. Salamanders are fed twice weekly, and the salamanders had been fed about three hours before the time of this observation. However, it is not known how long the cannibal had been in the process of consuming its prey and whether it had begun ingesting it prior to the scheduled feeding. Previous accounts of cannibalism among *E. rathbuni* adults (Lee et al. 2021, *op. cit.*) reported a disparity in size between the cannibal and its prey. Moreover, all previously reported events have described a “headfirst” approach by the cannibal. Herein, we report a cannibalism event of two similarly sized adult *E. rathbuni* individuals with a “tail first” approach by the cannibal.

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SQUAMATA — LIZARDS

HOLBROOKIA LACERATA (Plateau Spot-tailed Earless Lizard).

MATING. *Holbrookia lacerata* is phrynosomatid lizard that was recently elevated from subspecies status (*Holbrookia lacerata lacerata*) and is now recognized as a full species (Hibbitts et al. 2019. Zootaxa 4619:139–154). Following this split, *H. lacerata* is found in central Texas, USA, north of the Balcones Escarpment (Hibbitts et al. 2019, *op. cit.*). Few studies have been conducted on this species; therefore, little is known of their basic natural history, life history, and general ecology (Hibbitts et al. 2021, *op. cit.*). Due to the recent attention on assessing the conservation status of this species, data such as these are necessary and imperative.

On 11 June 2021, we captured 5 adult *H. lacerata* (1 male: 61 mm SVL; 4 females: 59.5 mm mean SVL, range: 51–65 mm) from near San Angelo, Tom Green County, Texas (31.381°N, 100.160°W; WGS 84; 563 m elev.). Upon returning to a laboratory at Texas A&M University-Kingsville, we individually housed the lizards in 38-L aquaria equipped with heat lamps, UV lights, and a substrate of 10 cm deep sandy loam soil. The five aquaria were positioned side-by-side along the 51 cm length side and we placed a visual barrier of construction paper along half (ca. 25 cm) of the aquaria length, which allowed each lizard the option of viewing its neighbor or positioning themselves out of line of sight of the other lizards.

Within minutes of being placed in its aquaria, the male *H. lacerata* noticed the female in the adjacent aquarium and began a series of rapid head-bobs, then sprinted towards her until he was pressed against the aquaria glass. The male used its front legs to kick away soil in what appeared to be an attempt to dig its way to the female. When first checked on the following day, 12 June 2021, the male had completely kicked away the soil substrate along the aquaria edge abutting the female's aquaria by continually running against the glass in what appeared to be futile attempts to get to her. At this point, we introduced the male into the female's aquarium, and he immediately ran to the female, climbed on her back, bit the skin on the back of her neck, and grasped her sides with his forelimbs. The female attempted to escape the male's grip with slow, jerky forward movements for ca. 20 s, however, the male continued to hold on to her. At this point the female ceased trying to escape and the male positioned himself to allow for cloacal apposition and inserted his hemipenes and rhythmically flexed his tail for 15–20 sec (Fig. 1). The male then partially retracted his hemipenes, which were removed from the female's cloaca; however, hemipenes remained partially exposed for 3 s. The male remained latched onto the female for another 30 s, laying completely motionless with his eyes closed as she began to slowly move around the aquarium dragging the male. After 75 sec from the initial grab by the male, the male released his grasp of the female, separated completely from the female, and laid motionless, which ended the interaction.