

HERPETOCULTURE NOTES

CAUDATA — SALAMANDERS

EURYCEA RATHBUNI (Texas Blind Salamander). **Cannibalism.**

Although diminutive (<135 mm SVL), *Eurycea rathbuni* is the top predator in the San Marcos Pool of the Edwards Aquifer in Hays County, Texas, USA. It feeds primarily on small invertebrates such as amphipods, shrimp, and aquatic snails. In captivity, *E. rathbuni* has been observed to indiscriminately consume all invertebrate prey types offered (Longley 1981. Int. J. Speleo. 11:123–128). The broad snout, long jaw, and wide head of this species suggests that it may be well-suited to eating large prey. It is plausible that they are opportunistic feeders that utilize their large heads not only to locate invertebrate prey, but also to consume conspecifics. While oophagy has been reported in *E. rathbuni* (Mendyk et al. 2018. Herpetol. Rev. 49:485–486), cannibalism among adults has not been previously reported. Herein, we report the first documented observations of adult cannibalism in both captive and wild *E. rathbuni*.

The San Antonio Zoo Center for Conservation and Research (SAZ CCR) maintains a population of ex-situ *E. rathbuni* for research purposes. SAZ CCR began trapping for this species at four sites (Johnson's Well, Primer's Fissure, Rattlesnake Cave, and Rattlesnake Well) in San Marcos, Texas, USA in January 2016 (USFWS permit numbers: TE800611-7 and TE081884-0, and TPWD permit numbers: SPR-0116-022 and SPR-0513-065). Half of the salamanders captured from each location were collected according to permit requirements and brought to SAZ CCR. Sex was visually determined for all individuals. Eighteen salamanders were brought to the zoo between January 2016 and January 2017 and were housed individually in 20-gal high Aqueon® aquaria with glass lids (63.5 cm in length, 33.66 cm in width, 43.82 cm in height) or in 13-gal Carlisle® food-safe containers (66.04 cm in length, 45.72 cm in width, 22.86 cm in height) with lids. Each enclosure contained pieces of limestone rock and artificial plants.

From January to March 2017, ten *E. rathbuni* were divided among three 20-gallon high Aqueon® aquaria in preparation for a breeding trigger assessment. Cannibalism was presumed in one of these aquaria, which contained three salamanders of both sexes from Primer's Fissure. Salamanders in this group were photographed before being placed in the tank together. As with other central Texas *Eurycea*, *E. rathbuni* have a unique pattern of pigmented spots on their heads that can be used to identify the individual (Bendik et al. 2013. PLoS ONE 8:e59424).

On 28 October 2017, one *E. rathbuni* was found missing from its tank. The tank contained salamanders with the assigned individual identification numbers: ER013, ER004, and ER008. The missing salamander, ER004, was identified by comparing photos with those of the two remaining salamanders. Staff members were uncertain if all three salamanders were accounted for the day prior to the disappearance of ER004 but noted that all three were accounted for at least two days prior to the disappearance. The tank was thoroughly inspected, but no trace of ER004 could be found. After a thorough search of the entire building and a review of the security camera outside of the building to rule out theft, it was assumed that ER013 had consumed ER004 after a staff member noticed that ER013 had a noticeably distended abdomen with a dark blue coloration.

Radiographs were taken of ER013 to look for evidence that it had consumed ER004, ca. 1 h after discovering that ER004 was missing. No extraneous bones were observed in the stomach, which would appear to indicate that ER013 had not eaten another vertebrate. ER013 was transferred to an individual tank following this event and monitored. In the following days, it passed at least three large feces, which was highly unusual for this species at SAZ CCR on the normal feeding schedule of twice per week. There was a 17.72 mm difference in SVL between the presumed cannibal and the victim.

On 27 March 2018, five *E. rathbuni* from Rattlesnake Well were placed together in a 100-gallon Rubbermaid® tub (134.62 cm in length, 78.74 cm in width, 63.5 cm in height) for breeding purposes. The tub did not contain a lid, and the water depth in the tub was ca. 15.2 cm. Artificial plants and layers of window screen were added to provide surface area and refuge. Salamanders in this group were administered visible implant elastomer tattoos consisting of a red and/or blue dot at specific points (right/ left, shoulder, pelvis, tail) prior to being placed

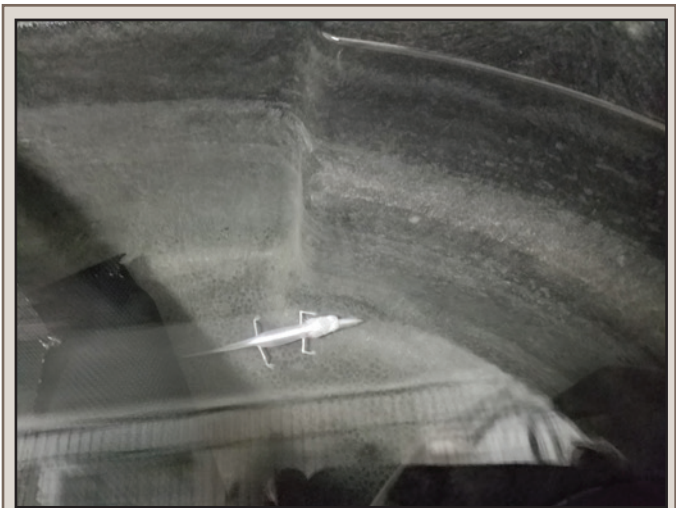


FIG. 1. ER015 found in the process of consuming ER019.



FIG. 2. Measurements taken of ER015 (bottom) and ER019 after it was extracted from ER015's mouth. There was a 15.68 mm difference between the two individuals.



FIG. 3. Female *Eurycea rathbuni* cannibal from Primer's Fissure, Texas, USA attempting to consume her second documented conspecific. The salamander was extracted from her mouth and lived.

in the tank together. In the afternoon of 15 August 2018, one of these five *E. rathbuni* was discovered in the process of consuming another salamander. Approximately 1 cm of the victim's tail was protruding from the cannibal's mouth (Fig. 1). The victim was extricated from the cannibal's mouth, and it was noted that the head appeared to have already been mostly digested.

Both salamanders involved were identified based on their elastomer tattoos. The partially digested salamander was identified as ER019 and the cannibal was identified as ER015. Subject ER019 was preserved in ethanol after measurements and photos were taken of both salamanders (Fig. 2). A thorough search of the tub was undertaken, and it was discovered that another salamander from the same tub, ER020, was missing. A thorough search of the building turned up no evidence of ER020, and it was assumed that this salamander was also a victim of cannibalism. The cannibal and the remaining two living salamanders from that tub were immediately moved into individual tanks. The SVL of the cannibal was 15.68 mm greater than its confirmed victim.

In addition to the observations of cannibalism among captive salamanders, we observed one incidence of cannibalism in the wild. A large female salamander captured in a trap in Primer's Fissure on 1 April 2019 was brought back to the zoo. While collecting morphometric data, it regurgitated a smaller conspecific. The cannibal's SVL was 74.24 mm, and the victim's SVL was 34.22 mm (a difference of 40.02 mm). The sex of the victim was unknown.

On 8 May 2020, the above cannibal salamander was grouped with 1.2.1 other *E. rathbuni* for breeding. Feeding was increased to three times per week. On 8 June 2020, the known cannibal salamander was found with the head and shoulders of another smaller female (30.27 mm SVL) in her mouth (Fig. 3). The animals were netted, and the smaller female was released alive. All salamanders were then housed separately.

Factors that may trigger cannibalism include resource scarcity, density, and opportunity. Cannibalism may be a widespread occurrence in this species, given its life history (long lifespan, slow growth, low metabolism, and low reproductive rate) and the stable, low energy environment in which it occurs. Institutions that house this species should take care to prevent cannibalism from occurring, including housing only salamanders of similar size together, maintaining low tank densities, and ensuring that adequate food is always provided.

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CROCODYLIA — CROCODILIANS

CAIMAN YACARE (Yacare Caiman). TRIPLETS. The Broad-snouted Caiman (*Caiman latirostris*) and Yacare Caiman (*Caiman yacare*) are the two crocodylian species that inhabit Argentina (Prado et al. 2012. Cuad. Herpetol. 26. Suppl 1:403–410). They can be easily differentiated based on species-specific morphological features (e.g., cranial and nuchal structures). These two species are broadly sympatric throughout their distribution in Argentina, although the *C. latirostris* appears to be allopatric across a larger area.

In Argentina, ranching occurs for both caiman species, with wild, field-collected eggs placed into artificial incubators until hatching. Once hatched, caiman are raised in captivity until they reach 1.2 m in total length, at which point they are harvested for their skins and meat; additionally, some individuals are released back to the wild. Results from these monitoring programs have indicated that the harvest of eggs from both species is sustainable, with populations continuing to increase over time (Larriera et al. 2008. Publicación Asociación de Amigos de Doñana 18:141–180). Argentinian ranching programs are recognized for their contribution to the conservation and biological knowledge base of both species (Villamarín et al. 2021. In Zucoloto et al. [eds.], Conservation Genetics of New World Crocodylians, pp. 1–30. Springer, Cham).

An important part of the program involves recording nesting details (e.g., GPS coordinates, number of eggs) and incubation and hatching data (e.g., incubation temperatures, time taken to hatch). After eggs arrive from the field, they are measured (length and width) and placed into plastic incubation containers inside an incubator. Most eggs from the same nest are usually of a similar size, unless they contain more than one embryo.

Although generally uncommon, multiple offspring hatched from the same egg has been reported for several oviparous reptiles. Twinning is more common than triplets, with very few cases of triplets documented in reptiles (Krauss and Horn 2004. Reptiles Austral. 1(4):14–15). Twinning has been reported in snakes (Marion 1980. Kansas Acad. Sci. 83:98–100), lizards (Hartdegen and Bayless 1999. Herpetol. Rev. 30:141; Mendyk 2007. Biawak 1:26–28; Leaché et al. 2013. Genome Biol. Evol. 5:2410–2419), turtles (Tucker and Janzen 1997. Copeia 1997:166–173; Cooper 2009. Introducción a la Medicina Forense Veterinaria Comparada México: Ed. Acirbia; Piovano et al. 2011. Folia Zool. 60:159–166) and crocodylians (Webb et al. 1998. Crocodiles of Australia. New Holland Publishers,