NATURAL HISTORY NOTES

CAUDATA — SALAMANDERS

***AMBYSTOMA JEFFERSONIANUM* COMPLEX (Jefferson Salamander complex). PREDATION.** Ground beetles from the family Carabidae are known to consume several salamander species, including *Ambystoma jeffersonianum* (Smith 1946. Herpetologica 3:67), *Plethodon jordani* (Lenski 1982. Ecology 63:1211–1217), *P. vehiculum* (Ovaska and Smith 2011. Can. J. Zool. 66:599–604), *Lissotriton vulgaris* (Bernard and Samolag. 2014. Entomol. Fenn. 25:157–160), *Triturus vittatus*, and *Salamandra salamandra* (Wizen and Gasith 2011. ZooKeys 100:181–191). The ground beetle species known to consume salamanders include species from the genera *Carabus*, *Epomis*, *Pterostichus*, *Scaphinotus*, and *Scarites*. Carabid beetles are widespread generalist predators of the forest floor. It is likely that many more instances of attempted predation on salamanders occur undetected because the salamanders and beetles are cryptic and frequently share microhabitats. Herein, we report a novel carabid beetle predator for an endangered salamander species in the *A. jeffersonianum* complex.

Our observation occurred near a vernal pool on the University of Toronto-Mississauga (UTM) campus in Mississauga, Ontario, Canada (exact coordinates undisclosed due to endangered species status). This pool contains a large number of *A. laterale-(2) jeffersonianum* (Jefferson-dependent Unisexual Salamanders) and contains some *A. jeffersonianum*. Hence, the salamanders are designated as *A. jeffersonianum* complex. On 20 July 2025 at around 0639 h, MCS found a newly emerged *A. jeffersonianum* complex metamorph (1.32 g) sitting motionless while a large *Carabus granulatus* (Granulated Ground Beetle) chewed on exposed flesh at the base of its tail. MCS snatched the beetle away to prevent further damage to the salamander, which was still alive (Fig. 1). A closer inspection revealed that part of the tail had been chewed off, and the tail showed signs of having been chewed in several places (Fig. 1). The skin was missing from the remaining tail of the salamander, and the flesh seemed to be chewed almost down to the bone at the base of the tail (Fig. 1). MCS and CKB also noted that the metamorph did not appear to have full mobility of its left hind leg, suggesting that the damage to the base of the tail was severe enough to include nerves and/or musculature.



FIG. 1. A predatory *Carabus granulatus* held in the top left and the individual of the *Ambystoma jeffersonianum* complex that the *C. granulatus* was preying upon (Left picture). The tail of the *A. jeffersonianum* complex (Right picture) was removed but not entirely consumed by the *C. granulatus*.

In a previous observation of beetle predation on *A. jeffersonianum*, Smith (1946, *op. cit.*) observed that two adults survived predation by a *Scarites subterraneus* (Big-headed Ground Beetle), despite having portions of their head consumed. The adult *A. jeffersonianum* exhibited no obvious defense other than ineffectively trying to hide their heads under their bodies (Smith 1946, *op. cit.*). The metamorph that we observed had lost its tail first, so it is possible that it tried to use the characteristic tail-waving defensive posture of *A. jeffersonianum* (Rand 1954. Copeia 1954:223–224; Brodie 1977. Copeia 1977:523–535) to deter the *C. granulatus* but was unsuccessful. It is also possible that *Ambystoma* salamanders do not have a viable defense against predation by large carabid beetles.

In addition to *C. granulatus*, which is introduced from Europe, our study site contains several other introduced carabid beetle species (e.g., *Pterostichus melanarius* and *C. nemoralis*). These species occur at high densities in the study site, with at least 12 individuals observed per evening in the summer. While no records exist yet for *C. nemoralis* depredating salamanders, *P. melanarius* has been reported to depredate the genus *Plethodon* (Ovaska and Smith 2011, *op. cit.*). Besides contributing to knowledge about invertebrate predators of amphibians, our observation has significant conservation implications for the *A. jeffersonianum* complex salamanders in areas where introduced carabid beetles, such as *C. granulatus*, occur. More research is needed to assess whether the interaction we observed was a one-off occurrence and whether introduced carabid beetles have negative effects on salamander populations. More research is also needed to evaluate the success of *Ambystoma* salamander defense strategies against introduced carabid beetles.

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***AMBYSTOMA OPACUM* (Marbled Salamander). ABNORMAL COLORATION.** On 24 September 2023, CFR found an adult male *Ambystoma opacum* beneath a log in an ephemeral woodland depression (7.6 km WNW center of Halifax, Halifax County, North Ca@rolina, USA; 36.34575°N, 77.67117°W; WGS 84). The

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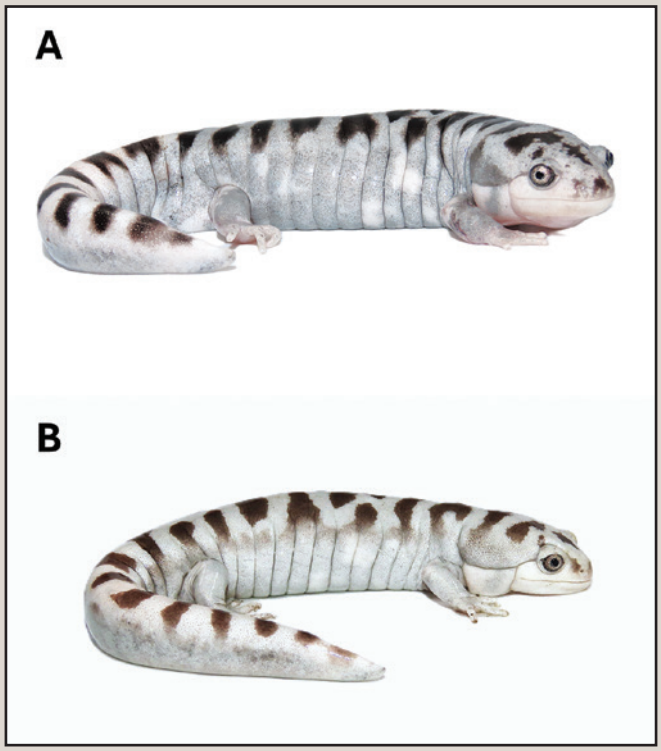


FIG. 1. Abnormally colored *Ambystoma opacum* from Halifax County, North Carolina, USA, on 26 September 2023 (A) and 4 August 2025 (B).

TABLE 1. *Ambystoma tigrinum* measurements from individuals trapped on 20 March 2025 in Hardin County, Ohio, USA.

	SVL (mm)	Total Length (mm)	Mass (g)	Head Width (mm)	Head Length (mm)
Larva 1	75.1	132.1	18.2	19.7	26.5
Larva 2	67.5	111.1	14.4	18.9	26.5
Larva 3	73.6	141.9	23.3	20.7	24.9

PHOTO BY TIM KRYNAK



FIG. 1. *Ambystoma tigrinum* larvae from Hardin County, Ohio, USA, from 20 March 2025.

specimen had an anomalous color and pattern perhaps best described as "reverse hypomelanism." The ground color of the dorsum, venter, head, and limbs was whitish and the salamander had gray-black markings on the dorsum and head—essentially a reversal of the typical color pattern for this species, which is normally black with white, gray, or silvery dorsal markings. The irises—typically dark brown in this species—were pale silvery-white with dark stippling (Fig. 1A). To our knowledge, this coloration has not been recorded in *A. opacum* previously. Pigmentation in individual amphibians may change over time (Fernandez and Collins 1988. Copeia 1988:928–938; Kraemer et al. 2012. Copeia 2012:748–755; pers. obs.), and the specimen has been maintained alive in captivity at the North Carolina State Museum of Natural Sciences to monitor for any such changes. As of 11 September 2025, there had been no significant change in its color pattern (Fig. 1B).

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***AMBYSTOMA TIGRINUM* (Eastern Tiger Salamander). OVERWINTERING LARVAE.** *Ambystoma tigrinum* typically breeds in fishless permanent ponds or ephemeral ponds with relatively long hydroperiods, which allows for lessened predation risk and ample time for development. In Ohio, USA, the species breeds in late February to early April, eggs develop for 19–50 days, and then larvae continue to develop over a period of two to five months before metamorphosis (Juterbock and Owen 2013. *In* Pfingsten et al. [eds.]. Amphibians of Ohio, pp. 157–174. Ohio Biological Survey, Columbus, Ohio). Here, we report evidence of aquatic larval overwintering in *A. tigrinum* in Ohio, which is a significant deviation from the natural history description of *A. tigrinum* in Ohio. However, the behavior we report is similar to populations in Michigan and Indiana, USA (Jones et al. 1993. Herpetol. Rev. 24:147-148; Whiteman et al. 1998. Herpetol. Rev. 29:141-142).

Ohio Northern University's Tidd-Oakes Farm (TOF; 40.3617°N, 83.5027°W; WGS 84), located in Hardin County, Ohio, has a wetland complex of permanent fish-filled, fishless, and ephemeral ponds hosting *A. tigrinum*. On 20 March 2025, three larval *A. tigrinum* (mean 72.1 mm SVL) were captured in a fishless permanent pond of TOF using mesh minnow traps. The *A. tigrinum* were brought to campus, weighed, measured, maintained outside overnight, photographed, and returned to the point of capture (Fig. 1; Table 1; Ohio Division of Wildlife Scientific Collection License number SC200047 to K. Krynak). Semlitsch (1983. Copeia 3:608–616) reported a mean SVL of 94.3–102.3 mm for adult *A. tigrinum*, with the smallest breeding adults recorded having 81 and 85 mm SVLs. Given that these salamanders at TOF were discovered within three weeks of adult breeding migrations into the pools (early March 2025), it is unlikely that they were larvae produced this year. In fact, an adult *A. tigrinum* was captured at the same time as these larvae and was actively laying viable eggs.

This overwintering behavior has been noted previously on the property in both fish-filled and fishless ponds. From 2020 to 2025, gilled larvae of advanced developmental stages have been documented from ponds with and without fish (e.g., *Lepomis cyanellus*) in months indicative of overwintering behavior (April 2020, June 2021, March 2024, June 2024, and this report). A study by Hassinger et al. (1970. Am. Midl. Nat. 1970:474–495) in New Jersey, USA, looked at the growth of larval *A. tigrinum* and found a mean SVL of 12.8 mm on 6 April. By 14 May, the SVL of the same group was 40.5 mm. The mean SVL of the three larvae found at TOF on 20 March 2025 was 72.1 mm, which is much

larger than that of the larvae in the Wassinger study. This further suggests that the individuals found on the Tidd-Oakes Farm were overwintering in the larval stage.

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***ANEIDES AENEUS* (Green Salamander). HABITAT.** *Aneides aeneus* is a rock outcrop specialist adapted to crevice refugia in cliffs, bluffs, and other vertical rock surfaces across the Appalachian Mountains and adjacent portions of North America. High crevice moisture and cool crevice temperatures are key attributes of *A. aeneus* habitat, leading to assumptions that the species is intolerant of human disturbances that alter outcrop structure (Smith 2024. Herpetol. Conserv. Bio. 19:23–32). While limited evidence of *A. aeneus* occupying constructed brick or concrete walls has been documented in the literature (Smith et al. 2018. Herpetol. Rev. 49:723–724), the species is assumed to be absent from natural rock features exposed and/or significantly altered by anthropogenic activities, such as blasting for surface coal mining or road construction (Hinkle et al. 2018. Herpetol. Conserv. Bio. 13:634–641).

In early 2025, during a regional survey of outcrop habitat in Wise, Dickenson, and Washington Counties in Virginia, USA, we documented numerous instances of *A. aeneus* occupying rock surfaces that had been exposed and modified by human activities. On 18 April 2025, we located five individuals, spanning all age classes, in a sandstone cliff that was created by blasting for railroad construction near Pound, Virginia (Fig. 1). Salamanders were found in crevice refugia throughout this feature, which was not exposed at the surface prior to construction activities. We subsequently located *A. aeneus* at two similar locations on 24 May 2025 and 18 June 2025, respectively—a limestone feature exposed by blasting for railbed construction near Mendota, Virginia, and a sandstone/shale highwall created by blasting on an abandoned surface mine near Fremont, Virginia. Geographic coordinates for each locality have been withheld due to conservation concerns.

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FIG. 1. Sandstone rock features exposed and modified during railroad construction. These features in this location host an *Aneides aeneus* population near Pound, Virginia, USA. Rails have been removed and the corridor converted into a gravel access road since initial construction.

The aforementioned observations, to our knowledge, provide the first documentation of *A. aeneus* occupying natural rock surfaces that were originally exposed and subsequently modified by construction activity. In each case, outcrops were located under dense, mature forest cover that had either been retained or regenerated following disturbance, providing extensive shading of rock surfaces (>90% canopy cover). Each constructed outcrop was also within close proximity (within 100 m) of naturally occurring outcrops that were not exposed or modified by human activities. While a detailed assessment of habitat conditions was beyond the scope of our work, it is likely that a combination of specific rock outcrop attributes and attributes related to the surrounding vegetative context is critical in determining if a given structure will be suitable for the species. However, our results suggest that *A. aeneus* is capable of occupying at least some rock outcrops created and/or modified by construction and mineral extraction. Managers should therefore include such rock surfaces, particularly those within intact, mature forests, when considering habitat protection and management approaches for *A. aeneus*.

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***ANEIDES AENEUS* (Green Salamander). HABITAT REPAIR.** The global decline of reptiles and amphibians has been well documented in the literature (Gibbons et al. 2000. BioScience 50:653–666). Habitat loss, degradation, and alteration are often listed as top factors contributing to population declines; however, these factors are most often discussed at large spatial scales despite evidence of localized negative impacts resulting from microhabitat destruction (Goode et al. 2005. Biol. Conserv. 125:47–54). As such, the use of artificial habitat structures has increased in areas of degraded or destroyed habitat. These artificial structures are effectively utilized by multiple species (Watchorn et al. 2022. Front. Ecol. Environ. 20:301–309). Likewise, habitat creation and restoration have shown encouraging results, though monitoring is required to minimize unanticipated negative consequences and ensure intended results (Goldingay and Newell 2000. Conserv. Biol. 14:1908–1912).

On 26 March 2023, while visiting a field site in South Carolina, USA, we identified vandalism of approximately 30 rock structures that provide important refugia for reptile and amphibian species of conservation concern in South Carolina. Most observed vandalism occurred to rocks with crevices, and they were either broken into several pieces and removed, or pried off larger rocks, to assist in gaining further access to previously inaccessible areas underneath. One of these locations included a boulder inhabited by a population of *Aneides aeneus*. Prior to vandalism, this portion of rock formed a crevice that was an important reproduction site for *A. aeneus*, with multiple successful nests documented each year (Newman et al. 2018. Herpetol. Rev. 49:511). Upon arrival and closer examination, we found a significant portion of the



FIG. 1. The rock after the vandalism of 26 March 2023 (top) and the rock after reattachment on 24 April 2024 (bottom).

rock, measuring approximately 89×59×18 cm, broken off and lying on the ground (Fig. 1). Markings on the remaining rock and broken portion were consistent with tools used for prying, confirming suspicion that it was removed intentionally.

On 24 April 2024, we reattached the broken portion of rock to the remaining original rock structure to restore the availability of this habitat for *A. aeneus*. Prior to beginning, we checked the area for salamanders to ensure our efforts were not negatively impacting any individuals. Using a masonry drill and a 1.27×40.64×45.72 cm bit, we drilled three holes through the detached rock in a triangular arrangement to aid in stabilization and to fine-tune adjustments during reattachment. The detached section of rock was roughly positioned under the location where it was removed. Using a combination of cinder blocks and bottle jacks, each side was alternately lifted and supported until the rock was positioned as close as possible to the original location. Using the three predrilled holes as a guide, we used the masonry drill and bit to drill into the intact rock. From underneath, we hammered a single anchor (Confast concrete fastening systems 1.27×30.48 cm stainless steel thundered wedge anchor; item# WAS1212) through all three holes and into the intact rock, leaving about 2.5 cm exposed. Using a socket wrench, we tightened a stainless-steel washer and nut that fit the threading of the anchor into place. Once all three anchors were securely in place, we were able to make minor adjustments to the rock by tightening or loosening each nut as needed. Once in place, we added an epoxy putty (J-B WaterWeld™) to the remaining exposed threads of the anchor to prevent tampering. The repair took approximately 3.5 hours (Fig. 1).

The repair was monitored one to three times weekly for the remainder of the year. On the morning of 20 June 2024, we documented the first adult *A. aeneus* using the repaired section. Three additional adults were seen near the edge of the repaired section. Over the remainder of the year, we documented several adult *A. aeneus* using the restored crevice. However, there appeared to be a preference for the original remaining intact section. A visual comparison of the repaired and intact rocks revealed a lack of moisture on the repaired section, possibly providing less suitable habitat, albeit habitat that did provide added protection by allowing salamanders to retreat further into the crevice. Our observations suggest that the repair was used and potentially beneficial for *A. aeneus* in the short term. However, replicating specific microhabitat conditions can be challenging, further emphasizing the importance and sensitivity of these structures. Future studies that monitor microhabitat variables over a longer period would be beneficial to better understand the effectiveness of similar habitat repairs as a management tool.

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***DESMOGNATHUS MARMORATUS* (Northern Shovel-nosed Salamander). REPRODUCTION AND MORPHOLOGY.** Natural-history variation in *Desmognathus marmoratus* is poorly known, particularly nesting and phenotype. During fieldwork (NCWRC permit # SWC25000144) at 1329 h on 6 September 2025, one of us (SMK) sampled *D. marmoratus* at a site in Hall Creek, Burke County, North Carolina, USA (35.60947°N, 81.78628°W; WGS 84; 407 m elev.). Populations at this locality are part of the nominal species but represent a geographic isolate in the Upper Catawba/Santee River drainage of the South Mountains (Pyron and Beamer 2023. Zootaxa 5270:262–280). The only two *Desmognathus* species documented at this site are *D. lycos* and *D. marmoratus* (Pyron et al. 2022. Ecol. Evol. 12:e8574).

SMK encountered a *D. marmoratus* nest on the underside of a flattened rock in the middle of the creek under normal flow (Fig. 1). The nest contained 25 eggs laid in a cluster. The mother was not observed but likely fled unnoticed during the disturbance of the riffle. The embryos were partially developed with visible pupils, gill buds, and all 4 limbs (albeit partially developed), but the eggs still had extensive yolk sacs. Very few nests from this species have been reported in the literature – Pope (1924. Am. Mus. Nov. 153:1–16) reported 28 eggs in a nest found on 6 August 1924 while Bishop (1924. NY State Mus. Bull. 253:88–102) reported 26 and 34 ovarian eggs in specimens collected on 12 October 1923, both near the type locality. The latter were presumably in early vitellogenesis for the following season. In contrast, the distantly related but ecomorphologically similar species *Desmognathus aureatus* (Southern Shovel-nosed Salamander) lays 27–54 eggs from May to July (Martof 1962. Am. Mid. Nat. 67:1–35).

SMK also encountered three xanthic specimens (Fig. 2), an adult (57 mm SVL; 97 mm total length) and two subadults (43 and 51 mm SVL; 68 and 81 mm total length), bringing the total of xanthic specimens to ca. 10 out of the ca. 100 total individuals encountered by the authors at this site in repeated visits since 2019. Such specimens exhibit mostly solid, bright-yellow pigmentation over all or part of their dorsal and lateral surfaces



FIG. 1. Nest of *Desmognathus marmoratus* in detail (A) and *in situ* (B), showing 25 eggs in a cluster on the underside of a flat rock under fast-moving currents in the middle of Hall Creek.

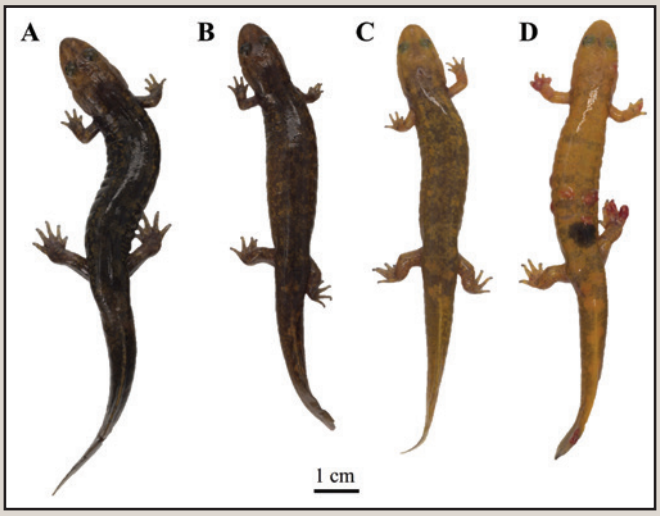


FIG. 2. Color variation in *Desmognathus marmoratus* at Hall Creek. Individuals were photographed at Highlands Biological Station (WCU IACUC protocol # 2024-06-20-01) in July 2024. Color variation at this creek ranges from: A) dark brown to black (70 mm SVL; 117 mm total length; 6.25 g); B) dark brown with tan splotches (62 mm SVL; 98 mm total length; 5.11 g); C) brown with yellow splotches (60 mm SVL; 100 mm total length; 4.33 g); and D) yellow with brown splotches (63 mm SVL; 101 mm total length; 4.82 g).

(Fig. 2C-D). This is in contrast to the ordinary dark-brown or black mottled pigmentation of normal adults (Fig. 2A-B). While scattered reports of this mutation exist for *D. marmoratus* (e.g., www.inaturalist.org; 15 Sep 2025), this is the only known population with a consistent occurrence. The mutation, previously referred to as "partial albinism" or "achromatosis", was observed to increase in frequency in populations of *D. aureatus* from "rare" in 1954 to ca. 15% in 1963 (Martof and Walton 1965. Physiol. Zool. 38:349–352). Those authors presented data suggesting that reduced tyrosinase activity resulting in reduced melanin synthesis after metamorphosis may underlie eventual pigment loss in adults. Whether this mutation or its variable frequency over time carries any adaptive or ecological significance is unknown, though it exhibits long-term persistence in geographically separated and genetically distant populations of at least two shovel-nosed species.

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***EURYCEA TROGLODYTES* (Valdina Farms Salamander). HABITAT.** *Eurycea troglodytes* is thought to have a limited range along the Western Edwards Plateau in Texas, USA. We observed adult and juvenile (< 25 mm) *E. troglodytes* at two hyporheic sites on the Frio River: Annandale Springs (Uvalde County) and a public low-water crossing on Ranch Road 337 in Leakey (Real County). Juvenile *E. troglodytes*, ca. 12 mm in total length, were believed to be around 2 months of age. The presence of juveniles indicates that breeding populations exist at these localities and represents an unreported novel habitat for neotenic *Eurycea*, which are thought to lay eggs in karst aquifers (O'Donnell et al. 2005. City of Austin Watershed Protection Review SR-06-06. 53 pp; www.ecos.fws.gov, 12 May 2026).

Both sites are in gravel banks on the edge of the Frio River where water was observed seeping from the gravels into the river. These flows may indicate hyporheic exchange. When seepage areas were discovered, a trial-and-error phase of digging with a shovel was undertaken in nearby gravels. Aquatic vegetation growing in gravels was also considered an indicator of flowing or persistent subsurface water. Because larger interstitial spaces are required for movement of *E. troglodytes*, cobble and gravel areas were preferentially selected for digging. Test holes were dug until clear percolating water was reached, which was observed at both collection sites. Observations occurred in fall 2024 and spring 2025, and *E. troglodytes* individuals were tail-clipped for genetic material before being released.

While water was observed discharging from the riverbanks into the Frio River at these sites, neither is known to contain a spring orifice. In general, neotenic salamanders are thought to maintain fidelity to spring openings and their vicinity (Sweet 1982. Herpetologica. 38:430-444). Sweet (1982) describes finding *E. troglodytes* by using a thermometer along a fault line, but our sites didn't show any signs of faulting or any obvious spring openings. Diffuse groundwater-upwelling into the hyporheic zone from underlying aquifers, including karst aquifers, is well-established (Dole-Olivier et al. 2022. Sci. Tot. Env. 843:156985), but the location, direction, and magnitude of groundwater-surface water exchanges can be variable in time and space and difficult to identify. Groundwater-upwelling zones have also been identified based on physical and geochemical signals, including underlying geology (Magliozzi et al. 2019. Env. Mod. & Software. 111:311-323), temperature (Briggs et al. 2014. J. Hydro. 519:1739-1751), radon (Marmonier et al. 2020. Sci. Tot. Env), and nitrate (Datry et al. 2008. Fund. Appl. Limno. 171:335-347), but these signals may be subtle, particularly in groundwater-dominated streams where geochemical differences between surface water and groundwater are small. Vertical hydraulic gradients cannot distinguish between groundwater upwelling from underlying aquifers and return flows from upstream surface-water downwelling (i.e., hyporheic exchange), which makes it difficult to

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FIG. 1. Digging in a gravel bed at the site near the low water crossing off Ranch Road 337 outside Leaky, Texas. Juvenile *Eurycea troglodytes* found at the site are pictured in the top left corner.

determine whether the observed *E. troglodytes* populations are inhabiting isolated deposits of alluvium or if they have direct access to the underlying aquifer. Given the extensive and continuous nature of the alluvial deposits and groundwater-dominated geochemistry of the Frio River, it seems plausible that *E. troglodytes* are moving freely through the hyporheic zone, including between distinct groundwater discharge points.

It has been hypothesized that neotenic *Eurycea spp.* of the Edwards Plateau retreat into the Edwards Aquifer to breed (Bendik et al. 2021. PeerJ. 11246), and that, at some locations, salamanders maintain some fidelity to a spring orifice, providing access to breeding habitat in the aquifer (Sweet 1982. Herpetologica. 38:430-444). We hypothesize that populations with no known access to the aquifer may result from individuals migrating in search of food and that, during flow recession, populations became isolated from the aquifer. The presence of juvenile *E. troglodytes* indicates that breeding occurs at these localities, though it is possible that an unknown connection to the aquifer is present. If this is the case, the observed juvenile *E. troglodytes* are a result of adult salamanders breeding in the aquifer and recently hatched juveniles migrating into the hyporheic zone in search of food. However, without being able to distinguish between groundwater upwelling from the aquifer and hyporheic exchange water, it is also possible that *E. troglodytes* populations are breeding directly within the hyporheic zone. This suggests that habitats in alluvial systems sufficiently mimic aquifer habitats and isolated populations may utilize hyporheic refuges to breed when no direct access to the aquifer is present.

To the best of our knowledge, we are the first to observe *Eurycea* breeding populations in the hyporheic zone, and our observations could have important impacts on the conservation of the species. *Eurycea troglodytes* populations' ability to persist in the hyporheic zone may be vital to the species' conservation in the Western Edwards Plateau because this habitat may serve as a refuge and/or dispersal corridor between springs. Either scenario could promote recolonization after disturbances such as drying, which is increasingly frequent and widespread in the region due to human water extraction and prolonged drought.

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***HYNOBIUS TSUENSIS* (Tsushima Salamander) and *HYNOBIUS TAGOI* (Tago's Salamander). SYNTOPIC REPRODUCTION.** Syntopic breeding by two congeneric species has been reported for some lentic breeding *Hynobius* salamanders, e.g., *H. nigrescens* and *H. lichenatus* (Hasumi and Kakegawa 1989. Nippon Herpetol. J. 37:1–9; Niwa 2024. Herpetol. Notes 17:509–512) and *H. takedai* and *H. nigrescens* (Akita 1985. Japan. J. Herpetol. 11:68–69). However, there is little information available for lotic breeding *Hynobius*, such as *H. tsuensis* and *H. tagoi*.

Hynobius tsuensis and *H. tagoi* occur on Tsushima Island, Nagasaki Prefecture, Japan. Both species breed underwater in mountain streams, but their breeding seasons differ from each other: late March to mid-April for *H. tsuensis* and early February to early March for *H. tagoi* (Niwa et al. 2023. Zootaxa 5339:201–236). The two species are endemic to the island, and their distributional ranges overlap widely, with several syntopic breeding sites (Niwa et al. 2023, *op. cit.*). However, detailed information on their breeding microhabitat and their interspecific interactions is still unknown.

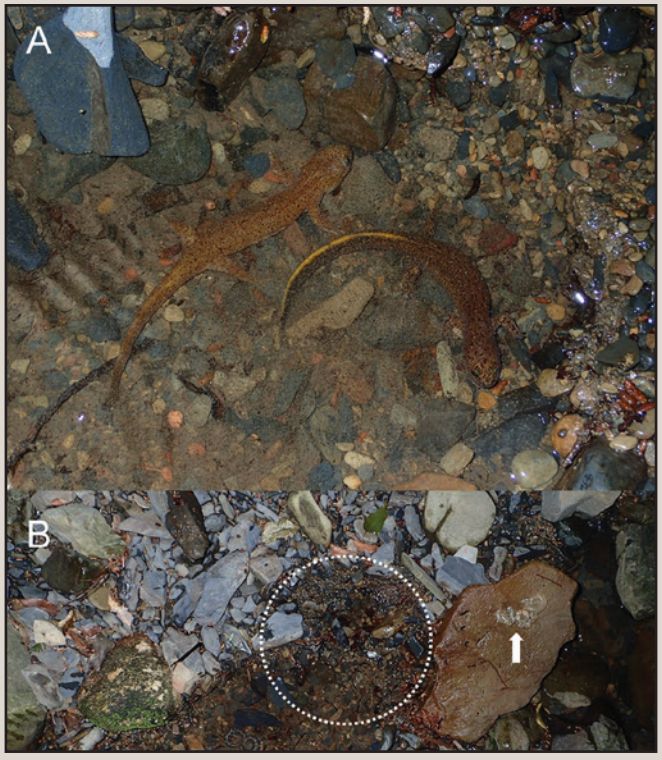


FIG. 1. A) An adult male *Hynobius tsuensis* (right: KUHE 60097) and an adult male *H. tagoi* (left: KUHE 60098) discovered under a stone in a stream on Tsushima Island, Japan; B) The breeding site where the two *Hynobius* salamanders (dashed line) and two egg-sacs of *H. tagoi* (arrow) were found.

On 30 March 2018 at 2140 h, I found one adult male each of *H. tsuensis* and *H. tagoi* under a stone (ca. 13 × 25 cm) in a stream in Mitsushima-machi, Tsushima City (Tsushima Island), Japan (Fig. 1A). Coordinates of the stream are not shown due to conservation concerns. The water depth under the stone was less than 3 cm, and air and water temperatures were 6.8 and 11.0°C, respectively. Both species were identified based on their coloration as described by Niwa et al. (2023, *op. cit.*). After observations, they were collected and deposited in the Graduate School of Human and Environmental Studies, Kyoto University (voucher numbers KUHE 60097 [*H. tsuensis*] and 60098 [*H. tagoi*]). The total length of the live *H. tsuensis* and *H. tagoi* was 125 and 123 mm, respectively. Neither external wounds nor digital defects were detected on them. Also, two pairs of egg-sacs of *H. tagoi* were attached to the stone (Fig. 1B). Developmental stages of the embryos in the egg-sacs were considered to be blastula to neural plate stage.

Both the *H. tsuensis* and *H. tagoi* were considered to be breeding adults because they were found underwater in the stream. Thus, my finding shows the coexistence of adult males of the two species during the breeding season at the syntopic site. Furthermore, it may suggest they share breeding microhabitat and may compete for the same microhabitat, although further studies are required.

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***PLETHODON CINEREUS* (Eastern Red-backed Salamander). DIET BIOFLUORESCENCE.** Biofluorescence occurs when organisms absorb high wavelengths of light and re-emit them at lower wavelengths. Although the phenomenon has been well studied in marine systems, recent reports in reptiles (e.g., Paul and Mendyk 2021. Herpetol. Rev. 52:221–237; Brecko and Pauwels 2024. Herpetol. Notes 17:411–418) and amphibians (Lamb and Davis 2020. Sci. Rep. 10:2821) have captured the interest of herpetologists. Despite an increase in reports of terrestrial biofluorescent species, very little is known about its function or source.

Biofluorescence in *Plethodon cinereus* was discovered in 2018 (Muñoz 2018. Herpetol. Rev. 49:512–513). It has since been identified as a male-biased, sexually dimorphic trait arising from ventral skin glands (Fig. 1A-B). Biofluorescence occurs only in adult *P. cinereus* and varies seasonally (Anthony et al. 2023. J. Herpetol. 57:262–269). Although males have greater numbers of and larger fluorescing glands, females also biofluoresce. The location of biofluorescent glands on the ventral tail is suggestive of a role in male-male competition and mate choice because this part of the tail is exposed during contests for territories (Jaeger and Gabor 1993. Copeia 1993:1171–1174) and during courtship (Gergits and Jaeger 1990. J. Herpetol. 24:93–95). Diet has been implicated in the production and maintenance of showy traits in many species (Olson and Owens 2005. J. Evol. Biol. 18:1534–1546), and in some species, biofluorescence has a dietary origin (e.g., Beckert et al 2017. Entomol. Heute 29:25–33). Because it is thought that a diet/phenotype linkage may function to promote signal honesty in males, fluorescence may be an example of a diet-sourced ornament.

Here, we document the first instance of fluorescing prey observed within the gut of a biofluorescent amphibian. At approximately 1355 h on 16 April 2024, an adult female *P. cinereus* was found in Ashtabula County, Ohio, USA, with visible fluorescence through the body wall. Gastric lavage was performed, and upon analysis, the fluorescent material was identified as a lepidopteran larva (Figure 1C-F). To the best of our knowledge, this is the first potential link between fluorescence in *P. cinereus* and the ingestion of fluorescent prey. Additionally, in October of 2024, we observed an adult male *P. cinereus* in Brown

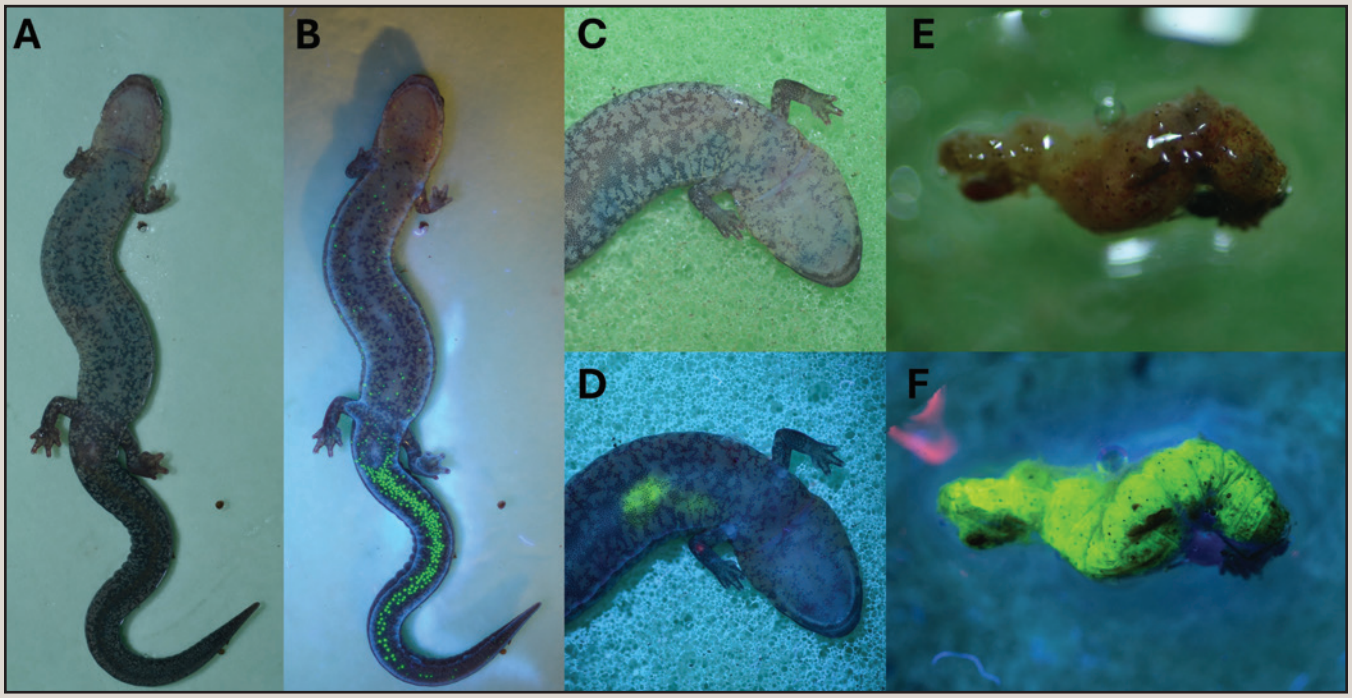


FIG. 1. Fluorescence in *Plethodon cinereus* and its prey. Male *P. cinereus* photographed ventrally under white light (A) and UV (365 nm) light (B) showing fluorescent glands. Female *P. cinereus* with fluorescent prey photographed under white light (C) and under UV light (D), showing fluorescent prey visible through the body wall. The fluorescent prey regurgitated by the *P. cinereus* under white light (E) and UV light (F).

County, Indiana, USA, with visible fluorescence around the gut region. In this case, we were unable to identify the prey species ingested.

Males and females of *P. cinereus* defend territories under rocks and logs on the forest floor, and these areas afford territorial residents exclusive access to prey, especially during dry periods when the surrounding leaf litter is inhospitable for foraging (Jaeger 1979. Herpetologica 35:90–93). High-quality territories are thought to be those with a preponderance of soft-bodied, easily digestible prey, such as the lepidopteran larva reported here. It is tempting to speculate that territorial residents with access to quality prey might advertise that fact to potential mates, and that only through such access can fluorescent traits be produced and maintained. Indeed, other soft-bodied prey that are sought after by *P. cinereus* fluoresce (e.g., Annelida and Collembola) (Jeng et al 2019. *In* Suzuki [ed.], Bioluminescence-Analytical Applications and Basic Biology, pp. 1–25. IntechOpen, London, UK). We speculate that fluorescence could serve as an honest signal of the quality of a territory holder – information that would be valuable to a potential mate or intruder. Additional research is needed to determine the frequency at which this occurs in nature and whether it plays a functional role in communication.

This research was approved by the John Carroll University (JCU) Institutional Animal Care and Use Committee (IACUC protocol 2505) and authorized under ODNR Division of Wildlife Permit SC230058.

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FIG. 1. A juvenile *Plethodon meridianus* from North Carolina, USA, emerging onto a mossy streamside rock after swimming away from the approaching photographer.

***PLETHODON MERIDIANUS* (South Mountain Gray-cheeked Salamander). HABITAT.** *Plethodon meridianus* is a relatively large plethodontid salamander in the *P. jordani* species complex that is endemic to the South Mountains region of North Carolina, USA (Wilson et al. 2024. Salamanders of the Eastern United States. The University of Georgia Press, Athens, Georgia. 481 pp.). This species is usually found in moist, forested habitats, taking refuge during the day under leaf litter, rocks, and logs and emerging on warm wet nights to forage (Wilson et al. 2024, *op. cit.*). Like other gray-cheeked salamanders, *P. meridianus* is thought to be primarily terrestrial in habit, although at lower elevations it is most abundant in streamside habitats due to their cooler temperatures and higher humidities (Radomski et. al. 2024. Herpetologica 80:91–96). *Plethodon meridianus* is direct-developing and does not have an aquatic larval stage; instead, it hatches from eggs laid in underground cavities on land (Wilson et al. 2024, *op. cit.*).

On 23 June 2025 at 2100 h, we observed a small juvenile (ca. 7 cm total length) *P. meridianus* crawling on a mossy rock on the bank of Jacob Fork near the South Mountains State Park Family Campground in Burke County, North Carolina, USA (35.59672°N, 81.62267°W; WGS 84; ca. 390 m elev.). Upon approaching the *P. meridianus*, it leapt into the water and swam rapidly for a short distance via lateral undulation of the body and tail (ca. 1 m). It then emerged from the water and climbed onto another mossy rock nearby (Fig. 1). The *P. meridianus* submerged its head and body completely underwater while swimming but remained close to the surface at all times.

Aside from occupying the forest floor, other members of the gray-cheeked salamander complex are known to occasionally climb up rock outcrops and plants, usually at night and in search of prey (Wilson et al. 2024, *op. cit.*). However, our observation represents what is, to our knowledge, the first documented example of aquatic habitat use by *P. meridianus* or any other gray-cheeked salamander. We did not approach the *P. meridianus* from the direction of the land adjacent to the peninsular rock it was on, so a terrestrial escape route was still unimpeded and available when it leapt into the water. The use of the aquatic habitat as a means of escape is therefore particularly interesting, as it suggests that the observed individual's reaction upon being confronted by a larger organism was to escape into the water, not on land, an instinct that is typical of semiaquatic and aquatic species but infrequently noted in terrestrial organisms. Our observation suggests that *P. meridianus* (and perhaps other closely related terrestrial plethodontids) may utilize aquatic habitats more frequently and readily than is traditionally thought.

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***PLETHODON PAULEYI* (Yellow-spotted Woodland Salamander). DIET.** *Plethodon pauleyi* is a small plethodontid salamander in the *P. wehrlei* species complex and is known from a few disjunct localities in West Virginia, Kentucky, Virginia, and Tennessee, USA (Wilson et al. 2024. Salamanders of the Eastern United States. The University of Georgia Press, Athens, Georgia. 481 pp.). *Plethodon pauleyi* is a rock outcrop specialist that shelters in rock crevices during the day and ventures out onto open rock faces at night, but little else is known of the natural history of this recently described and rarely encountered species (Felix et al. 2019. Zootaxa 4609:429–448).

On 18 June 2025 at 2300 h, we observed a *P. pauleyi* (ca. 10 cm total length) foraging on a rock outcrop in Summers County, West Virginia (exact locality withheld due to conservation concerns).

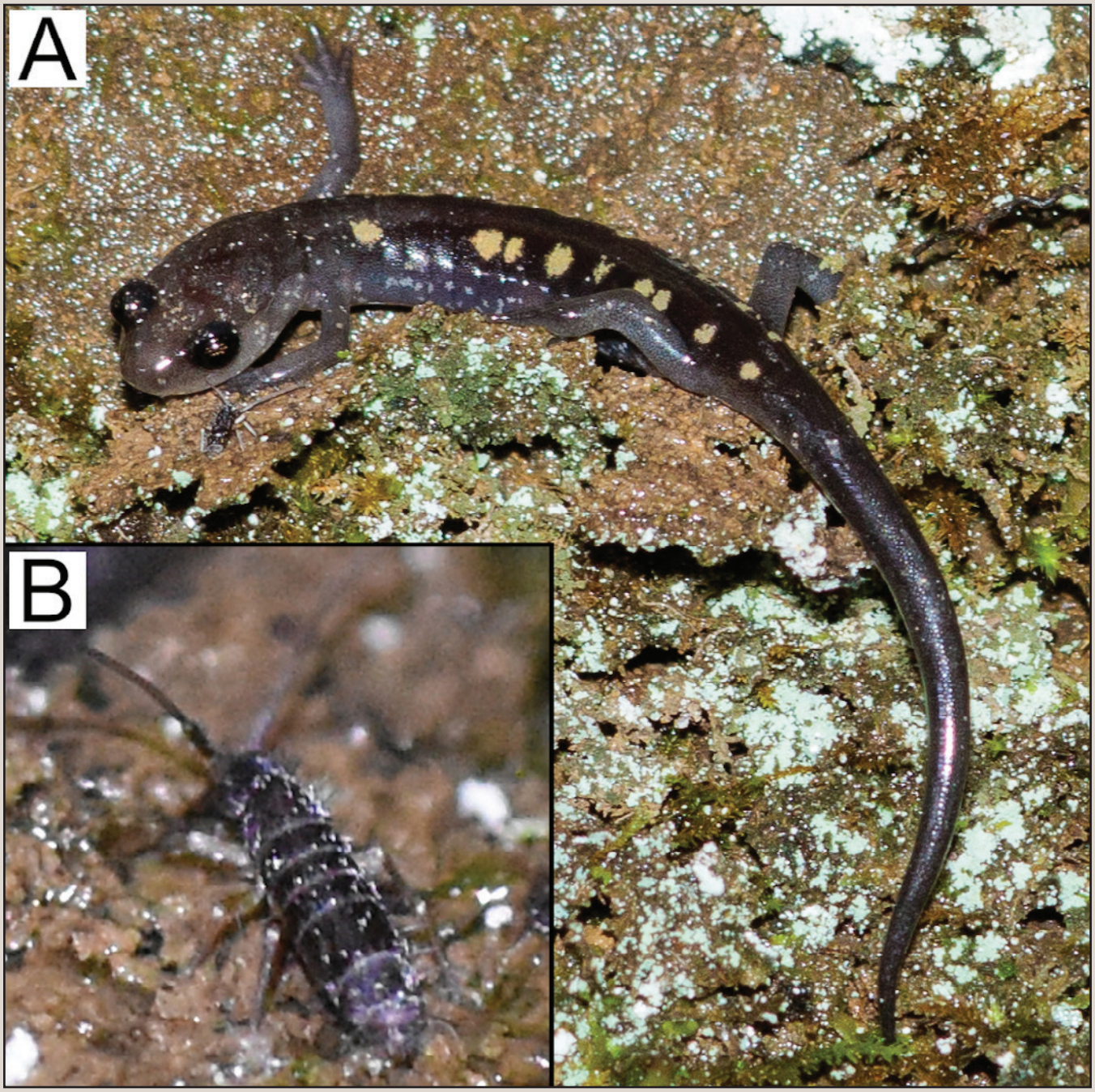


FIG. 1. *Plethodon pauleyi* from West Virginia, USA, shortly before consuming the springtail visible to the left of its head: A) the *P. pauleyi* and springtail as found on the rock face; B) a closer image of the consumed tomocerine springtail.

When we initially encountered the *P. pauleyi*, it was climbing on a vertical rock face with a tomocerine springtail (Collembola: Entomobryoidea: Tomoceridae: Tomocerinae) sitting to the immediate left of its head (Fig. 1). The *P. pauleyi* then proceeded to quickly swing its head leftward while opening its mouth, capturing and shortly thereafter consuming the springtail. We were unable to observe the extent to which tongue projection was involved in prey capture due to the speed at which the predation event took place, but there was no discernable distance between the mouth of the salamander and the springtail at the time of prey capture, suggesting that *P. pauleyi* may not utilize an especially elongated projectile tongue to capture prey. Both the *P. pauleyi* and the springtail were illuminated by artificial light sources during our observation, possibly impacting the predatory behavior; however, it seemed to us that the *P. pauleyi* had already located the springtail and was preparing to consume it by the time we first observed and illuminated it.

To our knowledge, our observation represents the first documented dietary record for *P. pauleyi*. The closely related *P. wehrlei* is known to consume a wide variety of invertebrate prey, including annelids, gastropods, myriapods, arachnids, insects, and collembolans (Hall 1976. J. Herpetol. 10:129–131). Collembolans are seemingly a scarce component of the diet of *P. wehrlei*, with weevils (Curculionidae), other insects, and

arachnids instead making up almost the entirety of this species' recorded diet (Hall 1975, *op. cit.*). Our observation alone is insufficient to infer whether collembolans constitute a greater proportion of the diet of *P. pauleyi*, though many of the ground- and soil-dwelling prey items preferred by *P. wehrlei* are potentially unavailable to *P. pauleyi* on rock outcrops. *Plethodon pauleyi* is a species of conservation concern throughout its range; a greater knowledge of its natural history, including its diet, will benefit efforts to protect this unique and threatened salamander.

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ANURA — FROGS

***BOANA BOANS* (Giant Gladiator Treefrog). DIET.** Frogs have been reported to be predators of bats, but this predation appears to be uncommon, and direct observations remain rare (Mikula 2015. Eur. J. Ecol. 1:71–80). Here, I provide the first photographic evidence of bat predation by *Boana boans*. On 14 January 2025 at 2145 h, I encountered a *B. boans* eating a bat (Order Chiroptera) at Fredberg Zintete Lodge, District Sipilawini, Suriname (4.63709°N, 55.41888°W; WGS 84). The frog was located next to a riverbank and was at ca. 1 m in height. The bat was only partially ingested, with the wrists (distal end of both radii) protruding out of the mouth of the *B. boans*. I was not able to identify the species of bat. This represents, to my knowledge, the first observation of bat predation by a member of the genus *Boana* in Suriname. This event further exemplifies the poorly understood role of frogs as predators of bats.



FIG. 1. A *Boana boans* preying upon a bat.

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***BUFO FORMOSUS* (Eastern Japanese Toad). ECTOPARASITE.** Ectoparasitic hematophagous leeches (Annelida: Hirudinea) on anurans have been reporterd in several countries (e.g., Barta and Desser 1984. J. Wildlife Dis. 20: 180–189; Rocha et al. 2012. Comp. Parasitol. 79: 352–356). In Japan, a total of seven species of anurans (including *B. formosus*) were detected from invertebrate-derived DNA (iDNA) of a terrestrial hematophagous leech, *Haemadipsa japonica* (Hanya et al. 2019. Ecol. Res. 34: 842–855; Morishima et al. 2020. Ecol. Evol. 10: 6030–6038). However, direct observations in the wild of these ectoparasites on anurans are rare. Therefore, detailed information on the ectoparasite *H. japonica* on Japanese anurans remains unknown.



FIG. 1. A juvenile *Bufo formosus* with an attached *Haemadipsa japonica* (arrow) in Akita, Japan.

Bufo formosus is a terrestrial toad endemic to the eastern parts of Honshu Island, Japan (Fukutani et al. 2023. PeerJ 11:e16302). The distributional range of *B. formosus* partly overlaps that of *H. japonica*, which occurs on the Japanese islands of Honshu, Shikoku, Kyushu, and their adjacent islands.

On 15 August 2025 at 1238 h, in Akita City, Akita Prefecture, Honshu Island, Japan (39.80°N, 140.22°E; WGS 84; 152 m elev.), I observed a juvenile *B. formosus* (ca. 15 mm SVL) with an attached *H. japonica* on a pathway in a conifer-broadleaf mixed forest containing *Cryptomeria japonica* (Japanese Cedar), *Fagus crenata* (Japanese Beech), and *Quercus serrata* (Jolcham Oak). The *H. japonica* had attached its oral and caudal suckers to the venter and left hindlimb of the *B. formosus*, respectively (Fig. 1). Air and ground temperatures were 27.0 and 23.3°C, respectively. Additionally, seven juvenile *B. formosus*, five *Rana tagoi* (Brown Frog), and more than 140 *H. japonica* were discovered from the pathway. To the best of my knowledge, this is the first record of the direct observation of an ectoparasitic *H. japonica* on a *B. formosus*.

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***BUFO (INCILIUS) NEBULIFER* (Gulf Coast Toad). MALFORMATION.** Physical anomalies have been previously documented in many taxa of anurans (Maden 1982. Am. Zool. 22:131–142; Ascoli-Morrete et al. 2019. Austral Ecol. 44:1025–1029). Among these abnormalities, those of the limbs are well documented and are shown to have various causes, including parasitic infections (Sessions and Ruth 1990. J. Exp. Zool. 254:38–47; Johnson et al. 2024. Int. J. Parasitol: Parasites Wildl. 24:100965) and physical injury (Michael and Hassona 1982. J. Exp. Zool. 220:207–218).

At 2151 h on 1 May 2025, a male *Bufo* [=*Incilius*] *nebulifer* (UTADC 10100) was observed with a bony projection projecting from the left shoulder (Fig. 1). This individual was found in San Marcos, Texas, USA, among apartment landscaping (29.84857°N,

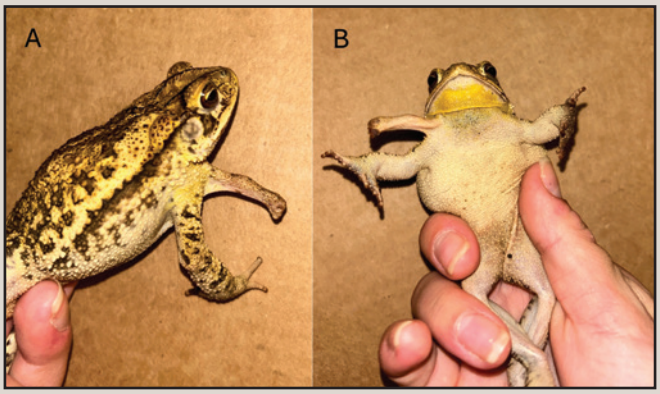


FIG. 1. Photographs showing a bony abnormality extending from the right side of the throat area in a *Bufo nebulifer* found in San Marcos, Texas, USA. The left portion of the image (1A) shows the bony protrusion from a side profile, and the right portion of the image (1B) shows a ventral view of the individual.

97.94844°W; WGS 84; 195 m elev.). This protrusion had no apparent joints within the structure or at its base. The end of the projection formed a sort of club, which appeared to potentially be an underdeveloped foot. The skin covering the projection was of similar thickness and texture to that on the forelimbs, and skin patterning was present on the dorsal side. We have chosen to classify this observation as a bony protrusion as there are no apparent joints within the deformity, and therefore, it cannot be classified as an extra limb (Meteyer 2000. Biol. Sci. Rep. USGS/BRD/BSR. 5:1–16). This is the first account, to our knowledge, of such an abnormality in *B. nebulifer.*

Furthermore, no deformity matching that seen in this individual seems to have been previously reported in bufonids. However, limb malformations have been increasingly documented in bufonids. For example, there are cases of brachydactyly and ectrodactyly in Brazilian bufonids (Ascoli-Morrete et al. 2019. Austral Ecol. 44:1025–1029). In Honduras, the congener of *B. nebulifer*, *Bufo valiceps,* has been documented showing tumors, brachydactyly, and ectrodactyly (Salguero-Sánchez et al. 2024. Stud. Neotrop. Fauna Environ. 59:1137–1146). Finally, a *Bufo* [=*Anaxyrus*] *terrestris* female from Mississippi, USA, was documented showing bilateral polyphalangy (Kreiser et al. 2016. Herpetol. Rev. 47:105).

The urban context of the deformed toad may hold some significance. Benvindo-Souza et al. (2025. Environ. Res. 271:121144) found that proximity to anthropogenic environmental contaminants was correlated with a significant increase in mutagenic damage. Such mutagenic damage is one potential causative factor of physical abnormalities such as the one observed here. Though a previous physical injury cannot be ruled out, there was no evidence of a prior event (e.g., no scarring or other evidence of injury). The individual was collected under a Scientific Permit for Research (SPR-0102-191) issued to Michael R. J. Forstner.

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***DENDROPSOPHUS* SP. (yellow treefrogs). PREDATION.** Predaceous terrestrial arthropods, including spiders, scorpions, centipedes, and various insects, are abundant in neotropical regions and are known to prey on amphibians and reptiles (Toledo et al. 2007. J. Zool. 271:170–177). However, records of orthopterans preying on frogs under natural conditions are rare and poorly documented (Toledo et al. 2007, *op. cit.*; Mora et al. 2023. Carib. J. Sci. 53:222–228). Among potential orthopteran predators in the neotropics, katydids (Insecta: Orthoptera: Tettigoniidae) are highly diverse, widely distributed, and seasonally abundant in the Amazon Forest. The genus *Copiphora* comprises 27 species and is easily distinguished from other katydids by its slanting head shape and larger body size (Mendes and Oliveira 2019. Entom. Com. 2019:ec01008). These katydids possess sharp and powerful mandibles and exhibit a varied diet that includes seeds and fruits, snails, insects (including other katydids), and even small vertebrates (Mendes and Oliveira 2019, *op. cit.*; Núñez-Escalante et al. 2021. Rept. Amphib. 28:302–305).

Copiphora longicauda has been recorded in several South American countries, including Colombia, Peru, French Guiana, and Suriname, and was recently documented in Brazil (Mendes and Oliveira 2019, *op. cit.*) Here, we report a predation event involving *C. longicauda* and an adult *Dendropsophus* sp. observed under natural conditions. On 24 January 2025, at ca. 1955 h, during an amphibian survey at a temporary pond along an ecotourism trail at Juma Lake Lodge, Paraná do Mamori River, Autazes, Amazonas, Brazil (3.4301°S, 59.4820°W; WGS 84; 32 m elev.), we observed a male *C. longicauda* preying on an adult *Dendropsophus* sp. ca. 80 cm above the water on the petiole of a palm (Fig. 1). Both specimens were collected; however, during transport to the camp, the *C. longicauda* completely consumed the frog. The C. longicauda was deposited in the Coleção Zoológica Paulo Burhein at the Federal University of Amazonas (UFAM).

Due to the complete consumption of the prey during transport, it was not possible to determine the species of *Dendropsophus*. The genus *Dendropsophus* (Hylidae) comprises 105 documented species (Frost, 2025. Amphibian Species of the World: an Online Reference. Version 6.2; amphibiansoftheworld.amnh.org; 29 March 2025) that are highly diverse in the Amazon, with multiple species coexisting in the same habitats. As a result, species identification is challenging in the absence of diagnostic morphological traits (Aguirre et al. 2025. Evol. Syst. 9:7–31). To the best of our knowledge, this observation represents the first published record of a katydid preying on a *Dendropsophus* sp. Reports of insects feeding on adult amphibians are scarce, and this is only the second documented case of *Copiphora* preying



FIG. 1. *Dendropsophus* sp. being preyed upon by a *Copiphora longicauda* in Autazes, Amazonas, Brazil.

on an anuran, with the first being the predation of *Pristimantis caryophyllaceus* (Strabomantidae) (Mora et al. 2023, *op. cit.*). This discovery also extends the known geographical range of *C. longicauda* to the southern region of the Amazonas River, marking only the fourth recorded sighting of this species in Brazil.

Specimen collection was done under collection permit no. 77979 issued by the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio). AL thanks CAPES for funding through a Ph.D. scholarship.

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***DRYOPHYTES SUWEONENSIS* (Suweon Treefrog). BEHAVIOR.** The luring strategy is a fascinating predatory method widely observed in fishes, reptiles, insects, and even plants, wherein diverse organisms mimic prey or mates or exploit sensory biases to enhance predation success (Bulbert and Wignall 2016. Curr. Biol. 26:1212–1213). Such luring techniques reduce search costs and mitigate predation risks, providing a unique opportunity to understand signal design and evolutionary processes. On 26 June 2025 at 2225 h, in reed beds at Pyeongtaek, South Korea (coordinates are withheld for conservation reasons), we observed a unique behavior in *Dryophytes suweonensis*. A single male *D. suweonensis* was found on a reed leaf, persistently tapping and flicking the elongated third toe of each hind foot. Recent studies have reported that *Dendrobates tinctorius* (Dyeing Poison Frog) exhibits posterior toe tapping behavior to lure prey (Parrish and Fischer 2024. Ethology 130:e13465). We presume the toe tapping exhibited by the male *D. suweonensis* also functions as a prey-luring behavior. Toe tapping on reed leaves, which are considered the primary habitat of *D. suweonensis* (Koo et al. 2024. *In* Proceedings of the 2024 Korean Society of Environmental Biology Annual Conference pp. 86), is likely advantageous for attracting a more diverse range of prey compared to terrestrial environments.



FIG. 1. A male *Dryophytes suweonensis* exhibiting toe tapping behavior on a reed leaf.

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***DRYOPHYTES EXIMIUS* (Mountain Treefrog). MICROHABITAT USE.** *Dryophytes eximius* is a hylid frog endemic to Mexico that inhabits the grasslands and temperate forests of mountainous regions. It is a mainly nocturnal species and is very abundant during its breeding season, which occurs in the rainy season (from June to August). The males vocalize with loud choruses near bodies of stagnant and temporary water formed by summer rains. They call from the beginning of twilight until late at night (Ramírez-Bautista et al. 2009. Herpetofauna del Valle de México: Diversidad y Conservación. CONABIO, UAEH, Hidalgo, Mexico. 123 pp.).

Amplexus, egg laying, and larval development occur from July to August (Lemos-Espinal and Dixon 2016. Amphibians &



FIG. 1. *Dryophytes eximius* tadpoles inside containers in different years: A) 2019, B) 2023, and C) 2025.

Reptiles of Hidalgo, Mexico. CONABIO, Mexico City, Mexico. 763 pp.); however, reproduction and larval development may be extended until November. Although *D. eximius* is a species with a very marked annual reproductive pattern, there are factors that can affect larvae, such as changes in rainfall patterns and hydroperiod, pollution, predation, and microhabitat destruction. The availability of suitable sites for *D. eximius* to reproduce and develop has been decreasing every year (Piñon-Flores et al. 2021. J. Nat. Cons. 64:1617–1318).

For the past eight years (2017–2025), the development of *D. eximius* larvae has been monitored in San José "El Vidrio", Municipality of Nicolas Romero, Estado de México, México (19.6455°N, 99.3831°W; WGS 84; 2644 m elev.). Día de Muertos festivities occur every year in the local cemetery, where *D. eximius* breeds (Osnaya-Becerril et al. 2022. Rev. Lat. Herpetol. 5:154–157), and *D. eximius* tadpoles develop in the containers or jars that are used as vases to decorate the site and subsequently accumulate rainwater (Fig. 1 A-C).

Once the Día de Muertos festivities are over, the flowers that were placed in the containers dry out or decay. This organic matter remains at the bottom of the containers until the rainy season begins, where, approximately one month after the first heavy rains, *D. eximius* returns to this site to reproduce and deposit eggs in the containers. Later, the tadpoles grow and develop by consuming this organic matter, the vegetation that may grow around them, and possibly microalgae. This event provides an opportunity for the species to survive in this locality, although *D. eximius* has been known to develop in temporary ponds in the same area (Tenorio-Mendoza et al. Herpetol. Rev. 55: 9–10).

Therefore, the use of these artificial shelters provides an opportunity for the larvae of *D. eximius* to complete their development. However, this also causes some individuals to prolong their development and be affected again with the Día de Muertos festivities, since people gather to alter the cemetery, by removing the grass, cleaning the containers, and placing new flowers, causing most of the remaining larvae to die. Therefore, it is important to involve the community in communicating the importance of the containers used by *D. eximius* tadpoles.

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***ELEUTHERODACTYLUS PLANIROSTRIS* (Greenhouse Frog). PREDATION.** *Eleutherodactylus planirostris* is a small (1–2 cm), terrestrial, direct-developing frog native to Cuba, the Bahamas, and the Cayman Islands (Dugo-Cota et al. 2019. Ecol. Lett. 22:884–893). The species was first recorded in Florida, USA, in 1863 as a non-native species (Cope 1863. Proc. Acad. Nat. Sci. Philadelphia. 15:43–54). Since its establishment, *E. planirostris* has spread throughout Florida (Mularo 2023. J. Herpetol. 57:381–389). *Anolis cristatellus* (Puerto Rican Crested Anole) is a small to medium-sized lizard (4–7 cm SVL) native to Puerto Rico and was introduced to Florida around 1975 (Schwartz and Thomas 1975. A checklist of West Indian amphibians and reptiles. Carnegie Museum of Natural History, Pittsburgh, Pennsylvania. 75 pp.). *Anolis cristatellus* is a generalist predator of arthropods and small vertebrates (Walker et al. 2019. Anolis Newsl. VII: 96–300), including conspecifics (Campbell et al. 2018. Herpetol. Rev. 49:27–28). *Anolis cristatellus* and *E. planirostris* are commonly found in sympatry in south Florida (Clements et al. 2025. Ecol. Evol. 15:e71556). Here, we describe a successful predation event on an *E. planirostris* by a female *A. cristatellus* in South Florida.

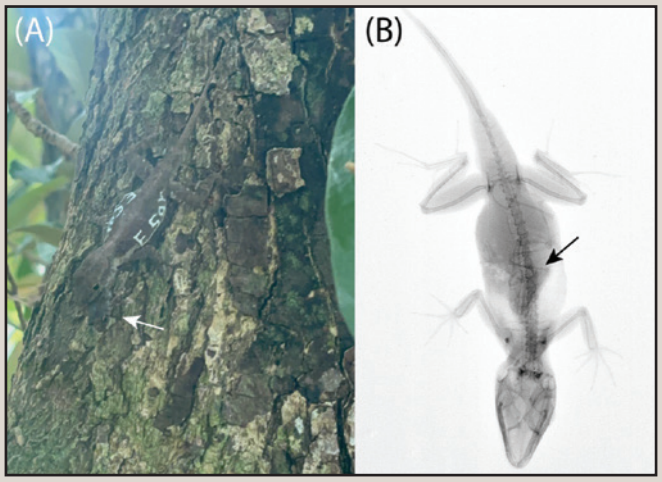


PHOTO BY KATHLEEN GRIFFIN

FIG. 1. A) *Anolis cristatellus* consuming an *Eleutherodactylus planirostris*; B) radiograph of the same individual, showing the skeleton of the consumed *E. planirostris*.

At 1029 h on 4 July 2025, we observed an adult female *A. cristatellus* (ca. 38 mm SVL) consuming an *E. planirostris* ca. one meter from the ground on a tree trunk (Fig. 1A) at Fairchild Tropical Botanic Garden in Coral Gables, Florida (25.67679°N, 80.27146°W; ca. 1 m elev.). The *A. cristatellus* was captured three hours later (1331 h), and a radiograph confirmed a successful predation event and full ingestion of the *E. planirostris* (Fig. 1B). To our knowledge, this is the first recorded instance of predation on *E. planirostris* by *A. cristatellus*.

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***EUPHLYCTIS ADOLFI* (Adolf Skipper Frog). DIET.** *Euphlyctis adolfi* is a common dicroglossid frog species distributed across South Asia and is known for its adaptation to both aquatic and semi-aquatic habitats. It is typically found in streams, riverbanks, marshes, paddy fields, and other wetland environments. In India, the species occurs widely across the North-Eastern states and the lower foothills of the Himalayas.

Here, we report the predation of an aquatic hemipteran, *Ptilomera assamensis*, by *E. adolfi*. An *E. adolfi* (36.1 mm total length), collected from a hill stream in Simoksongital village, South West Garo Hills District, Meghalaya, India (23.58234°N, 90.08986°E; WGS 84; 41 m elev.), was deposited in the National Zoological Collection, Zoological Survey of India, Shillong (Reg. No. V/A/NERC/ZSI/1972). During preservation, two appendages of an aquatic hemipteran were noticed protruding from the mouth of the specimen (Fig. 1). Upon making an incision in the abdominal region, a large, undigested, and intact *P. assamensis* was recovered (Fig. 2).

This observation provides new dietary information for *E. adolfi*, a species for which feeding habits have not been

PHOTO BY BIKRAMJIT SINHA



FIG. 1. A *Euphlyctis adolfi* exhibiting protruding appendages of an ingested *Ptilomera assamensis*.

PHOTO BY JENNIFER LYNGDOH

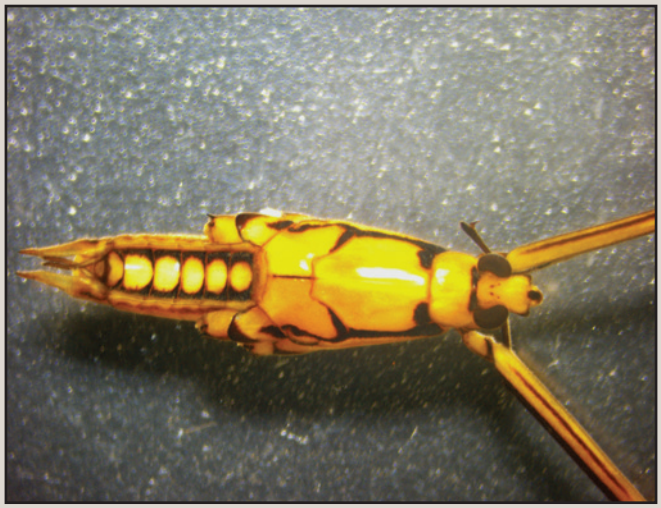


FIG. 2. The ingested *Ptilomera assamensis* extracted from the gut of a *Euphlyctis adolfi*.

documented. This work was supported by permit number SBB.19/ABS/Pt.-IV/8785, dated 12 January 2023 and issued by Meghalaya Biodiversity Board, Shillong, Government of Meghalaya, India.

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HADDADUS BINOTATUS (Clay Robber Frog). **PREDATION.** Water bugs, inhabiting a variety of aquatic environments, are widely recognized for their active predatory behavior, with a generalist diet that includes both vertebrates and invertebrates (Hirai 2007. Entomol. Sci. 10:333–336). The most frequent records of water bugs preying upon vertebrates involve small vertebrate prey when compared with the body size of the predatory water bug, although there are occasional reports of larger species being consumed (Ohba 2011. Insects 2:435–446; Luna et al. 2022. Herpetol. Notes 15:741–746). Anurans are known prey of water bugs, including belostomatid (Hemiptera) nymphs (Ohba 2011. Entomol. Sci. 14:364–365; Gambale et al. 2014. Rev. Chil. Hist. Nat. 87:1–5). There are numerous records of water bugs preying upon tadpoles, juvenile anurans, and small adult anurans (Toledo 2003. Phyllomedusa 2:105–108; Ceron et al. 2017. Herpetol. Notes 10:263–265). However, predation on fully grown adult anurans remains rarely documented.

Haddadus binotatus (Craugastoridae) is a direct-developing anuran species endemic to the Atlantic Forest of Brazil (Hedges et al. 2008. Zootaxa 1737:1–182). It has both diurnal and nocturnal habits, is strictly associated with the forest environment, and is commonly found in the leaf litter, which makes interactions with aquatic predators unusual (Guimarães et al. 2019. Anfíbios do Parque Estadual do Rio Doce, Minas Gerais. Second edition. MZUFV, Viçosa, Minas Gerais. 57 pp.).

During a field expedition on 13 January 2025, 2055 h, in Serra do Padre Ângelo, Municipality of Conselheiro Pena, Minas Gerais, southeastern Brazil (19.23165°S, 41.57282°W; WGS 84; 1048 m elev.), we recorded a novel case of predation on *H. binotatus* by a fifth instar water bug nymph of the *Belostoma testaceopallidum* species group (Hemiptera: Belostomatidae). The event was observed in a small dam that was located at the forest edge and was adjacent to a dirt road and near a bamboo grove. We saw the nymph holding the already dead *H. binotatus*, which was partially submerged (Fig. 1). The piercing-sucking mouthparts of the nymph can be seen inserted into the body of the *H. binotatus*. To facilitate more accurate taxonomic identification, we collected and measured both individuals (governmental collection permit SISBIO 68199) and photographed them. We preserved the *H. binotatus* in 10% formaldehyde and deposited it in the Amphibian Collection of Centro de Coleções Taxonômicas da Universidade Federal de Minas Gerais (UFMG-AMP22781). The nymph of the *B. testaceopallidum* species group was preserved in 70% ethanol and deposited in the collection of Laboratório de Organismos Aquáticos da Universidade Estadual de Santa Cruz (Hete0050).

The *H. binotatus* individual measured 41.02 mm SVL, while the *Belostoma* nymph measured only 22.38 mm total length



FIG.1. *Belostoma* nymph preying on an adult *Haddadus binotatus* in Serra do Padre Ângelo, Conselheiro Pena, Minas Gerais, Brazil.

PHOTOS BY G.C. SANTOS

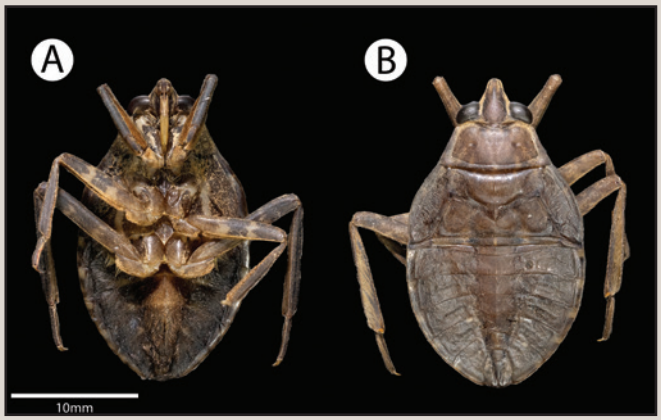


FIG. 2. Ventral (A) and Dorsal (B) views of the fifth instar nymph of the *Belostoma testaceopallidum* species group (same individual as in Fig. 1).

(Fig. 2). The presence of *H. binotatus* in an aquatic environment represents atypical behavior for the species, and predation by a *Belostoma* nymph significantly smaller in size makes the event even more remarkable. This record highlights the predatory potential of juvenile stages of *Belostoma* nymphs. This record contributes not only to the ecological knowledge of *H. binotatus* but also broadens our understanding of the trophic plasticity of *Belostoma* nymphs.

This work was supported by the Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG), through the project 'BioChronos: Monitoramento da Degradação Oculta, Biodiversidade, Funções e Serviços Ecossistêmicos na Interface Terra-Água do Rio Doce' (Grant APQ-00031-19). We also thank Julio César Ribeiro and Recanto Serra do Padre Ângelo for their valuable support during the field campaign, including guidance through the forested areas and logistical assistance.

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***HYLARANA INTERMEDIA* (Rao's Intermediate Golden-backed Frog). DIET.** A *Hylarana intermedia* was seen feeding on a *Raorchestes luteolus* (Coorg Yellow Bush Frog) on 16 November 2023, at ca. 2130 h, in an *Areca catechu* (Betel Nut) plantation, at Agumbe, Karnataka, India (13.57528°N, 75.10722°E; WGS 84; 701 m elev.).

An individual *Hylarana intermedia* was perched on a shrub ca. 1.2 m above the ground, which caught our attention as *Hylarana intermedia* is a predominantly stream-dwelling species. Upon closer observation, we realized this individual was feeding on an *R. luteolus*, with the prey already partly consumed. Before we could photograph the behavior and the prey clearly, the *H. intermedia* had almost finished swallowing its prey, leaving only the hind limbs visible (Fig. 1). Our identification of *R. luteolus* was based on its yellowish-brown color with distinct continuous dark longitudinal lines (Garg et al. 2021. PeerJ 9:e10791).

This observation occurred during the monsoon season, a time when *R. luteolus* is most active. To the best of our knowledge, this is the first time *H. intermedia* has been observed preying upon an *R. luteolus*, an arboreal frog.



PHOTO BY JORIS VAN DE VEN

FIG. 1. A *Hylarana intermedia* perched on a shrub and feeding on a *Raorchestes luteolus.*

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***INCILIUS ALVARIUS* (Sonoran Desert Toad). BREEDING BEHAVIOR.** *Incilius alvarius* is a large toad found in the Sonoran Desert of the southwestern United States and northwestern Mexico. The species breeds in rain-formed pools primarily during the monsoon season from mid-July through mid-September (Sullivan and Malmos 1994. Herpetologica 50:146–156; Holycross et al. 2022. A Field Guide to Amphibians and Reptiles in Arizona, Second Edition, Arizona Game and Fish Department, Phoenix,

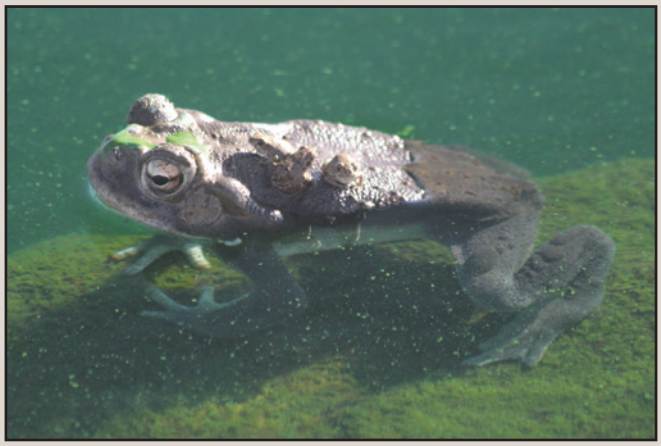


FIG. 1. An adult *Incilius alvarius* in a permanent pond with three newly metamorphosed individuals sitting on its back at DC Ranch, Scottsdale, Arizona. Note, the metamorph *I. alvarius* lengths are ca. half the size of the adult's parotoid glands.

Arizona. 176 pp.). Although there is one published account of breeding in a permanent cattle tank in southwestern New Mexico on 16 June 1992, which was independent of recent rainfall (Degenhardt et al. 1996. Amphibians and Reptiles of New Mexico, University of New Mexico Press, Albuquerque, New Mexico. 507 pp.), use of permanent water bodies appears rare. Here we report on an unusually early breeding event at an anthropogenic, cement-lined, permanent pond with fish in Scottsdale, Arizona.

An unusual early monsoon storm on the night of 1–2 June 2025 deposited 29 mm of rain within 24 hrs at a rain gauge (Maricopa Co. Flood Control District gauge: 33.6546°N, 111.8944°W; WGS 84) ca. 1 km to the immediate W of an effluent-filled artificial pond at DC Ranch, Scottsdale, Arizona (33.6487°N, 111.8869°W; WGS 84; 489 m elev.). Five weeks later, on the morning of 8 July 2025, we visited the site and found tens of thousands of recently metamorphosed (12–16 mm SVL; Fig. 1) *I. alvarius* in and around the pond, as well as six adults in the pond. On a follow-up visit on 11 July 2025, we again found tens of thousands of metamorphosed *I. alvarius*, although in lower numbers than the first visit, as well as four adult *I. alvarius* still in the pond. The presence of such high densities of newly metamorphosed *I. alvarius* five weeks after the storm suggests there was a breeding event on the night of 1–2 June.

To our knowledge, this is the earliest reported breeding activity of *I. alvarius* by ca. two weeks (Degenhardt et al. 1996, *op. cit.*) and only the second instance of this species breeding in a permanent water body. This is also the first instance of *I. alvarius* breeding in a water body with fish, with *Ctenopharyngodon idella* (White Amur) and *Pimephales promelas* (Fathead Minnow) both present in the pond.

These observations were conducted under a license (LIC #SP140065) from the Arizona Game and Fish Department issued to BK Sullivan. Thanks to R. Babb and T. Jones for discussions about the natural history of toads.

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***INCILIUS ALVARIUS* (Sonoran Desert Toad). PREDATION.** Despite their relative unpalatability, recently metamorphosed toads are highly vulnerable to predation as they leave the water, in part due to their small size and high densities. Numerous bird species are known to prey on recently metamorphosed *Anaxyrus boreas*, including *Perisoreus canadensis* (Gray Jay), *Turdus migratorius* (American Robin), and *Charadrius vociferous* (Killdeer) (Bull 2009. Herpetol. Conserv. Biol. 4:236–247), with the latter species also reported to prey on toadlets of *A. californicus* (Sweet and Sullivan 2005. *In* M. Lannoo [ed.], Amphibian Declines: The Conservation Status of United States Species, pp. 396–400. University of California Press, Berkeley, California). However, this list of bird predators on metamorphosed toads is likely woefully incomplete. Here we report on the predation of recently metamorphosed *Incilius alvarius* by four species of avian predators from an urban pond in Scottsdale, Arizona, USA.

On the morning of 11 July 2025, between 0655 and 0800 h, we visited an effluent-filled, artificial pond at DC Ranch, Scottsdale, Arizona (33.6487°N, 111.8869°W; WGS 84; 489 m elev.), to take notes on the emergence of tens of thousands of metamorphosing *I. alvarius* from a breeding event ca. five weeks prior. For the first ca. 45 minutes, we did not see any birds as we slowly walked the perimeter of the pond, observing scores of small *I. alvarius* dispersing across the cultivated lawn toward native desert vegetation ca. 15 m away. At ca. 0735 h, a small mixed-foraging flock of birds, including two *Quiscalus mexicanus* (Great-tailed Grackle), two *Toxostoma curvirostre* (Curve-billed Thrasher), and one *Mimus polyglottos* (Northern Mockingbird), landed on the edge of the grass and moved toward the pond. As the birds landed, we were able to see a number of small *I. alvarius* hop, and within one minute, the birds started to hunt and consume the *I. alvarius* toadlets. Because of the density of the *I. alvarius* toadlets and the proximity of the birds, which were all within a ca. 5 m area of low-cut Bermuda grass, we could not determine how many *I. alvarius* toadlets each bird consumed. However, we are certain that each *T. curvirostre* and the *M. polyglottos* ate at least three *I. alvarius* toadlets before they flew off. One of the *Q. mexicanus*, a female, consistently captured *I. alvarius* toadlets and fed them to the other *Q. mexicanus*, which was apparently a juvenile.

On the morning of 13 July 2025, between 0545 and 0615 h, one of us (BKS) visited the pond again and observed predation again by three *Q. mexicanus*, one *T. curvirostre*, and this time a *Geococcyx californianus* (Greater Roadrunner). The *G. californianus* foraged for *I. alvarius* toadlets exclusively in the fringing desert vegetation, and it consumed a minimum of five *I. alvarius* toadlets within five minutes.

To our knowledge, this is the first report of bird predation on any life stage of *I. alvarius*, and in this case, these four bird species seemed to be taking advantage of the large numbers of newly metamorphosed *I. alvarius* toadlets at this breeding site. Although *I. alvarius* are noxious, neither the parotoid nor the leg glands were visible on the *I. alvarius* toadlets, and none of the birds seemed to have a negative response to handling or eating the toads.

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***LEPTODACTYLUS PODICIPINUS* (Pointedbelly Frog). CANNIBALISM.** Cannibalism is well-documented in anurans, particularly among species that engage in anurophagy (Toledo et al. 2007. J. Zool. 271:170–177; Measey et al. 2015. PeerJ 3:e1204). Although a recent review of predation in *Leptodactylus* documented

anurophagy of three *Rhinella* spp., cannibalism has not been reported for *L. podicipinus* (Cavalheri et al. 2023. Caldasia 45:136–150). *Leptodactylus podicipinus* is a small-bodied, nocturnal leptodactylid widely distributed from the Amazon Basin to Paraguay, Argentina, and Bolivia (Frost 2025. Amphibian Species of the World: An Online Reference. Version 6.2; https://amphibiansoftheworld.amnh.org, 13 March 2025). Females reach up to 54 mm SVL, while males are slightly smaller, measuring up to 43 mm SVL. Here, we present documentation of cannibalism in *L. podicipinus*.

On 21 January 2025 at 1846 h, during a nocturnal survey at Juma Lake Lodge, Paraná do Mamori River, Autazes, Amazonas, Brazil (3.6958°S, 59.8092°W; WGS 84; 17 m elev.), we observed an adult *L. podicipinus* (ca. 37 mm SVL) perched on a partially submerged log near the water's edge. When approached, it jumped and immediately seized a juvenile conspecific (ca. 19 mm SVL). The juvenile's hind limbs protruded from the adult's mouth (Fig. 1), and its body remained largely intact, allowing for species identification. Both individuals were collected, and after ca. 10 seconds inside a transparent plastic bag, the adult regurgitated the juvenile, likely as a stress response. The specimens were preserved and deposited in the Coleção Zoológica Paulo Bührnheim, Universidade Federal do Amazonas (CZPB-AA-2470 and CZPB-AA-2471, respectively).

While anurophagy is commonly reported in larger *Leptodactylus*, this is the first documented case of conspecific predation in *L. podicipinus*. Conspecific predation has been recorded in other anuran species, often influenced by body size, habitat complexity, and population density (Measey et al. 2015, *op. cit.*; Cavalheri et al. 2023, *op. cit.*). Our observation expands knowledge on the feeding ecology of *L. podicipinus* and reinforces that the species exhibits opportunistic predatory behavior.



FIG. 1. *Leptodactylus podicipinus*, with the hind foot of a juvenile protruding from its mouth, in Autazes, Central Amazon, Brazil.

We thank Sergio Gianizella for all his support in cataloging the specimens in the collection. Specimen collection was done under collection permit no. 77979 issued by the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio). AL thanks CAPES for funding through a Ph.D. scholarship.

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***LEPTODACTYLUS SAVAGEI* (Savage's Thin-toed Frog). MITE PHORESY.** Amphibian species carry a range of ectoparasites, including mites, leeches, and ticks (Phangurha et al. 2024. Amphibia-Reptilia 45:123–130.). Researchers have commonly observed mites on hylids and other arboreal frogs, but they are less frequently recorded on ground-dwelling leptodactylids (Sladky 2001. J. Zoo Wildl. Med. 31:570–575.). Among mite associations, phoretic mites, which use amphibians for transportation without feeding, are especially rare and poorly documented across all anurans. Only a handful of phoretic mite associations have been reported in anurans. Among them is a single case involving *Archegozetes magnus* (Trhypochthoniidae; Oribatida) observed on *Engystomops pustulosus* (Túngara Frog; Leptodactylidae) in Panama (Beaty 2013. Int. J. Acarol. 39:1–3.). However, no phoretic or parasitic mite associations have previously been documented for the genus *Leptodactylus*.

At 2100 h on 18 June 2025, during a field survey in Parismina, Costa Rica (10.3204°N, 83.3628°W; WGS 84; ca. 3 m elev.), I observed the first recorded case of phoretic mites on *Leptodactylus savagei*, a large, terrestrial Neotropical frog. The juvenile *L. savagei* appeared lethargic, and upon inspection, it was found to be carrying over 30 individual mites. These mites were clumped along the anterior dorsal region, as well as scattered sparsely across the body, suggesting potential site preference. The mites showed no evidence of feeding behavior and are presumed to be phoretic based on their external attachment and morphology.



PHOTO BY RENATO I. GUZMAN

FIG. 1. A juvenile *Leptodactylus savagei* with phoretic mites concentrated on the anterior dorsal surface, Parismina, Costa Rica.

I did not collect specimens, so species-level identification of the mites was not possible. However, their morphology and behavior suggest they belong to the family Trhypochthoniidae (Acariformes; Oribatida), a group in which phoresy is rare but has been documented, albeit in exceptional cases, on amphibians. Researchers presume these mites use phoresy as a means of dispersal between microhabitats, typically relying on invertebrate hosts such as beetles and arachnids. This finding represents a previously undocumented ecological interaction for *L. savagei* and highlights the need for further investigation into mite diversity and host specificity among Neotropical amphibians.

I thank the Turtle Love team in Parismina for their hospitality and guidance. Ernesto Orozco-Rodriguez helped recognize the novelty of this interaction. I also thank Matthew Scot Atkinson for his support and feedback on this note.

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***LITHOBATES SPHENOCEPHALUS* (Southern Leopard Frog). DIET.** *Lithobates sphenocephalus* is a medium-sized ranid frog commonly found in wetland and upland habitats throughout the southeastern United States (Krysko et al. 2019. Amphibians and Reptiles of Florida, University of Florida Press, Gainesville, Florida. 706 pp.). The species feeds primarily on invertebrates but is known to be a voracious feeder that opportunistically attempts to consume any small moving organism it encounters. While predation of vertebrate species by *L. sphenocephalus* is rarely observed, one study found remains of vertebrates (primarily the mosquitofish *Gambusia affinis* but also several additional fish, frog, and salamander species) in the stomachs of 37 out of 443 individuals sampled (Kilby 1945. Quart. J. Florida Acad. Sci. 8:71–104). *Lithobates sphenocephalus* has also been observed preying upon the non-native *Eleutherodactylus planirostris* (Greenhouse Frog) (Baakliny and Kutok 2023. Herpetol. Rev. 54:272), as well as cannibalizing its own species (DR Jackson, pers. comm.). Although consumption of reptilian and mammalian vertebrates by *L. sphenocephalus* seems to occur considerably less frequently, a few reports do exist, including one *L. sphenocephalus* that was photographed swallowing a *Lasiurus seminolus* (Seminole Bat) (Carr 1940. Univ. Florida Biol. Sci. Ser. 3:1–118) and a *L. sphenocephalus* that was found DOR with a *Scincella lateralis* (Little Brown Skink) in its stomach (Farr and Forstner 2014. Herpetol. Rev. 45:682).



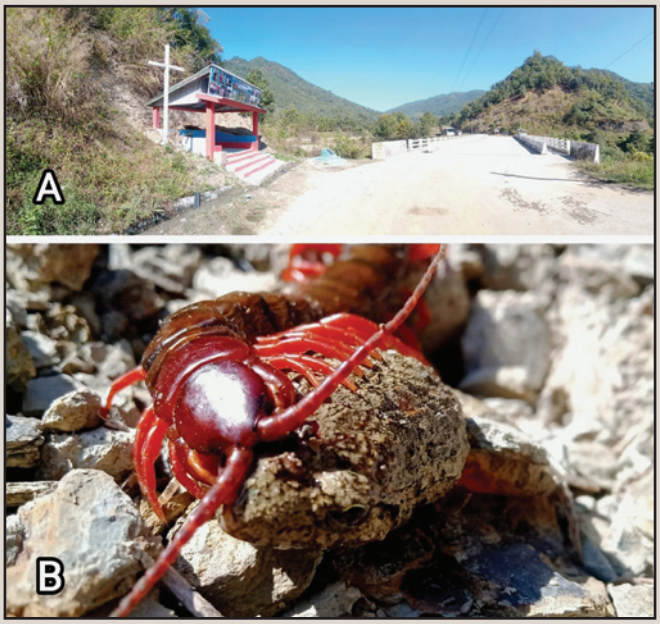
PHOTO BY TYLER DEVOS

FIG. 1. *Lithobates sphenocephalus* consuming an adult *Hemidactylus mabouia*.

At 2111 h on 20 May 2025, I observed an adult *L. sphenocephalus* consuming a non-native *Hemidactylus mabouia* (Tropical House Gecko) along the edge of Lake Jackson in Osceola County, Florida, USA (27.91095°N, 81.14981°W; WGS 84). Only the anterior third of the *H. mabouia* remained visible outside the mouth of the *L. sphenocephalus* (Fig. 1), with the mouth of the *H. mabouia* clamped firmly over the anterior right foot of the *L. sphenocephalus* (a presumed anti-predation behavior). When accidentally startled, the *L. sphenocephalus* made a single escape hop and, while doing so, pushed the rest of the *H. mabouia* into its mouth. Because the *H. mabouia* did not relinquish its bite during this process, the *L. sphenocephalus* landed with its own foot inside its mouth. At this point, I temporarily retreated to avoid further disturbing the predation event. When I returned ca. five minutes later, the *L. sphenocephalus* was still present and had freed its forelimb from the grasp of the *H. mabouia*. The *H. mabouia* was not visible and is presumed to have been successfully predated, although it is possible the *H. mabouia* may have escaped if the *L. sphenocephalus* removed its limb from its mouth with the *H. mabouia* still attached. To my knowledge, this observation constitutes the first record of a predation attempt of *L. sphenocephalus* upon any *Hemidactylus* sp. gecko, as well as only the second record of *L. sphenocephalus* preying upon any lizard.

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***MINERVARYA ASMATI* (Bangladeshi Cricket Frog). PREDATION.** Centipedes of the family Scolopendridae are known to be opportunistic, generalist predators (Dugon and Arthur 2012. J. Insect Physiol. 58:874–880). They use their forcipules to hold and envenomate their prey, and their diet commonly consists of



PHOTOS BY JOSEPH ZAIREMMAWIA AND LAL MUANSANGA

FIG. 1. A) Location where a *Minervarya asmati* was found being preyed upon by a *Scolopendra morsitans* at a roadside on the way to Champhai–Hnahlan–Khuangphah main road in Champhai district, Mizoram, India; B) The *S. morsitans* tightly grasping the *M. asmati*.

small arthropods and vertebrates like amphibians, lizards, snakes, birds, bats, and rodents (Hodges and Goodyear 2021. Int. J. Trop. Insect Sci. 41:3257–3262; Vabeiryureilai et al. 2022. Herpetol. Rev. 53:507).

At 1022 h on 9 November 2023 at Champhai–Hnahlan–Khuangphah road near Tuithoh Bridge in Champhai District, Mizoram, India (23.6456°E, 93.3418°N; WGS 84; 1090 m elev.), Joseph Zairemmawia encountered a foraging centipede at a roadside (Fig. 1A). The centipede, a *Scolopendra morsitans* (Red-headed Centipede) ca. 20 cm in total length, attacked a *Minervarya asmati* (Dicroglossidae) with an SVL of ca. 4 cm (Fig. 1B). The *S. morsitans* tightly grasped the right side of the head of the *M. asmati*. The *M. asmati* attempted to free itself from capture for 1.19 min but was finally subdued. The centipede started to consume the *M. asmati*'s right eye, increasingly tightening its grip on its prey and dragging it along the ground. To the best of our knowledge, this represents the first record of predation of a dicroglossid frog by *S. morsitans*.

This work was conducted under the permission for herpetological specimen collections throughout Mizoram (Permit No: A.33011/2/99CWLW/225 issued by the Chief Wildlife Warden, Environment, Forest and Climate Change Department, Tuikhuahtlang, Aizawl, Government of Mizoram). We are thankful to Joseph Zairemmawia, Lengteng Sanctuary wildlife guard, Tualcheng Forest Beat, Khawzawl Wildlife Division, for photographs. We acknowledge the funding agency DST–SERB File Nos: EEQ/2023/000877, CRG/2023/000805 and MZU/RPG/11/-349/2023/FIN–B, New Delhi, Govt. of India.

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***NYCTIMANTIS BRUNOI* (Bruno's Casque-headed Frog). DISTRESS CALL.** *Nyctimantis brunoi* is a hylid species that occurs in the coastal lowlands of Brazil (Izecksohn and Carvalho-e-Silva 2001. Anfíbios do Município do Rio de Janeiro. UFRJ, Rio de Janeiro, Brazil. 148 pp.). Primarily associated with restingas, it is characterized by a large head and a heavily ossified skull that is adorned with spiny projections linked to toxic secretions (Jared et al. 2015. Curr. Biol. 25:2166–2170).

During a field expedition on Marambaia Island (Ilha da Marambaia), Municipality of Mangaratiba, Rio de Janeiro, Brazil (23.0598°S, 43.9895°W; WGS 84), at 2130 h on 25 January 2024, we observed several male *N. brunoi* forming a chorus. It was raining heavily, with a relative humidity of 97% and a temperature of 24.3°C. Three individuals were found on leaf- and twig-covered ground within a one-meter radius. After nearly 30 minutes of inactivity, an increase in rainfall intensity and the vocalizations of other *N. brunoi* individuals farther away in the forest coincided with the resumption of calling activity by two of the *N. brunoi*, which were 50 cm apart. Their calls were organized in antiphony, possibly reducing competition for acoustic space. One male, when captured for morphometric measurements, vocalized vigorously during handling, which allowed us to record the behavior.

More than a year after this event, at ca. 2030 h on 17 February 2025, we recorded the same call in two other *N. brunoi* in a different area of the island (23.0603°S, 43.9896°W; WGS 84). These males were found sheltered inside bromeliads and were not engaged in calling activity (no chorus formation for the species was observed that night). When handled for morphometric measurements, the individuals emitted calls, allowing new recordings. One of them produced the same vocalization while inside a plastic bag during weighing, repeating the behavior even when lightly touched.

Table 1. Acoustic parameters of the distress call of *Nyctimantis brunoi*. N = 36 notes.

Acoustic parameters	Median	IQR	Range
Note duration (s)	0.04	0.04–0.04	0.03–0.05
Inter-note interval (s)	0.13	0.13–0.14	0.13–0.19
Dominant frequency (kHz)	1.13	1.12–1.13	0.95–1.14
Peak time (s)	0.03	0.02–0.03	0.01–0.04
Envelope Shape	0.65	0.58–0.75	0.37–0.93

Five recordings, each lasting 1–3 minutes, were made using a Marantz PMD 660 digital recorder and a Sennheiser ME66/K6 shotgun microphone. The files were analyzed using the bioacoustic software Avisoft Sonagraph Light 1 and Sound Ruler version 0.9.4. Acoustic parameters were described based on the analysis of all notes emitted during the tracks.

The call of *N. brunoi* that we recorded (Table 1; Fig. 1) is organized into sequences of 3–5 tonal notes, with few isolated emissions, exhibiting ascendant-exponential amplitude modulation. The median interval between sequences is 1.6 s (range = 0.83–2.80 s; N = 7). Although the mean initial frequency is 1.05 kHz (range = 0.7–1.2 kHz; N = 36), and the mean final frequency is 1.21 kHz (range = 0.90–1.31 kHz; N = 36), the call is not frequency modulated (t-test; t = -1.446; p = 0.1604). Of the *N. brunoi* whose calls we recorded, we an average SVL of 6.6 cm. an average SVL of 6.6 cm.

Given the context, we interpret this vocalization as a distress call, a category that has not been previously described for *N. brunoi*. Distress calls are vocalizations produced when an animal is under attack or capture, representing an adaptive behavior that startles or confuses predators, potentially resulting in escape or serving as a warning to other individuals of the species (Duellman and Trueb 1994. Biology of Amphibians. Johns Hopkins University Press, Baltimore, Maryland. 670 pp.; Wells 2007. The Ecology and Behavior of Amphibians. University of Chicago Press, Chicago, Illinois. 1400 pp.). Within the Lophyohylini tribe, which comprises 89 species (www.amphibiansoftheworld.amnh.org; 15 September 2025), distress calls have been reported for *Osteocephalus taurinus* (Lima et al. 2006. Guide to the frogs of Reserva Adolpho Ducke, central Amazonia. Áttema Design Editorial, Manaus, Brazil. 176 pp.), *Trachycephalus "vermiculatus"* (Mendoza-Henao 2024. Rev. Latinoam. Herpetol. 7.2:195–198), *T. mesophaeus*, and *T. typhonius* (Toledo et al. 2009. South Am. J. Herpetol. 4.1:25–42). Toledo et al. (2009, *op. cit.*) also tested one *N. brunoi* female and one *Corythomantis greeningi* male but did not find a positive response to the same stimuli (handling technique) that elicited this type of call in 34 other species across 13 anuran families.

The call we recorded differs from the advertisement call of *N. brunoi* previously described (Freire et al. 2019. Zootaxa 4550:423–430), which consists of multipulsed notes in sequences of 1 to 8, with an average duration of 0.7 s per call, intervals of 37.9 s between calls, notes lasting 0.46 s, and intervals of 0.15 s between notes. The call we recorded also differs from the behavioral context of an advertisement call. The new call further differs from the general pattern expected for release calls, which are emitted when decompression occurs in the lateral abdominal region behind the forelimbs (Batista et al. 2017. Herpetozoa 30:100–105). The

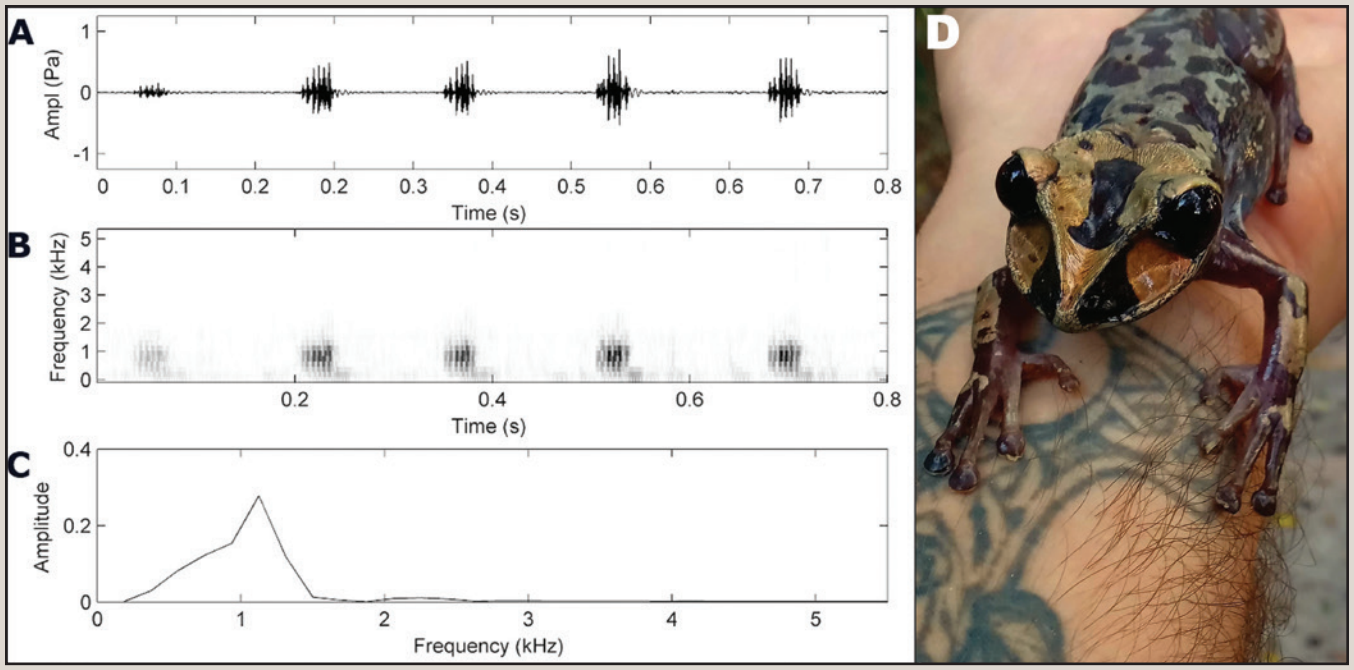


FIG. 1. Oscillogram (A), spectrogram (B), and power spectrum (C) of the distress call of *Nyctimantis brunoi* (D).

observed call was emitted during handling without abdominal decompression and was even recorded while an individual was inside a plastic bag without experiencing significant mechanical pressure.

The new call type we recorded for *N. brunoi* does not fully match the general pattern of distress calls described by Wells (2007, *op. cit.*) and Duellman and Trueb (1994, *op. cit.*) since, although produced during handling, the call we recorded is not explosive, abrupt, or disorganized like a scream, high-pitched shout, or squeal emitted with an open mouth. However, distress calls with different acoustic structures than these typical screams and shouts have been documented in several anuran species (Hödl and Gollmann 1986. Amphibia-Reptilia 7:11–21). The behavioral context of calling when seized or while fleeing (Toledo et al. 2011. Ethol. Ecol. Evol. 23:1–14) may be more relevant for categorization as a distress call than the utilization of specific acoustic traits or mouth opening, given the homoplastic nature of the behavior (Ferreira et al. 2019. Behav. Ecol. Sociobiol. 73:69). More broadly, the call we recorded may also be categorized as a defensive call of *N. brunoi* (Köhler et al. 2017. Zootaxa 4251:1–124).

We conclude that this new observation sheds light on relevant aspects of the ethology and natural history of *N. brunoi*. However, further observations with a larger sample size and a deeper understanding of the context in which these newly discovered calls occur are necessary to clarify the biological and social significance of this behavior.

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***OSTEOPILUS SEPTENTRIONALIS* (Cuban Treefrog). DEFORMITY.** On 10 August 2025 at 1753 h, a non-native *Osteopilus septentrionalis* with a posterior dorsal "fin" was observed climbing on the wall of a residence in Dade City, Pasco County, Florida, USA (Fig. 1). The fin resulted from the urostyle projecting diagonally upwards, apparently from a broken sacral link to the pelvis. We were unable to find reports in the literature of any anuran species with this deformity or injury. The urostyle provides a point of attachment for muscles and helps transmit thrust from the hind limbs during jumping. An articulating sacrum and urostyle



FIG. 1. An *Osteopilus sepentrionalis* with a posterior dorsal "fin" in Florida, USA.

provide the best joint for saltatorial locomotion (Pugener and Maglia 2009. South Am. J. Herpetol. 4:193–209). We suspect the saltatorial ability of this *O. septentrionalis* was affected, unlike its scansorial ability.

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***POLYPEDATES BRAUERI* (Brauer's Whipping Frog), *CLINOTARSUS ALTICOLA* (Point–nosed Frog), and *XENOPHRYS SERCHHIPII* (Serchhip's Horned Toad). INTERSPECIFIC AMPLEXUS.** Several incidences of interspecific amplexus among amphibians have been documented from Mizoram in northeast India (Lalremsanga 2011. Studies on the Ecology, Breeding Behavior and Development of Ranid and Microhylid Anurans prevalent in Mizoram, Northeast India. Ph.D Thesis, North-Eastern Hill University (NEHU), Shillong, Meghalaya. 441 pp.; Decemson et al. 2020. Herpetol. Notes. 13:433–434; Lalremsanga et al. 2021. Rept. Amphib. 28:278–279). Herein, we report two cases of interspecific amplexus of sympatric anuran

PHOTOS BY HT. DECEMSON (A–B); BISWARUP SEN, HT. DECEMSON AND VANLALHRUAIA (C–D).

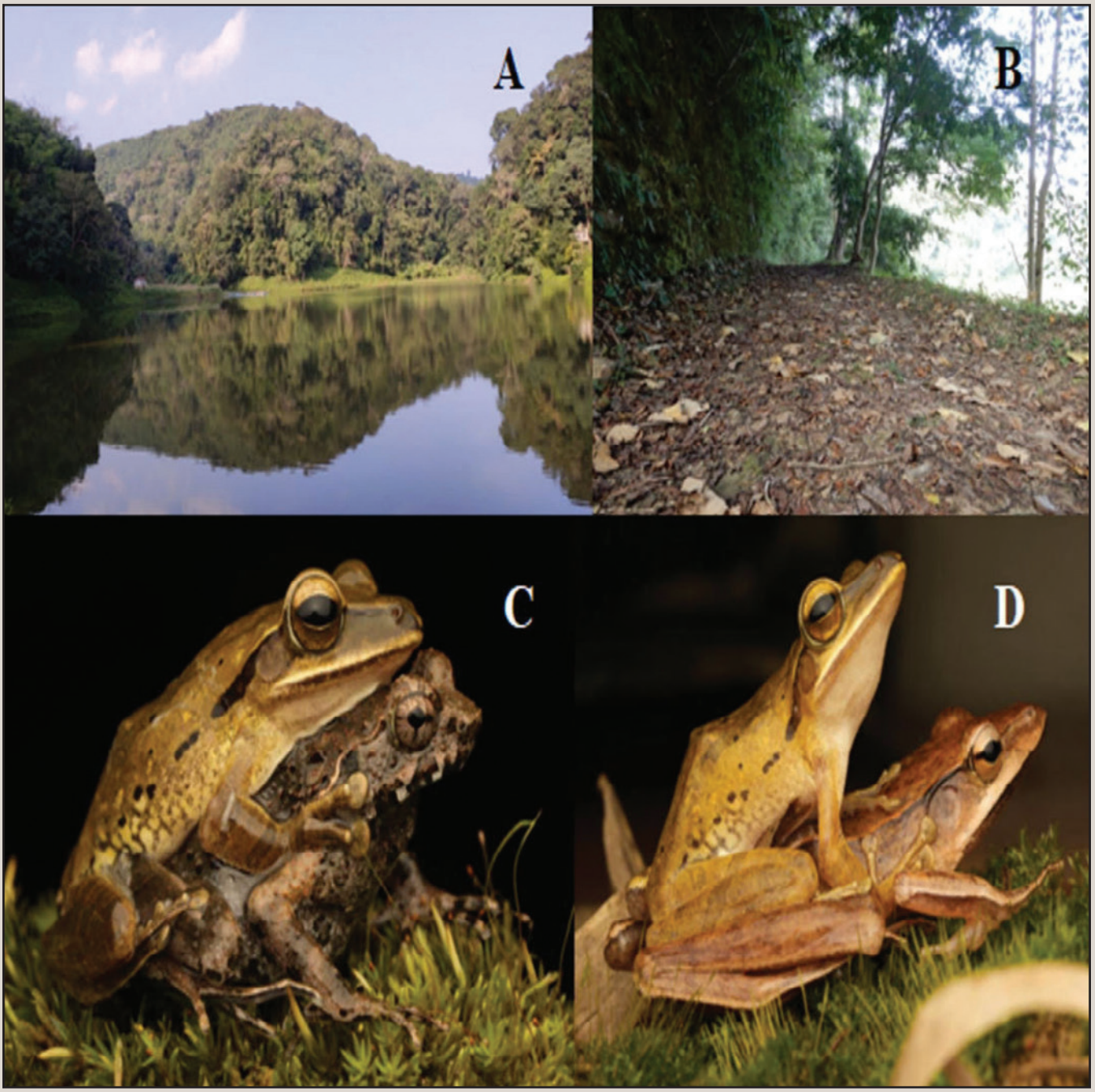


FIG. 1. A) view of Tamdil National Wetland at Saitual district in Mizoram, India; B) natural microhabitat where specimens were encountered; C) *Polypedates braueri* and *Xenophrys serchhipii* in interspecific amplexus; D) *Polypedates braueri* and *Clinotarsus alticola* in interspecific amplexus.

species in Mizoram: amplexus between *Polypedates braueri* and *Xenophrys serchhipii* and amplexus between *P. braueri* and *Clinotarsus alticola*. These instances of interspecific amplexus are also amplexus of species belonging to distinct families. To our knowledge, this represents the first report of interspecific amplexus between these species.

At 2039 h on 17 August 2024 at the Tamdil National Wetland, Saitual district in Mizoram, northeast India, we conducted surveys along a forest trail that was covered by mosses and dry leaf-litter (Figs. 1A–B). Here, we encountered a male *P. braueri* in amplexus with a female *X. serchhipii* (23.7381°N, 92.9516°E; WGS 84; 759 m elev.; Fig. 1C). Along the same path, ca. 17 m ahead, we observed a male *P. braueri* in amplexus with a female *C. alticola* (23.7378°N, 92.9516°E; WGS 84; 759 m elev.; Fig. 1D). After we photographed these animals, they were left undisturbed in their natural habitat.

We thank the Chief Wildlife Warden, Environment, Forest and Climate Change Department, Aizawl, Government of Mizoram, for the research permit no: A.33011/2/99CWLW/225 for herpetofaunal collections. We are grateful for our financial support from DST–SERB File Nos: EEQ/2023/000877, CRG/2023/000805 and MZU/RPG/11/–349/2023/FIN–B, Govt. of India.

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***RANA CATESBEIANA* (American Bullfrog). DIET.** *Rana catesbeiana* is one of the most prolific invasive species in the United States. Initially introduced into New Mexico, USA, in the late 1800s for food and sport, they have since become widespread throughout the state (Degenhart et al. 1996. Amphibians and Reptiles of New Mexico. University of New Mexico Press, Albuquerque, New Mexico. 85 pp.). In the Western United States, *R. catesbeiana* consumes a variety of herpetofauna and has been documented ingesting multiple snake species, including *Rena dissecta* (New Mexico Threadsnake) (Krupa 2002. Southwest. Nat. 47:461–467), *Diadophis punctatus* (Ring-necked Snake) (Graf et al. 1939. Copeia 1939:101–104), *Gyalopion canum* (Chihuahuan Hook-nosed Snake) (Caldwell et al. 2011. Sonoran Herpetol. 24:47–51), *Pituophis catenifer* (Gopher Snake) (King et al. 2002. Herpetol. Rev. 33:130–131), *Thamnophis eques* (Mexican Gartersnake), *T. marcianus* (Checkered Gartersnake) (Rosen and Schwalbe. 2002b. *In* Tellman (ed.), Invasive Exotic Species in the Sonoran Region, pp. 221–240. The University of Arizona Press and The Arizona-Sonora Desert Museum, Tucson, Arizona), *Crotalus atrox* (Western Diamond-backed Rattlesnake) and *Lampropeltis californiae* (= *getula*) (California Kingsnake) (Clarkson and DeVos. 1986. J. Herpetol. 20:42–49). Despite a considerable range overlap and *L. pyromelana* (Arizona Mountain Kingsnake) being commonly observed near water sources (Hamilton and Co nrad 2008. Iguana 15:86–91), there have not been any records of *L. pyromelana* in the diet of *R. catesbeiana*.

While surveying for *Anaxyrus microscaphus* (Arizona Toad) in the Middle Fork of the Gila River (Catron County, New Mexico) on 21 May 2024, CME, JTG, and AJP collected one adult *R. catesbeiana* from alongside the bank of the river via hand capture (33.22844°N, 108.23652°W; WGS 84; 1726 m elev.). The *R. catesbeiana* was a gravid female (211 mm SVL; Fig. 1) and was dissected on 22 May 2024 by AJP and GAL as part of an ongoing stomach content study on the species by the Amphibian and Reptile Conservancy. A juvenile *L. pyromelana* (256 mm SVL), along with a few unidentified rodent parts, was removed from the *R. catesbeiana* stomach, and both the *R. catesbeiana* and *L. pyromelana* were transferred to the Museum of Southwestern Biology at the University of New Mexico and cataloged as MSB:Herp:109134 and MSB:Herp:109135, respectively.



PHOTO BY GRACE LASKEY

FIG. 1. Juvenile *Lampropeltis pyromelana* and unidentified rodent parts removed from an adult gravid female *Rana catesbeiana* collected from the Gila River, Grant County, New Mexico, USA, in 2024.

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***RANA ONCA* (Relict Leopard Frog). POLYMELIA.** Although much has been published about malformations in anurans (Ouellet et al. 1997. J. Wildl. Dis. 33:95–104; Ouellet 2000. *In* Sparling et al. [eds.] Ecotoxicology of Amphibians and Reptiles, pp. 617–661. SETAC Press, Pensacola, Florida, USA; Johnson et al. 2024. Int. J. Parasitol. 24:100965), there are no published data on the occurrence of malformations in *Rana onca* (Dodd 2023. Frogs of the United States and Canada. Second Edition. Johns Hopkins University Press, Baltimore, Maryland. 954 pp.). Herein, we provide the first observation of polymelia in *R. onca* and provide prevalence data within an experimental population.

On 20 September 2022, at 1518 h, a juvenile *R. onca* was dipnetted during routine pond maintenance of the experimental ponds located within the 73-ha Springs Preserve in Las Vegas, Clark County, Nevada, USA (36.17463°N, 115.18406°W; WSG 84; 640 m elev.). In addition to two fully formed posterior limbs, this frog had an extraneous pair of shrunken polymelic posterior limbs emanating from its posterior abdominal surface (Fig. 1).

PHOTO BY JEAN-AXEL URBIETA AGUILAR



FIG. 1. A juvenile *Rana onca* exhibiting polymelia captured at the Springs Preserve, Clark County, Nevada, USA.

PHOTO BY JASON SULLIBAN



FIG. 2. Ventral radiograph of the posterior of the preserved juvenile *Rana onca* exhibiting polymelia.

Polymelia is the presence of an extra limb with identifiable major segments (Meteyer 2000. Field guide to malformations of frogs and toads with radiographic interpretations. Biological Science report USGS/BRD/BSR-2000-005. 18 pp.). The musculature of the functionless limbs was either undeveloped or had atrophied due to lack of use (Fig. 1). Nonetheless, the limbs had knee and ankle joints, as well as fully formed, yet atrophied, posterior feet. After being photographed, the frog was released into the pond unharmed.

On 4 October 2022, the same frog was recaptured in the refugium pond during an annual multi-agency mark-recapture survey. The *R. onca* had an SVL of 33 mm and a mass of 3.5 g. The *R. onca* was euthanized, preserved, and will be deposited in the Nevada State Museum collection. The specimen was x-rayed to produce a digital radiograph to explore the nature of the extraneous posterior limbs (Fig. 2). The radiograph shows the two limbs and what appears to be portions of an additional combination of ischium, acetabulum, and possibly short remnants of ilium (anatomical terminology per Meteyer et al. 2000. Teratology 62:151–171), all located anterior to the functional pelvic bones. These remnants protrude from, and are external to, the abdominal cavity, as seen in Fig. 1.

From 2020–2024, a total of 692 newly metamorphosed *R. onca* were captured during annual fall surveys in the refugium ponds at the Springs Preserve. Thus, the prevalence of polymelia over five years of monitoring was 0.14%. Given the protected nature of the Springs Preserve (Saumure et al. 2021. *In* Soorae [ed.]. Global Conservation Translocation Perspectives: 2021. Case Studies from Around the Globe, pp. 76–81. International Union for the Conservation of Nature, Gland, Switzerland), there is no reason to suspect that this low baseline prevalence of polymelia is anything other than a rare congenital abnormality, or an instance caused by trauma during metamorphosis (Johnson et al. 2002. Ecol. Monogr. 72:151–168).

The *R. onca* refugium ponds at the Springs Preserve were established under Landowner Cooperative Agreement LCA-R01 with the assistance of the Nevada Department of Wildlife (NDOW Permit: 489200) and the US Fish and Wildlife Service under the programmatic Relict Leopard Frog Candidate Conservation Agreement with Assurances. Protocols involving live animals were approved by UNLV Institutional Animal Care and Use Committee (IACUC-01186) and authorized under permits by NDOW (LIC #: 39750).

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***RHAEBO GUTTATUS* (Smooth-sided Toad). DEFENSIVE BEHAVIOR.** Anurans exhibit a wide array of defensive repertoire (behavioral, morphological, or physiological), which are thought to have coevolved in response to strong and continuous selective pressures from predation (Ferreira et al. 2019. Behav. Ecol. Sociobiol. 73:69). The bufonid genus *Rhaebo* is distributed from eastern Honduras to northern and western Colombia, northwestern Ecuador and Venezuela, and across the Amazonian lowlands of Venezuela, Colombia, Ecuador, Peru, Bolivia, Brazil, and the Guianas (Frost 2025. Amphibian Species of the World: an Online Reference, Version 6.2; https://amphibiansoftheworld.amnh.org; 16 September 2025). This monophyletic genus of medium to large-sized toads contains 12 species, and *R. guttatus* is one of the two *Rhaebo* species occurring in Brazil (Mueses-Cisneros et al. 2012. Zootaxa 3447:22–40; Frost 2025, *op. cit.*). *Rhaebo guttatus* is widely distributed throughout Brazilian Amazonia and occurs southward to the Cerrado of central Brazil (Andrade et al. 2020. Herpetol. Notes 13:125–127). *Rhaebo guttatus* is a large-sized (males: 121.3–146.9 mm SVL; females: up to 174.3 mm SVL) nocturnal species associated with primary forests. *Rhaebo guttatus* can be found on the ground at the margins of rivers and streams or in the leaf litter on the forest floor (Mueses-Cisneros et al. 2012, *op. cit.*). While this species is known for its remarkable ability to voluntarily squirt poison from its parotoid glands (Jared et al. 2011. Amphibia-Reptilia 32:546–549), little is documented about its postural defensive displays.

On 7 September 2025, at 2118 h, we observed a juvenile wild *R. guttatus* in a secondary forest fragment in Entre Rios, Altamira,



FIG. 1. A juvenile *Rhaebo guttatus* performing a limb interweaving defensive posture, with hindlimbs raised and intertwined over the inguinal region.

Pará, Brazil (5.33851°S, 54.47081°W; WGS 84). Upon our approach, the *R. guttatus* rapidly assumed a unique defensive posture, interweaving its hindlimbs in the inguinal region, a behavior consistent with the Type 6 classification of limb interweaving as described by Velasco et al. (2025. Cuad. Herpetol. 39:41–45).

To our knowledge, this observation represents the first recorded instance of limb interweaving in *R. guttatus*. This finding expands the known defensive repertoire of the species and is a valuable addition to the natural history of bufonids. Recently, a review on limb interweaving behaviors in Neotropical anurans identified only 12 species that perform limb interweaving (Velasco et al. 2025. Cuad. Herpetol. 39:41–45). Notably, only one other bufonid, *Frostius pernambucensis* (Frost's Toad), has been recorded exhibiting limb interweaving in Brazil (Ramos et al. 2021. Phyllomedusa 20:209–213). The specific posture exhibited by *F. pernambucensis* was also classified as Type 6 (Velasco et al. 2025, *op. cit.*). AL thanks CAPES (Portaria 133/2023) for the PhD scholarship.

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***RHINELLA* CF. *DAPSILIS* (Sharp-nose Toad). PREDATION.** On 1 May 2025 at 2136 h, we observed a *Phareicranaus* sp. (harvestman; Opiliones; Cranaidae) feeding on a juvenile *Rhinella* cf. *dapsilis* on a leaf ca. 75 cm above the ground along the Río Sucusari



PHOTO BY RENATO I. GUZMAN

FIG. 1. A *Phareicranaus* sp. feeding on a juvenile *Rhinella dapsilis*, Loreto, Peru.

(3.25124°S, 72.90888°W; WGS 84; 92 m elev.), Loreto Province, Peru. The prey was identified as *Rhinella cf. dapsilis* based on external morphology and locality, but because the individual was a juvenile and the specimen was not collected, the identification is tentative. *Rhinella dapsilis* is a leaf-litter-dwelling member of the *R. margaritifera* group that feeds primarily on ants and other small invertebrates (Ortiz and Coloma 2014. AmphibiaWeb, https://amphibiaweb.org/species/158, 15 July 2025). These anurans are preyed upon by snakes, birds, and mammals; however, to our knowledge, this is the first documented case of a cranaid preying upon a member of this group of *Rhinella* and the first documented case of a cranaid preying upon any member of the family Bufonidae.

The juvenile *Rhinella* appeared freshly killed, with moist skin, no external signs of decomposition (e.g., fungal growth or debris), and no visible trauma beyond puncture marks from the *Phareicranaus* sp.'s chelicerae. Given the freshness of the carcass, absence of decomposition, and puncture wounds consistent with cheliceral strikes, we infer this was an active predation event rather than scavenging. Harvestmen (Opiliones) are generally omnivorous, with carnivorous taxa typically preying on small or soft-bodied invertebrates, but they are also known to scavenge carrion, including small, recently deceased vertebrates (Pinto-da-Rocha et al. 2007. Harvestmen: The Biology of Opiliones. Harvard University Press, Cambridge, Massachusetts. 597 pp.). A single previous report exists of a *Neosadocus maximus* (harvestman; Gonyleptidae) feeding on a deceased hylid (probably *Hypsiboas bischoffi*; Castanho and Pinto-da-Rocha 2005. Rev. Ibér. Aracnol. 11:43–45).

This observation broadens the understanding of predatory capacity in the Opiliones and suggests that, under certain ecological conditions, large harvestmen, such as *Phareicranaus*, may actively hunt small amphibians. Although such interactions are likely rare, they could have localized ecological significance in amphibian-rich tropical forests. We thank J.C. Chaparro and J.A. Ochoa for species identifications, W.F. Lanza for field assistance, Explorama Lodges for logistical support, and the Margres Lab at the University of South Florida for partial funding.

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***RHINELLA HORRIBILIS* (Mesoamerican Cane Toad) and *INCILIUS VALLICEPS* (Gulf Coast Toad). INTERSPECIFIC AMPLEXUS.** In Mexico, interspecific amplexus in anurans has been poorly reported, and both its frequency and reproductive implications remain underexplored. Here, we document two interspecific amplexus events between *Rhinella horribilis* and *Incilius valliceps*, which were recorded in southeastern Mexico. It is also the first known record of such reproductive interaction between these two species.

PHOTO BY ALBERTO GONZÁLEZ GALLINA



FIG. 1. Interspecific amplexus between *Rhinella horribilis* and *Incilius valliceps* in Las Choapas, Veracruz, Mexico.

PHOTO BY ALONDRA LIZBETH ÁLVAREZ NAAL



FIG. 2. Interspecific amplexus between *Rhinella horribilis* and *Incilius valliceps* in Pablo García, Calakmul, Campeche, Mexico.

The first case was recorded in Las Choapas, Veracruz, Mexico (17.83177°N, 94.10251°W; WGS 84; 29 m elev.) on 08 June 2022 at 2200 h in a garden where the surrounding area was transformed into a tropical pine plantation with remnants of subperennial forest (Fig. 1). The second event occurred in the locality of Pablo García, Calakmul, Campeche, Mexico (18.5995°N, 90.1453°W; WGS 84; 95 m elev.) on 13 July 2025 at 1117 h in a fragment of subdeciduous forest surrounded by areas destined for agricultural and livestock activities (Fig. 2). In both cases, a male *I. valliceps* was observed in axillary amplexus with a female *R. horribilis*. Individuals were motionless on the ground, and the female jumped away only after we approached them.

Both species are common and sympatric in southeastern Mexico, sharing a breeding season during the rainy season (Lee 1996. The amphibians and reptiles of the Yucatán Peninsula. Cornell University Press, Ithaca, New York. 500 pp.). Factors such as a high density of individuals, similar acoustic signals, or reduced visibility can induce errors in specific recognition and encourage atypical reproductive behaviors (Ryan and Rand 2003. Evol. 57:2608–2618). Although generally unsuccessful from a reproductive point of view, this type of interaction can have important ecological implications, such as the energy expenditure of the male and the possible delay in the effective fertilization of the female. Records like this provide valuable information to understand the plasticity of anuran reproductive behavior in tropical environments.

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***SCAPHIOPUS HOLBROOKII* (Eastern Spadefoot). ENDOPARASITES.** *Scaphiopus holbrookii* is a fossorial amphibian that ranges widely throughout the eastern United States (Conant and Collins 1998. A Field Guide to Reptiles and Amphibians: Eastern and Central North America. Houghton Mifflin Harcourt, Boston, Massachusetts. 634 pp.) and whose diet consists of ground-dwelling arthropods (Jamieson and Trauth 1996. J. Ark. Acad. Sci. 50:75–78). Individuals generally stay near burrows when foraging and move very little outside of breeding and metamorph dispersal (Timm et al. 2014. J. Herpetol. 48:84–97). Information on endoparasites of wild populations of *S. holbrookii* is scarce.

Surveys were conducted in June and July 2023 at Village Creek State Park in Eastern Arkansas, USA (35.1702°N, 90.7069°W; WGS 84), and at Meeman-Shelby Forest State Park in Western Tennessee, USA (35.3407°N, 90.0417°W; WGS 84). *Scaphiopus holbrookii* were located by eyeshine between 2000 h and 2200 h, brought back to the lab, and placed into individual plastic containers (35.9 × 19.7 × 12.4 cm). Containers were sprayed with treated water to maintain the humidity levels and were covered with a pillowcase. Fecal samples were collected 1–4 d after the initial survey date, and spadefoots were returned to

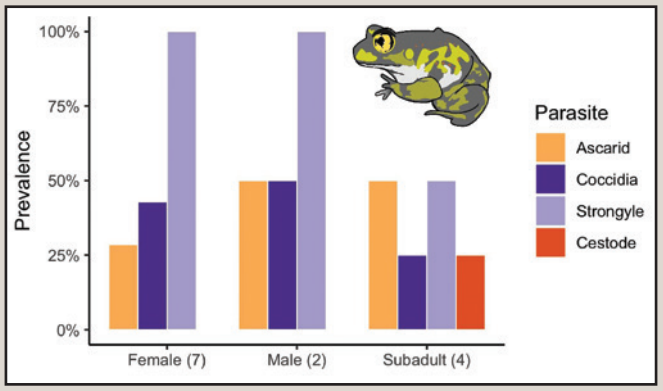


FIG. 1. Prevalence (proportion of individuals with at least one ova or oocyst) of four parasite groups in fecal samples from *Scaphiopus holbrookii* in Arkansas, USA (N = 13).



FIG. 1. A *Falco sparverius* preying on a *Scinax acuminatus* in Brazil.

their original location after 4 d. Fecal parasite analysis was done via a salt floatation method adapted from Hayward et al. (2019. Functional Ecol. 33:1307–1320). Endoparasites were examined at 100× under a phase-contrast microscope (Olympus CX41, Tokyo, Japan).

We captured 14 *S. holbrookii*, with 13 individuals producing fecal samples. The mean SVL was 57.64 ± 3.02 mm, and the mean mass was 20.58 ± 2.87 g. We detected four parasite guilds in *S. holbrookii* fecal samples that occurred at varying prevalences: ascarids and strongyles (both Nematoda), cestodes (Platyhelminthes), and coccidia (Apicomplexa) (Fig. 1). Strongyles were detected in all 9 adult samples (Fig. 1), while cestodes were only found in one subadult individual (Fig. 1). Ascarids, strongyles, cestodes, and coccidia are common vertebrate endoparasites that are known to infect amphibians (e.g., Muzzall and Andrus 2014. Comp. Parasitol. 81:191–198). In *Scaphiopus hurterii* in southern Oklahoma, USA, ascarids, strongyles, and cestodes were observed via necropsies (McAllister et al. 2005. Texas J. Sci. 57:383–389).

This research was conducted under Arkansas Game and Fish Commission Scientific Collection Permit 042520231, Tennessee Wildlife Resource Agency Scientific Collection Permit 5090, and Memphis Zoo IACUC Approval 202311.

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***SCINAX ACUMINATUS* (Mato Grosso Snouted Tree Frog). PREDATION.** *Falco sparverius* (American Kestrel) is one of the smallest birds of prey that exists, with a wide distribution in North and South America (White et al. 1994. Family Falconidae (falcons and caracaras), pp. 216–275. *In* del Hoyo et al. [eds], Handbook of the birds of the world, pp. 216–275. Lynx Edicions, Barcelona, Spain). It occurs in natural or agriculturally altered open grasslands (White et al. 1994, *op. cit.*). The diet of *F. sparverius* is composed mainly of arthropods, with few records of vertebrates (Cabral et al. 2006. Rev. Bras. Ornitol. 14:393–399). Among vertebrates, Squamata predominate (Cabral et al. 2006, *op. cit.*). *Scinax acuminatus* is a medium-sized, arboreal, nocturnal hylid with a distribution in Argentina, Bolivia, Paraguay, and the west and midwest regions of Brazil (Frost 2025. Amphibian Species of the World: An Online Reference. Version 6.1; https://amphibiansoftheworld.amnh.org; 09 April 2025). *Scinax acuminatus* occurs in open areas where males call perched on bushes and branches that are at the edge of permanent and semi-permanent ponds (Prado et al. 2005. Amphibia-Reptilia 26:211–221; Prado and Haddad 2005. Herpetol. J. 15:181–189).

At 0710 h on a day in June 2021, in a region of the northern Pantanal of Mato Grosso do Sul, Brazil (18.04204°S, 56.00889°W; WGS 84), that is known as Pantanal do Paiaguás, I observed predation of an *S. acuminatus* by a *F. sparverius*. An adult male *F. sparverius* was perched on a power line, flew towards a dripping faucet, grabbed something, and flew off, landing on a fence. As I approached, it was clear that it was holding an adult *S. acuminatus* in its talons. The *F. sparverius* consumed the hind limbs first and soon afterwards ingested the rest of the *S. acuminatus* while it was still alive. To the best of my knowledge, this is the first record of predation of an *S. acuminatus* by an *F. sparverius*.

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***SPEA INTERMONTANA* (Great Basin Spadefoot). OVIPOSITION.** *Spea intermontana* occurs in ephemeral wetlands and shallow lake shores across the Great Basin of North America (Morey 2005. *In* Lannoo [ed.], Amphibian Declines: The Conservation Status of United States Species, pp. 517–519. University of California Press, Berkeley, California). This species is listed as Threatened under Canada's Species at Risk Act (COSEWIC 2019. Assessment and status report on the Great Basin spadefoot (*Spea intermontana*) in Canada 2019. Committee on the Status of Endangered Wildlife in Canada, Ottawa. xii + 69 pp.) and is a Species of Greatest Information Need in the State Wildlife Action Plan of Idaho, USA (Idaho Department of Fish and Game. 2024. Idaho State Wildlife Action Plan. 2023 rev. ed. Boise (ID): Idaho Department of Fish and Game. https://idfg.idaho.gov/). As a Species of Greatest Information Need, additional life-history information is necessary for the conservation and management of *S. intermontana* and its habitat.

Spea intermontana purportedly can have clutches ranging from 5 to 106 eggs (Ashpole et al. 2014. Northwestern Nat.

PHOTO BY SAAC LEE



FIG. 1. A *Spea intermontana* pair laying and fertilizing a clutch of eggs on a bulrush at Egin Lakes, Idaho, USA.

PHOTO BY SAAC LEE



FIG. 2. A *Spea intermontana* pair resting after laying and fertilizing 20 clutches of eggs at Egin Lakes, Idaho.

95:35–40; Stebbins 2018. Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Harcourt, New York, New York. 576 pp.), and females may lay between 285 and 1386 eggs each season (Ashpole et al. 2014, *op. cit.*). No published studies, however, have documented oviposition for *S. intermontana* in the field. While conducting 63 surveys across 225 hours for *S. intermontana* egg masses and tadpoles from 2022 to 2025, we documented one daytime oviposition event of a *S. intermontana* pair at Egin Lakes in Idaho, USA (43.96504°N, 111.85276°W; WGS 84; 1490 m elev.).

On 17 May 2023, SL encountered a pair of *S. intermontana* in amplexus at 1144 h. At that observation, air temperature was 18°C, with 10% cloud cover and 3.2 km/h winds; moreover, water temperature was 23.2°C, pH was 8.1, and conductivity was 0.11 mS/cm. After that initial observation, the observer watched the pair swim in amplexus for 45 minutes before they laid their first clutch of eggs at 1229 h. During that event, the breeding pair rested on the hip waders of the observer multiple times, indicating that the presence of the observer did not cause an overt reaction. For each egg mass laid, the observer recorded the time, a visual estimate of clutch size (exact digits for egg masses < 10 and in multiples of 5 for egg masses ≥ 10), water depth, and the substrate to which the egg mass was adhered.

The female laid and the male fertilized approximately 762 eggs in 26 clutches. Each clutch had a mean size of 29 eggs (SD = 15.5, range = 2 to 80 eggs). The eggs were oviposited in water with a mean depth of 26.7 cm (SD = 5.6 cm), and all clutches were adhered to *Schoenoplectus* spp. (bulrushes) (Fig. 1). The female laid and the male fertilized the first 20 clutches with a mean of 4.8 minutes between each clutch. The pair then took a 41-minute break in a small tunnel along the shore (Fig. 2). After that break, the pair came out to lay and fertilize six more clutches with a mean of 4.2 minutes between each clutch. Excluding the 41-minute break, there was a mean of 4.7 minutes (SD = 5.0, range = 1 to 22 minutes) between each clutch laid. The final clutch was laid at 1503 h, and the observer continued to watch the pair until 1544 h at which time he ended the survey.

To the best of our knowledge, our observation is the first detailed account of a *S. intermontana* oviposition event in the field. This behavior is difficult for biologists to record because this species primarily breeds at night. Previously, other estimates of individual oviposition were based on counting the number of eggs in spadefoot carcasses (Ashpole et al. 2014, *op. cit.*).

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STRABOMANTIS ANOMALUS **(Choco Robber Frog). PREDATION.** Invertebrate predation of anurans, particularly of adults, has been reported infrequently (Toledo 2005. Herpetol. Rev. 36:95–400). However, these events are likely underreported due to the cryptic and opportunistic nature of invertebrates. This is particularly true for aquatic crustaceans, such as shrimp and crayfish, which, though occasionally documented preying on anuran larvae and young metamorphs (Cruz et al. 2006. Herpetol. J. 16:247–254), are seldom observed preying on adults.

On 17 July 2025 at 2300 h, in the lowland Pacific rainforests of the Colombian Choco, near the coastal town of Termales, Choco, Colombia, we observed an adult *Macrobrachium* sp. (ca. 12 cm) depredating an adult *Strabomantis anomalus* (ca. 4 cm SVL; Lynch and Duellman 1997. Frogs of the genus Eleutherodactylus in western Ecuador. University of Kansas Natural History Museum Special Publication 23. 236 pp.) in a streamside pool of the Meco River. We did not measure the predator or prey so as not to interrupt the predation event. The *Macrobrachium* sp.

PHOTO BY PEARSON MCGOVERN

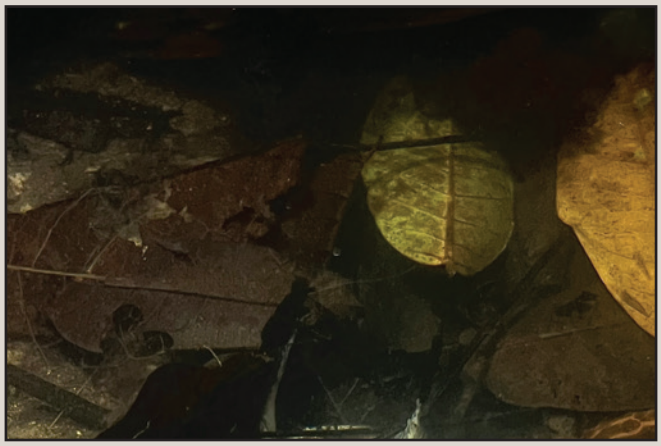


FIG. 1. An adult *Macrobrachium* sp. depredating a still-living *Strabomantis anomalus* in a streamside pool of the Meco River, Termales, Choco, Colombia.

PHOTO BY PEARSON MCGOVERN



FIG. 2. A mutilated *Strabomantis anomalus* with damage to both hindlimbs after temporarily escaping a depredation event by a *Macrobrachium* sp.

had captured the *S. anomalus* by one hindlimb and one forelimb and was in the process of killing its prey when we caught sight of the interaction (Fig. 1). The *Macrobrachium* sp. continued to pull the *S. anomalus* beneath the surface and into a leaf pack at the bottom of the shallow (ca. 20 cm) pool. After about one minute of observation, the shrimp let go of the still-living *S. anomalus*, having mutilated both hindlimbs up to that point (Fig. 2). Though we likely affected the predation event by observing the interaction, the shrimp's intent was clear. The *S. anomalus* attempted to swim away; however, the damage to both hind limbs precluded escape from the pool, and we are confident the shrimp finished its meal after we left the scene. To the best of our knowledge, this is the first record of invertebrate predation on any *Strabomantis* species.

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***TRACHYCEPHALUS VERMICULATUS* (Central American Milk Frog). DIET.** *Trachycephalus vermiculatus* is a hylid with a broad distribution from Sinaloa, Mexico, southward into trans-Andean South America (Barrio-Amorós and Güell 2023. Rept. Amphib. 30:e18452). *Trachycephalus vermiculatus* feeds primarily on

PHOTO BY RAZIEL ALEJANDOR ESCALANTE-PASOS.

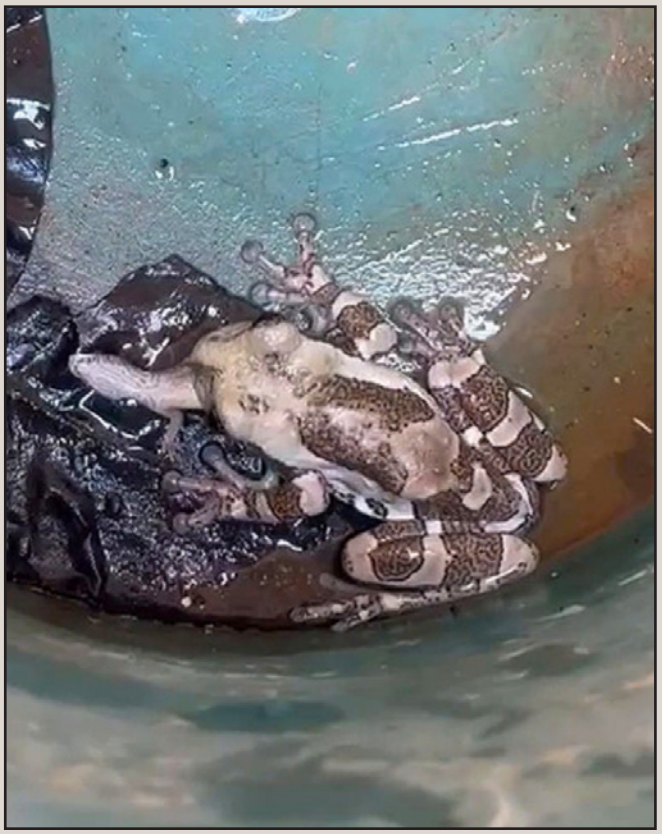


FIG. 1. A *Trachycephalus vermiculatus* consuming an *Anolis* sp.

arthropods, including beetles, hymenopterans, homopterans, dipterans, orthopterans, spiders, and scorpions; however, it has occasionally been documented consuming vertebrates such as *Hypopachus variolosus* (Sheep Frog) and *Hemidactylus frenatus* (Common House Gecko) (Marín and Mora 2022. Rev. Latinoam. Herpetol. 5:127–132).

On 30 September 2025, at 1021 h, a *T. vermiculatus* was observed inside a plastic container in a residential area of Conkal, Yucatan, Mexico (21.06267°N, 89.53481°W; WGS 84; 9 m elev.). The ambient temperature was 30.9°C, and the sky was partly cloudy. The *T. vermiculatus*, ca. 6–8 cm SVL, was recorded on video while consuming an *Anolis* sp. (Fig. 1), possibly an introduced *Anolis sagrei* (Brown Anole) or native *A. rodriguezii* (Rodriguez's Anole), as these species are common in urban areas of Yucatan (Nahuat-Cervera 2021. Rev. Latinoam. Herpetol. 4:82–94). To our knowledge, this represents the first record of *T. vermiculatus* consuming a lizard of the genus *Anolis*.

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***UPERODON MORMORATUS* (Indian Dot Frog) and *HOPLOBATRACHUS TIGERINUS* (Indian Bullfrog). PREDATION.** Beetle larvae and adults are unusual predators of amphibians, especially anurans. While most insects avoid amphibians, *Epomis* beetles have evolved to feed almost entirely on them. In particular, *Epomis* larvae use a deceptive luring behavior to attract frogs, which ultimately become their prey (Winzen et al. 2017. Herpetol. Rev. 48:612).



FIG. 1. Adult carabid beetle feeding on an egg mass of *Uperodon mormoratus*.



FIG. 2. *Epomis* sp. larva attached to the throat region of a juvenile *Hoplobatrachus tigerinus*.

In India, anuran species preyed upon by *Epomis* include *Duttaphrynus scaber* (Ferguson's Toad) (Barve and Chaboo 2011. Herpetol. Rev. 42:83–84), *Pseudophilautus amboli* (Amboli Bush Frog) (Winzen et al. 2017. Herpetol. Rev. 48:612), *D. melanostictus* (Asian Common Toad) (Kulkarni et al. 2020. J. Bombay Nat. Hist. Soc. 117.10.17087), *Minervarya cepfi* (CEPF Burrowing Frog) (Pardeshi et al. 2020. IRCF Rept. Amphib. 27:279–280), *Indirana leithii* (Leith's Leaping Frog) (Yadav et al. 2021 IRCF Rept. Amphib. 28:161–62), *Indirana chiravasi* (Amboli Leaping Frog) (Komanduri and Sreedharan 2021. Herpetol. Rev. 42:827–828), *Microhyla nilphamariensis* (Nilphamarai Narrow-mouther Frog) (More, 2021. Herpetol. Rev. 52:833–34), and *Raorchestes kollimalai* (Kollimalai Bush Frog) (Muthukrishnan and Gokula 2023. Zoo's Print 38:23–24).

Here, we report two more records of anuran species preyed upon by carabid beetles: 1) an adult *Epomis* sp. opportunistically feeding on eggs of an injured *Uperodon mormoratus*, and 2) a larval *Epomis* sp. feeding on a *Hoplobatrachus tigerinus*. On 9 July 2021, at 2353 h at Kadra, Karwar, Uttara Kannada, Karnataka, India (14.9253°N, 74.3473°E; WGS 84), we observed an injured *U. mormoratus* that had been struck by a vehicle. The frog's abdomen was ruptured, and egg masses were protruding. An adult *Epomis* sp. was seen feeding on the exposed eggs for nearly an hour, returning several times after short pauses, while the *U. mormoratus* was still alive and struggling to move (Fig. 1). This behavior clearly shows how opportunistic *Epomis* sp. can be, exploiting unusual food resources when available.

On 4 August 2025, at 1132 h, during a survey in paddy fields near Chandgad village, Kolhapur, Maharashtra, India (15.9389°N, 74.1828°E; WGS 84), we noticed a larval *Epomis* sp. firmly attached to the throat region of a sub-adult *H. tigerinus*. The *Epomis* sp., apparently in its second instar, was feeding on the juvenile *H. tigerinus*. The *H. tigerinus* was still alive and moving but appeared to be struggling to breathe (Fig. 2). Larval *Epomis* sp. are often seen attached to small frogs or juveniles of larger species, probably because these individuals spend more time near water bodies where the beetles are found.

To the best of our knowledge, these are the first documented cases of an *Epomis* sp. consuming *U. mormoratus* eggs and a larval *Epomis* sp. preying on a *H. tigerinus*, with these records coming from the Central and Northern Western Ghats, India, respectively. Both observations highlight the remarkable feeding strategies and opportunism of *Epomis* beetles, adding to our understanding of amphibian-insect interactions in the region.

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***ZHANGIXALUS ARBOREUS* (Forest Green Treefrog). LIMB MALFORMATION.** Limb malformations in anurans have been reported worldwide (Borkin and Pikulik 1986. Amphib. Rept. 7:205–216; Peltzer et al. 2011. Herpetol. Conserv. Biol. 6:432–442; Henle et al. 2017. Mertensiella 25:57–164; de Souza et al. 2021. Herpetol. Notes 14:31–41). In Japan, there are many reports of polymelia (supernumerary limbs) in anurans (e.g., Takeishi 1996. Bull. Kitakyushu Mus. Nat. Hist. 15:119–131 [in Japanese]), but reports of other types of limb malformations are scarce for Japanese anurans.

Zhangixalus arboreus is a rhacophorid species naturally distributed in Japan in Honshu (the main island of Japan) and Sado Island (Fukuyama 1996. *In* Sengoku et al. [eds.], The Encyclopaedia of Animals in Japan. Volume 5: Amphibians, Reptiles, Chondrichthyes, p. 50. Heibonsha, Tokyo, Japan [in Japanese]). *Zhangixalus arboreus* was introduced to Izu-Oshima Island, Tokyo, Japan, more than 20 years ago (Toda and Yoshida 2005. Bull. Herpetol. Soc. Jpn. 2005:139–149 [in Japanese]). Here, we report a case of polyphalangy (duplication of part of a toe) in a *Z. arboreus* collected from Izu-Oshima Island.

At 2145 h on 3 August 2025, we found a *Z. arboreus* in a bamboo thicket at Motomachi, Izu-Oshima Island (34.7703°N, 139.3763°E; WGS 84). We captured the *Z. arboreus* and

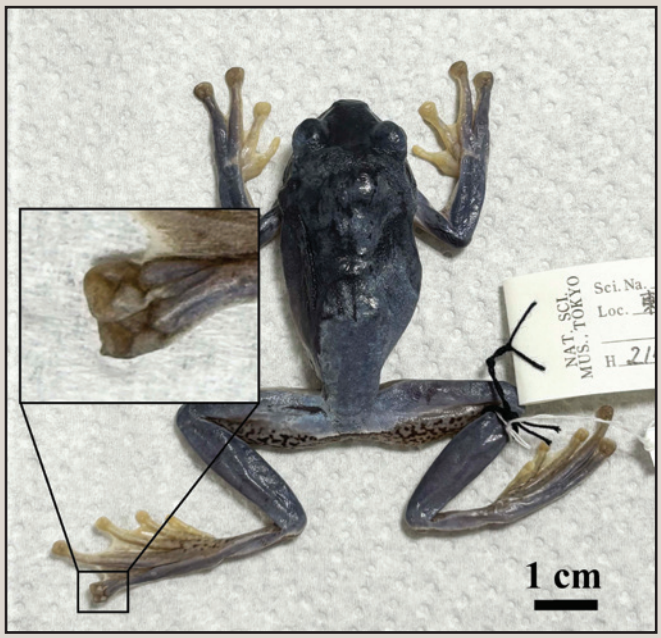


FIG. 1. A male *Zhangixalus arboreus* (NSMT-H 21452) exhibiting polyphalangy of the fifth toe of the left hindlimb. Inset: close-up view of the fifth toe of the left hindlimb.

transported it to the National Museum of Nature and Science, Tokyo (NSMT). Upon hand-capture, we noticed that the *Z. arboreus* had duplicated distal phalanges of the fifth toe of the left hindlimb (Fig. 1), showing a limb malformation known as "polyphalangy" (Meteyer 2000. Field Guide to Malformations of Frogs and Toads with Radiographic Interpretations. U.S. Geological Survey, Reston, Virginia, USA. 16 pp.). The *Z. arboreus* was euthanized, fixed in 10% formalin, and preserved in 70% ethanol. The *Z. arboreus* has been deposited in the NSMT herpetological collection as NSMT-H 21452. The specimen was a male *Z. arboreus* with an SVL of 55.40 mm.

Sasaki and Suzuki (1954. Coll. Breed. 16:366–368 [in Japanese]) reported polymelia in the forelimb of *Z. arboreus* collected from Niigata Prefecture, Japan. Therefore, to the best of our knowledge, this is the second record of limb malformation in *Z. arboreus* and the first record of polyphalangy in this species. Limb malformations in anurans are caused by many factors, including environmental pollution, mutation, parasites, and UV radiation (Uehlinger 1969. J. Embryol. Exp. Morphol. 21:207–218; Alvarez et al. 1995. Arch. Environ. Contam. Toxicol. 28:349–356; Meteyer 2000, *op. cit.*; Blaustein and Johnson 2003. Front. Ecol. Environ. 1:87–94). Further studies on the frequency and causal factors of limb malformations are needed to evaluate whether the Izu-Oshima population of this species is abnormal.

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***ZHANGIXALUS SCHLEGELII* (Schlegel's Tree Frog). PREDATION.** *Zhangixalus schlegelii* is a frog species native to Japan that produces underground foam nests near rice fields and ponds from April to May (Matsui and Maeda 2018. Encyclopedia of Japanese Frogs. Bun-ichi Company Ltd., Tokyo, Japan. 190 pp.).



FIG. 1. An attempted predation of a *Zhangixalus schlegelii* by an *Odontobutis obscura*.

Zhangixalus schlegelii has been reported to be predated by giant water bugs and snakes (Mori 1988. Snake. 20: 98–113; Hirai and Hikida 2002. Ecol. Res. 17:655–661). *Odontobutis obscura* (Dark Sleeper) is a common freshwater fish belonging to the order Perciformes. *Odontobutis obscura* primarily inhabits rivers, and occasionally ponds, in Japan and South Korea (Iwata et al. 1985. Jpn. J. Ichthyol. 31:373–388). At 0242 h on 6 June 2025, YY found an *O. obscura* biting the head of an adult *Z. schlegelii* in the Inashi River, Yasugi City, Shimane Prefecture, Japan (35.2699°N, 133.1393°E; WGS 84; 242 m elev.). The *O. obscura* released the *Z. schlegelii* alive and escaped quickly due to the disturbance from our flashlight. We hypothesized that *Z. schlegelii* accidentally jumped into the river and was subsequently encountered by *O. obscura*, which then attempted to eat it. This observation represents an additional predator of *Z. schlegelii*.

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TESTUDINES — TURTLES

***ACTINEMYS MARMORATA* (Northwestern Pond Turtle) and *TRACHEMYS SCRIPTA ELEGANS* (Red-eared Slider). INTERGENERIC COURTSHIP BEHAVIOR.** Courtship in freshwater turtles is known to include visual, tactile, olfactory, and auditory signals (Liu et al. 2013. Chelonian Conserv. Biol. 12:84–100). The western pond turtle complex, formerly considered two subspecies of *A. marmorata*, was recently split into two species: *A. marmorata* and *A. pallida* (Spinks et al. 2014. Mol. Ecol. 23:2228–2241). Courtship and mating behaviors of *A. marmorata* and *A. pallida* have been occasionally documented but are difficult to detect due to these behaviors typically occurring underwater, limiting visibility (Holland 1988. Herpetol. Rev. 19:87–88; Ashton 2007. Herpetol. Rev. 38:327–328; Bettelheim 2009. Herpetol. Rev. 40:212–213). In California, USA, courtship and mating in both western pond turtle species has been documented as early as April (Reese 1996. PhD

Dissertation, UC Berkeley, Berkeley, California. 253 pp.) and as late as September (Ashton 2007. Herpetol. Rev. 38:327–328). Interspecific courtship and mating are known to occur where the ranges of the two species overlap. One case of intergeneric mating has also been observed in *A. pallida*, with a male *A. pallida* attempting to mate, and appearing to successfully copulate with, a non-native female *T. s. elegans* (Leatherman and Jennings 2007. Herpetol. Rev. 38:327).

This note documents the first report of intergeneric courtship event occurring between an *A. marmorata* and a *T. s. elegans*. In the afternoon at around 1310 h on 9 March 2024, a male *A. marmorata* was observed attempting to court and copulate with a female *T. s. elegans* in a 1 m deep irrigation canal located in Butte County, California (39.33548°N, 121.76185°W; WGS 84; 23 m elev.). The high temperature for the day was 16.1°C. The event was observed for roughly five minutes, and photographs of the courtship attempt were captured (Fig. 1). The male *A. marmorata* was seen actively pursuing the female *T. s. elegans* and engaged in repeated displays of courtship behavior. These included a forelimb scratching/swiping motion directed at the female's head and anterior marginal scutes, a behavior that is consistent with western pond turtle courtship observations (Holland 1988, *op. cit.*; Ashton 2007, *op. cit.*; Bettelheim 2009, *op. cit.*). The scratching/swiping motion lasted several seconds and was followed by persistent pursuit, realigning, and reattempting. The female *T. s. elegans* appeared non-receptive, swimming away between the male's attempts and at times submerging to evade further interaction. Successful mounting or copulation was not observed during this encounter. The timing of this event also documents courtship occurring in *A. marmorata* as early as March, instead of the previously observed earliest month of April (Reese 1996, *op. cit.*).

Intergeneric courtship and mating attempts between native *A. marmorata* and introduced *T. s. elegans* may reflect an unexpected impact of this introduced species on the behavior and reproductive ecology of the native turtle species. Previous studies of co-occurring native and non-native turtles, specifically non-native *T. s. elegans*, suggest potentially negative but difficult to assess impacts on native turtles, such as competition for basking sites (Spinks et al. 2003. Biol. Conserv. 113:257–267), interference competition over food resources (Polo-Cavia et al. 2011. Biol. Invasions 13:1387–1396.), and parasite transmission (Verneau et al. 2011. Parasitology. 138:1778–92.). The implications of

PHOTOS BY WILLIAM MCCALL

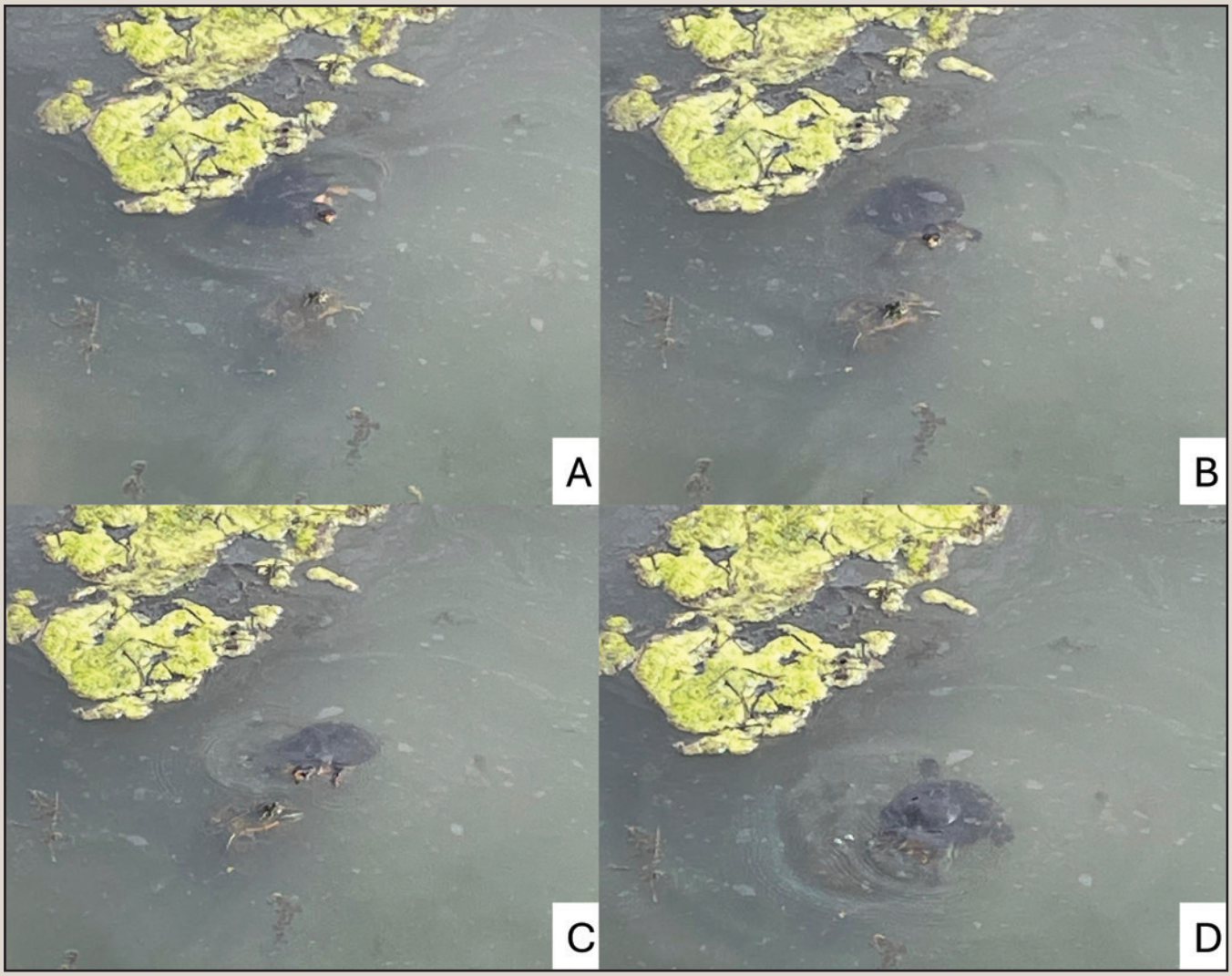


FIG. 1. Male *Actinemys marmorata* attempting to court and copulate with a female *Trachemys scripta elegans* on March 9, 2024, in Butte County, California, USA. A, B) The male *A. marmorata* approaching the female *T. s. elegans*; C) the attempted courtship from the male *A. marmorata*; D) the male *A. marmorata* diving underwater to pursue the female *T. s. elegans* after it fled.

intergeneric courtship and mating between western pond turtles and *T. s. elegans* have yet to be assessed. However, with indications of increasing species-level extinction risk in the next approximately 50 years for *A. pallida* and 75 years for *A. marmorata* (USFWS 2023. Species Status Assessment Report for the Northwestern Pond Turtle (*Actinemys marmorata*) and Southwestern Pond Turtle (*Actinemys pallida*), Version 1.1. Species Status Assessment Reports. Ventura, California. 139 pp.), the potential impacts of these intergeneric interactions should be studied to inform future management activities of *A. marmorata* and *A. pallida*.

One suggested reason for the observed intergeneric courtship and mating could be due to a lack of conspecific females within the local population (Leatherman and Jennings 2007, *op. cit.*). Male *A. marmorata* have been found to have home ranges twice the size of female home ranges (Bury 1972. PhD Dissertation, UC Berkeley, Berkeley, California. 205 pp.) and sometimes as large as 2.8 times the size of female home ranges (Reese 1996, *op. cit.*). Multiple females thus tend to be encompassed within a male's home range, with multiple females potentially inseminated by a single male during the mating period (Bury 1972, *op. cit.*). It is possible that males court congenerics in their attempt to mate with multiple conspecific females. Based on the timing of the above observation, it is possible that this encounter could be the first female turtle encountered this season by the male *A. marmorata*.

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***APALONE SPINIFERA* (Spiny Softshell Turtle). INTERGENERIC MATING ATTEMPT.** At 1600 h on 24 September 2025, at an anthropogenic pond system on the Texas State University campus, San Marcos, Hays County, Texas, USA (29.53143°N, 97.56145°W; WGS 84; 173 m elev.), a male *Apalone spinifera* was observed pursuing and repeatedly attempting to mount a female *Pseudemys texana* (Fig. 1). Courtship-like behavior (persistent following and circling) progressed for approximately 10 minutes by the male, including multiple copulation attempts. At 1610 h, the female ultimately evaded and fled from the male. The interaction was documented with a Nikon D3X camera and 105mm lens.

Hybridization and interspecific reproductive behavior have been documented within Emydidae (Spinks and Shaffer 2009. Syst. Biol. 58:1–20; Godwin et al. 2014. Copeia 2014:725–742) and specifically within *Pseudemys* (Moreno et al. 2022. Ecol. Evol. 12:1–15). However, to our knowledge, courtship and mating attempts between members of Trionychidae and Emydidae have not been reported. The timing of our observation coincides during a period when *A. spinifera* reproductive activity is often reduced, although males may retain viable sperm into autumn, and females may hold sperm overwinter for spring nesting (Robinson and Murphy 1978. Herpetologica 34:137–140). *Pseudemys spp.* generally follow a similar breeding pattern as *A. spinifera*, exhibiting primary breeding from spring to early summer, but with sperm storage observed to occur overwinter in females to facilitate spring nesting following earlier copulation events (Ward & Jackson 2008. Chelonian Res. Monogr. 5:006.1–006.7; Gist & Jones 1989. J. Morphol. 199: 379–384).

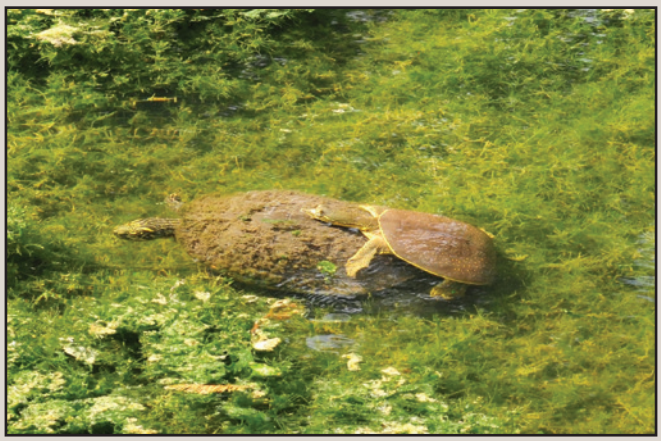


FIG. 1. Male *Apalone spinifera* (on top) attempting copulation with a female *Pseudemys texana* (on bottom) after engaging in courtship behavior including pursuing and rapidly circling the female. The image was taken shortly after the first attempt at copulation was observed.

To our knowledge this is the first recorded observation of a male *Apalone* attempting to mate with a *Pseudemys* female. We recommend additional observation of mixed-species assemblages at anthropogenic water bodies to evaluate the frequency of such interfamily interactions.

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***APALONE SPINIFERA* (Spiny Softshell Turtle). PREDATOR AVOIDANCE BEHAVIOR.** Predator avoidance shapes a wide range of behavioural responses in animals (Lima and Dill 1990. Can. J. Zool. 68: 619–640; Lima 1998. Bioscience. 48: 25–34). Intra-species variation in predator avoidance behavior should translate into variation in survival among individuals (Sansom et al. 2009. Behav. Ecol. 20: 1168–1174). *Apalone spinifera* (Spiny Softshell Turtle) is a highly aquatic freshwater turtle species. Its use of terrestrial habitat is infrequent and usually restricted to brief emergence for nesting, which typically occurs from June to early July (Lazure et al. 2019. Herpetol. Conserv. Biol. 14: 659–667). In aquatic habitats, adult and juvenile *Apalone spinifera* often bury themselves in soft substrate, sometimes leaving their heads exposed. This behavior is thought to facilitate predator avoidance and ambush hunting (Ernst and Lovich 2009. Turtles of the United States and Canada. Johns Hopkins University Press, Baltimore, Maryland. 827 pp).

We have observed *A. spinifera* at a nesting site on a sandspit along Lake Erie in Chatham-Kent County, Ontario, Canada, since 2011 as part of a long-term research project. We typically hand-capture females for data collection after they complete oviposition, but we avoid alerting them to our presence until this point because they are extremely cautious while out of the water. Prospective or nesting *A. spinifera* often abandon nesting activity if alerted to the presence of a perceived predator, including humans or raccoons (*Procyon lotor*). *Apalone spinifera* is notoriously fast both in the water and on land (Pace et al. 2001. J. Exp. Biol. 204:3261–3271), and thus, flight response toward the nearest body of water is a common terrestrial predator avoidance behavior.

Here we describe terrestrial self-covering behaviour, an alternate predator avoidance strategy exhibited by female *A. spinifera*. We recorded this behavior on three separate occasions after females on the sandspit noticed the nearby presence of humans. On 16 July 2014, an adult female basking on the sandspit noticed the observing research team and quickly buried into the sand. On 7 July 2016, a nesting female completed oviposition, then buried herself in the sand after spotting the research team.

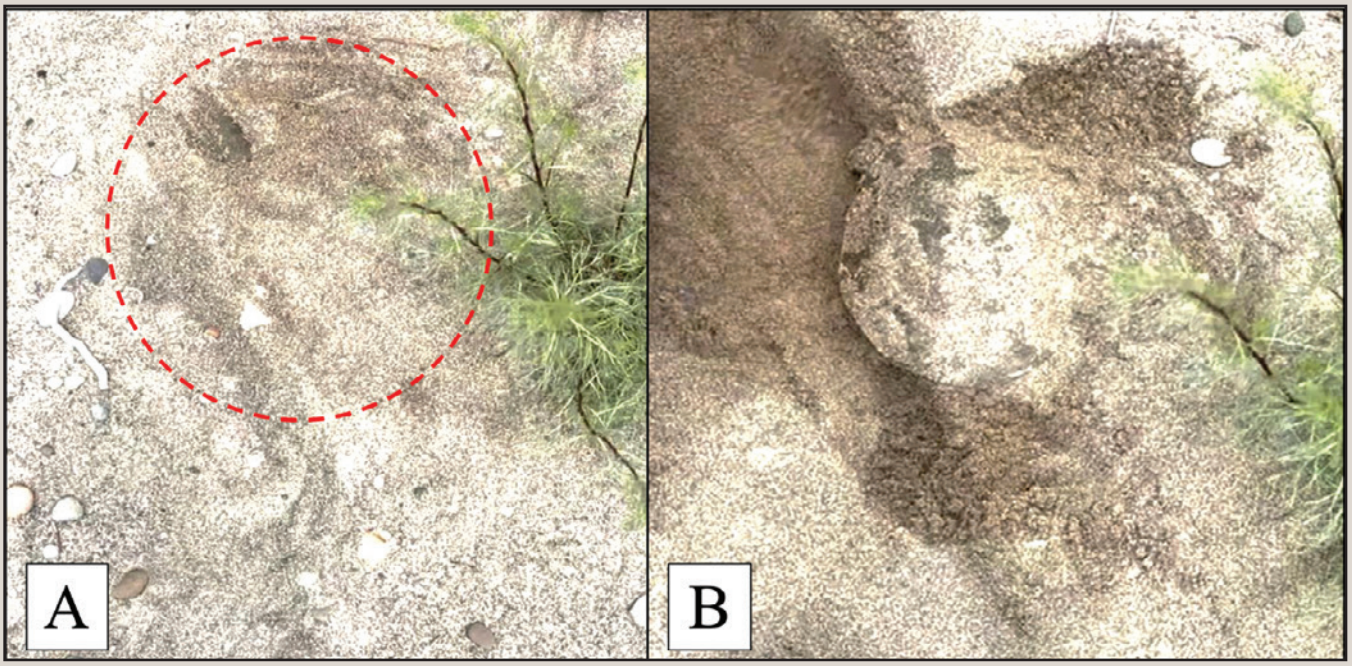


Fig. 1. A) Sand impressions left by an adult female *Apalone spinifera* after it buried itself in response to the presence of humans; B) partially excavated view of the same turtle.

On 13 June 2025, we observed a mature female emerge from aquatic habitat onto the sandspit and begin excavating a nest chamber. After completing oviposition, the individual quickly became alerted to our presence, and, within 30 seconds, had buried into the sandy substrate and covered itself entirely, such that it was not visible from the surface (Fig. 1A). In all three cases, the buried females did not make any attempt to move or crawl under the substrate for some time after they had covered themselves, even when approached and excavated (Fig. 1B).

Adult *Apalone* "troughs" have been observed in association with nesting crawls, where, after oviposition, a female may dig in and move beneath the substrate and re-emerge some distance away (Plummer and Doody 2010. IRCF Rept. Amphib. 17:79–81). This behavior is not fully understood but has apparently not been observed occurring in direct response to the presence of a human or predator. To our knowledge, this is the first description of such behavior in *A. spinifera* on terrestrial habitat as a predator avoidance response.

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***CLAUDIUS ANGUSTATUS* (Narrow-bridged Musk Turtle). DIET.** The Narrow-bridged Musk Turtle (*Claudius angustatus*) is a highly aquatic kinosternid distributed from southern Mexico into northern Central America (Cervantes-López et al. 2021. Chelonian Conserv. Biol. 20:278–286; Munscher et al. 2022. Herpetol. Notes 15:735–740). It is a reclusive, bottom-dwelling species known for its aggressive temperament, especially in captivity (Legler and Vogt 2013. The Turtles of Mexico: Land and Freshwater Forms. University of California Press). While the diet of *C. angustatus* has been reported to include aquatic invertebrates, carrion, and small vertebrates (Legler and Vogt 2013, *op. cit.*), direct evidence of active predation on other turtles is lacking.

During a field survey in July 2025 at the Belize Foundation for Research and Environmental Education (BFREE) in southern Belize, we captured a small adult female *C. angustatus* (straight-line carapace length (SCL) = 12.1 cm) in a partially submerged hoop trap (baited with sardines in buffalo sauce and oil) that was placed within a lowland tropical forest wetland. In the same trap, we discovered a deceased juvenile White-lipped Mud Turtle (*Kinosternon leucostomum*; 6.7 cm SCL). The carcass exhibited significant bite marks in the gular region, and the throat had been severely torn open (Fig. 1). No other animals were present in the trap.

The location and severity of the injuries are consistent with a predatory attack. The absence of other potential predators, combined with the known aggression of *C. angustatus* (Legler and Vogt 2013, *op. cit.*), strongly suggests that the musk turtle attacked and killed the juvenile *K. leucostomum*. While turtles



Fig. 1. Deceased juvenile White-lipped Mud Turtle showing injuries to the neck region from the presumed bites of a Narrow-bridged Musk Turtle.

are occasionally opportunistic scavengers, the targeted nature of the throat wound, which is common in predation attempts on small vertebrates (Legler and Vogt 2013, *op. cit.*), suggests active predation rather than post-mortem scavenging.

Intraguild predation among freshwater turtles is infrequently documented, though anecdotal accounts exist for other kinosternids and emydids under captive or stressed conditions (Mahmoud 1968. Herpetologica 24:77–81; Ernst and Lovich 2009. Turtles of the United States and Canada. Second Edition. Johns Hopkins University Press, Baltimore, Maryland. 827 pp.). This is, to our knowledge, the first documented case of *C. angustatus* preying upon another turtle in the wild.

This observation contributes to the growing understanding of the behavioral ecology of *C. angustatus* and supports the need for further investigation into predatory behavior among freshwater turtles, especially in resource-limited or high-density environments.

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***CLEMMYS GUTTATA* (Spotted Turtle) and *CHRYSEMYS PICTA* (Painted Turtle). RAILROAD MORTALITY.** Railroads can be a significant source of mortality for wildlife populations (Dorsey et al. 2015. *In* van der Ree et al. [eds.], Handbook of Road Ecology, pp. 219–227. John Wiley & Sons, Ltd., West Sussex, UK; Heske 2015. Urban Nat. 4:1–4), including turtles (Popp and Boyle 2017. Basic Appl. Ecol. 19:84–93; Platt et al. 2021. Herpetol. Rev. 52:126–127). Turtles typically perish on railroads due to overheating after becoming entrapped between the rails (Kornilev et al. 2006. Herpetol. Rev. 37:145–148; Platt et al. 2023. Herpetol. Rev. 54:643–644) or from being struck and killed by passing trains (Platt et al. 2022. Herpetol. Rev. 53:112–114; Platt and Rainwater 2025. J. Raptor Res. 59:jrr2420). While recognized as a potential population-level threat, railroad mortality of turtles and other small vertebrates remains underreported because researchers typically spend little time actively searching railroads (DeGregorio et al. 2014. Herpetol. Rev. 45:142). Here, we report two observations of turtles that perished along a railroad after becoming entrapped in viscous creosote tar that leached from wooden crossties.

Our observations were made during an ongoing, long-term (2008 to present with hiatus in 2011) annual monitoring study of wildlife mortality along a 32 km segment of the Metro-North Commuter Railway in the Great Swamp of southeastern New York, USA (Platt and Rainwater 2023. Vulture News 85:1–14). The Great Swamp in Putnam and Dutchess counties encompasses approximately 30,000 ha of floodplains, beaver (*Castor canadensis*) wetlands, swamp forest, marsh, and fen, and as such, it is the largest freshwater wetland in the state (Siemann 1999. The Great Swamp: A Watershed Conservation Strategy. The Nature Conservancy, Pawling, New York. 69 pp.). Our survey methodology and monitoring protocols are described in detail elsewhere (Platt and Rainwater 2023, *op. cit.*).

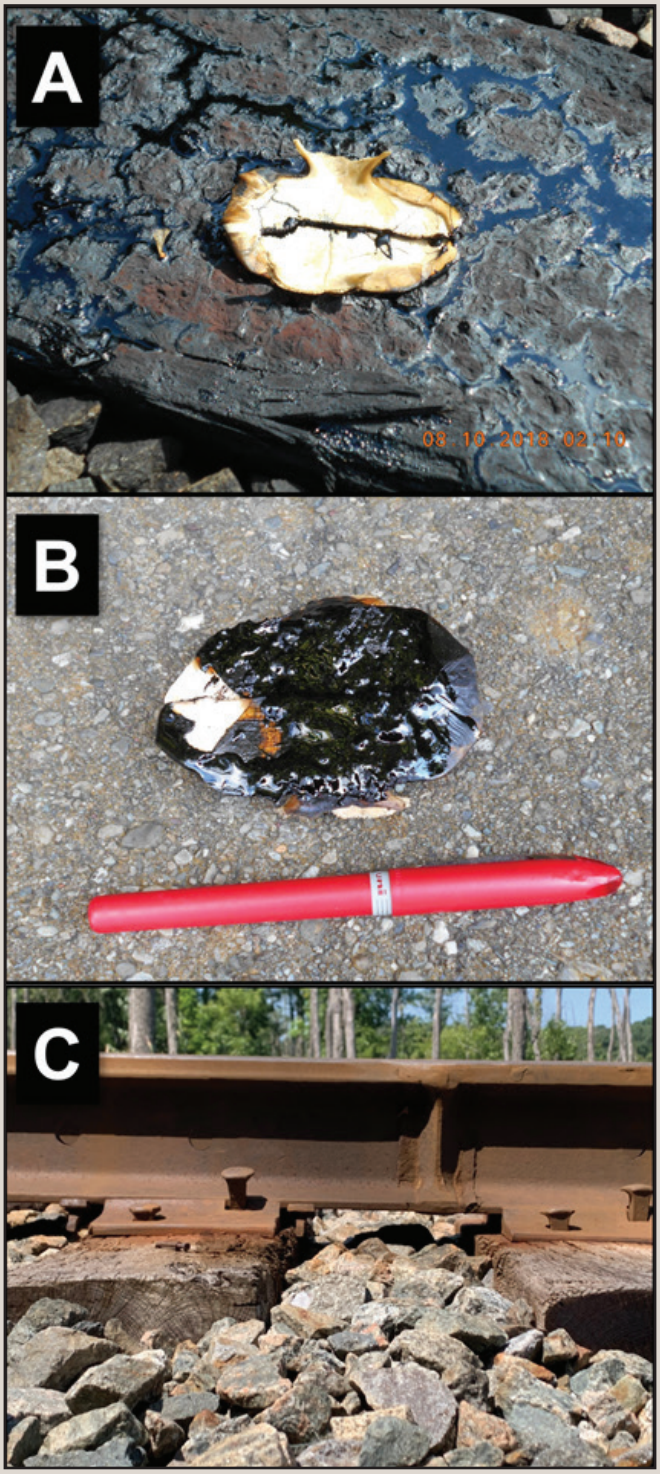


FIG. 1. A) Plastron of a Spotted Turtle (*Clemmys guttata*) that perished after becoming mired in creosote tar that leached from a crosstie along the Metro-North Railway in Dutchess County, New York, USA; B) ventral view of the plastron after being removed from the creosote tar; C) gap between rails and ballast that allows small-bodied turtles to gain access to the tracks.

Our first observation of turtle mortality occurred on 9 August 2018 when we found a plastron (with right and left bridge elements

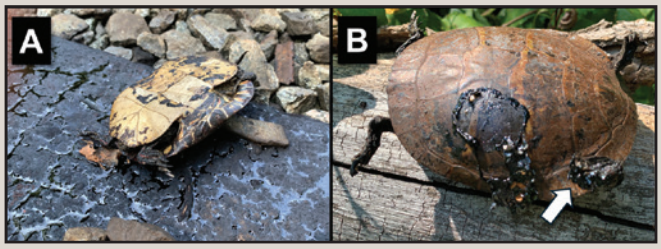


FIG. 2. A) Remains of a Painted Turtle (*Chrysemys picta*) held fast by creosote tar that oozed from a crosstie along the Metro-North Railway in Dutchess County, New York, USA; B) The left rear leg (white arrow) and left lateral surface of the carapace of the turtle were anchored securely to the crosstie by the creosote tar.

attached) of a *Clemmys guttata* (85 mm plastron length [from base of anal notch]; ca. 6 growth annuli visible on right humeral scute) trapped in highly viscous creosote tar that leached from a wooden crosstie between the rails (Fig. 1A). The plastron was held fast to the crosstie by the creosote, and some effort was required to wrench it free. A thick coating of creosote adhered to the humeral, pectoral, abdominal, and femoral scutes (Fig. 1B). Our interpretation of the kill-site suggests the turtle entered the railway by crawling through a gap between the rails and ballast (Fig. 1C), became mired in the creosote while moving along the railbed, over-heated, and ultimately succumbed to lethally high body temperatures (see also Kornilev et al. 2006, *op. cit.*). A predator – most likely a raccoon (*Procyon lotor*) – likely later scavenged the carcass, removing the carapace in the process. The physical appearance of the remains suggested entrapment occurred two to three months previously (May–June). The habitat adjacent to the railway at this location is a mixture of beaver swamp and open marsh (specific location withheld at request of New York Department of Environmental Conservation), and *C. guttata* have previously been confirmed in the area (Platt et al. 2023, *op. cit.*). Ballast ramps installed between the rails to provide a means for turtles to escape entrapment (see Platt et al. 2021, *op. cit.*) are present along this stretch of railway.

Our second observation of turtle mortality occurred on 15 August 2025 when we found the intact shell (with desiccated limbs and head still attached) of a *Chrysemys picta* (110 mm carapace length) stuck in creosote tar that was oozing from a crosstie between the rails (Fig. 2A). The left rear leg and left lateral surface of the carapace (two anterior costal and two posterior marginal scutes) were held securely to the crosstie by the creosote tar (Fig. 2B). As in the first instance (see above), the turtle most likely accessed the railway through one of the many gaps between the rails and ballast and became mired when moving along the tracks. We speculate the left rear leg first became stuck, and the turtle then flipped over while attempting to free itself from the tar, with death occurring soon afterwards. There are no ballast ramps along this section of railway, which is adjacent to the Gordon Douglas Nature Preserve.

Our two observations compliment a previous report by Vincent et al. (2022. Herpetol. Rev. 53:308–309) of a *C. picta* that perished from over-heating after becoming mired in creosote tar that leached from a crosstie. We are unaware of any other similar reports of turtle mortality attributed to entrapment in creosote tar. Given that we documented only two cases during 17-years of survey effort along the Metro-North Railway, creosote-related mortality among turtles is a rare occurrence in our study area. Similarly, Vincent et al. (2022, *op. cit.*) concluded entrapment of turtles by creosote leaching from crossties was a minor source of mortality after documenting only one case during three-years of weekly surveys along a railway in Ontario, Canada. That said, turtles that are able to get between the rails will almost certainly succumb to over-heating, regardless of whether they become mired in creosote tar. We stand by our earlier assessment that ballast ramps installed along the Metro-North Railway (Platt et al. 2021, *op. cit.*) are largely ineffectual in facilitating the escape of turtles (except perhaps large *Chelydra serpentina*) from between the rails (Platt et al. 2023, *op. cit.*). Instead, we urge transportation authorities in New York to eliminate gaps beneath the rails by adding extra ballast to the railbed, thereby preventing turtles from getting between the rails.

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***GLYPTEMYS INSCULPTA* (Wood Turtle). MORTALITY SOURCE.** Adult mortality is a significant factor affecting population persistence in long-lived, late maturing turtle species, particularly those with low fecundity such as Wood Turtles (*Glyptemys insculpta*). Simulation modeling suggests that Wood Turtle population persistence requires ≥95% adult annual survivorship (Compton 1999. M.S. Thesis. University of Maine, Orono, Maine. 91 pp.; Berkeland 2020. M.S. Thesis. University of Minnesota, Minneapolis, Minnesota. 76 pp.). However, a 2–4-yr survival study revealed that adult survivorship averaged <95% among Wood Turtle populations in northeastern Iowa, USA (52 monitored turtles; 2012–2015 mean = 0.86 ± 0.03 SD), and in northeastern Minnesota, USA (29 monitored turtles; 2015–2016 mean = 0.89 ± 0.05 SD) (Lapin et al. 2019. Herpetol. Conserv. Biol. 14:668–679). Thus, any adult mortality in these populations is significant and mortality sources should be identified and documented to inform species management and conservation policy.

Of 150 Wood Turtles encountered in Iowa during a long-term (2003–present) monitoring project, 56 known mortalities have been recorded, 48 (85.7%) of which have occurred since 2013. Based on track abundance, bite and scratch marks on carcasses, and direct observation at six field sites monitored via radio telemetry, predation by mammalian mesopredators (primarily Raccoons [*Procyon lotor*], Opossums [*Didelphis virginiana*], Mink [*Neogale vison*], and River Otters [*Lontra canadensis*]) is the largest source of adult mortality (23 [41.1%] of 56 observed mortalities).

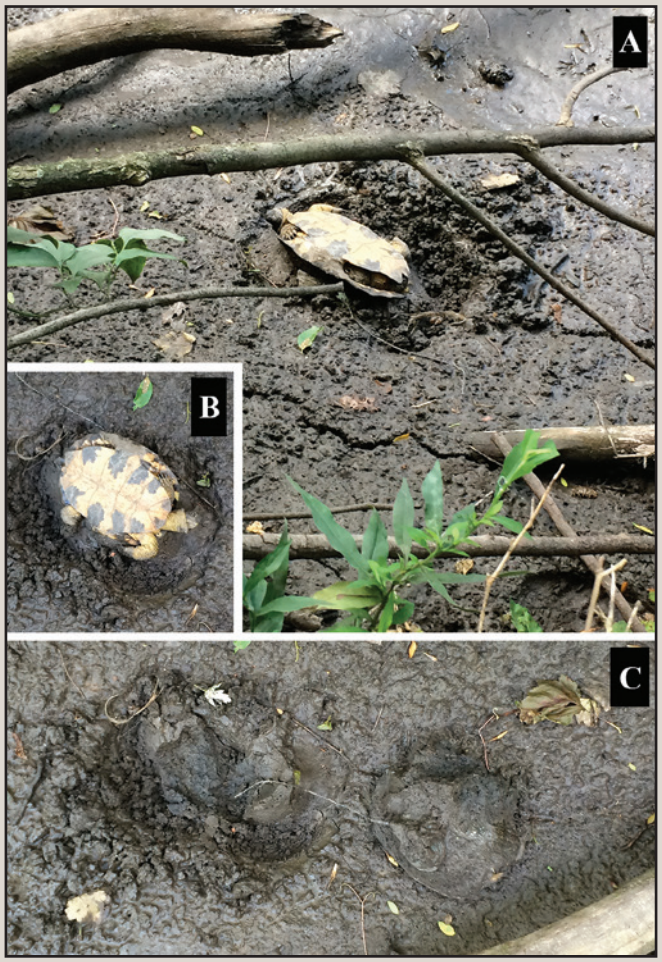
In northeastern Minnesota, despite the region experiencing less anthropogenic alteration than that of Iowa sites, adult mortality rates are also high (Lapin et al. 2019. Herpetol. Conserv. Biol. 14:668–679). From 2015–2018, in one section of a river, 77 Wood Turtles were found dead, producing a corresponding decline in estimated abundance at long-term monitoring sites (Crozier 2020. Tech. Rpt. MN DNR U-25-HM-1, Grand Rapids, Minnesota. 77 pp.). Swab samples from live turtles suggest disease

was an unlikely cause, and predation is a leading candidate for this large mortality event as there was an abundance of dead turtles and living individuals with missing limbs at these sites.

Northeastern Iowa and adjacent southeastern Minnesota are heavily impacted by land conversion to agriculture, and the streams that support Wood Turtle populations in this region (the Western Corn Belt Plains ecoregion) have experienced increased levels of stream flow and flooding over the past five to six decades, resulting in highly turbid streams that are often surrounded by mudflats, have steep muddy riverbanks, and possess areas of mixed sand, mud, and silt river substrates (Schilling and Libra 2003. J. Am. Water Resour. Assoc. 39:851–860; Lenhart et al. 2013. Water 5:1243–1261). In addition, agricultural practices are associated with increased raccoon and skunk (*Mephitis* spp.) abundance in Iowa (Kuehl and Clark 2002. J. Wildl. Manage. 66:1224–1234). Coyote (*Canis latrans*), opossum, raccoon, and skunk populations have more than doubled in Iowa since 2006 (Kaminski et al. 2024. Iowa Spring Spotlight Survey. 2024 Summary. Iowa Dept of Nat. Resour. Rpt. 44 pp.). In northeastern Minnesota (the Northern Lakes and Forests ecoregion), Wood Turtle habitat is less impacted by agriculture but still experiences habitat fragmentation from roadways and habitat alteration due to logging activities and development. Turtles also face mortality from predation and all-terrain vehicles (Lapin et al. 2019. Herpetol. Conserv. Biol. 14:668–679).

Here, we report a potential new Wood Turtle mortality source observed at two field sites in northeastern Iowa and at one site in northeastern Minnesota (specific locations withheld for conservation purposes). While conducting radio telemetry studies we have found five occurrences of Wood Turtles (four in Iowa, one in Minnesota) stuck in saturated mud and/or muddy sand, overturned on their carapace and unable to dislodge and right themselves. Trackways and adjacent digging patterns provide evidence that in these cases the turtles were attempting to navigate steep riverbanks after emerging from streams and overturned while climbing the bank, resulting in them being incapable of freeing themselves. Turtle age estimates were determined by annuli count and/or amount of wear and erosion on the shell. Turtles over 20-yrs-old were estimated in 4–5 yr intervals. Straight-line maximum carapace length (CL) and straight-line maximum plastron length (PL) were measured with a Marathon digital caliper (model 030300; ± 0.1 mm), and body mass (± 0.1 g) was determined at first encounter via an Schimadzu Libror digital scale (model EB-4300 DW; 4300.00 g). Sex of adults was determined via presence of secondary sex characteristics. Descriptions of the circumstances and habitat for each are provided below when available, including canopy cover (determined via spherical crown densiometer; Forestry Suppliers, Inc.), turtle cloacal temperatures, and ambient air temperatures (± 0.1°C; Digi-Sense Long-Stem Digital Thermometer). In each of these occurrences, researchers freed the turtles, which later showed no evidence of harm or altered behavior. We provide previous and subsequent relocation dates and movement distances when available.

Four observations occurred in Iowa. The first occurred at 1134 h on 30 May 2014 in Butler County, when an approximately 31–35-yr-old adult female (IA104; 188.98 mm CL, 175.09 mm PL; mass = 987.6 g) was found overturned on her back in saturated muddy sand under 10% canopy cover at the base of an eroded streambank on a hot sunny day with no cloud cover. This turtle was 1.0 m from the west stream edge and near the junction of a small canal and the primary stream. This turtle had previously been located 13.5 m upstream (North) on the same streambank on 24 May 2014. Air temperature was 30.7°C, and the turtle cloacal temperature was 34.8°C. This was the second highest cloacal temperature of 10,256 field-recorded turtle body temperatures among Iowa Wood Turtles but beneath the critical thermal maximum for *G. insculpta* (mean = 41.3°C; range = 39.6–42.5; mean loss of righting ability occurs at 39.8°C [range = 39.0–40.5]) (Hutchison et al. 1966. Herpetologica 22:32–41). The turtle was rescued by field researchers and was next located 9.0 m upstream on this same stream bank on 9 June 2014.



PHOTOS BY JEFF TAMPLIN

FIG. 1. A) Adult female *Glyptemys insculpta* (IA104) from Iowa found stuck upside down on saturated mud on 11 July 2016; B) close-up view; and C) view of turtle after rescue, showing the depression left in the mud.

At 1603 h on 11 July 2016 in Butler County, IA104 was again found stuck upside down along this same stream bank, 120.0 m downstream (Southeast) from the 30 May 2014 location. She was found under 20% canopy cover on saturated mud, approximately 5.5 m from the stream edge, after a heavy rainstorm passed through the field site (Fig. 1). This turtle was in shade on a partly sunny day with 60% cloud cover and possessed a cloacal temperature of 27.7°C, slightly lower than the ambient air temperature (28.3°C). This individual had last been observed basking in a grass and forb terrestrial habitat 27.0 m Southeast of this location on 6 June 2016 and was next located 52.0 m upstream (Northwest) on 26 July 2016. IA104 was first encountered on 5 May 2014 and was eventually found dead on 7 May 2019, the result of a predator attack. Raccoon scat and tracks were found nearby.

PHOTOS BY JEFF TAMPLIN

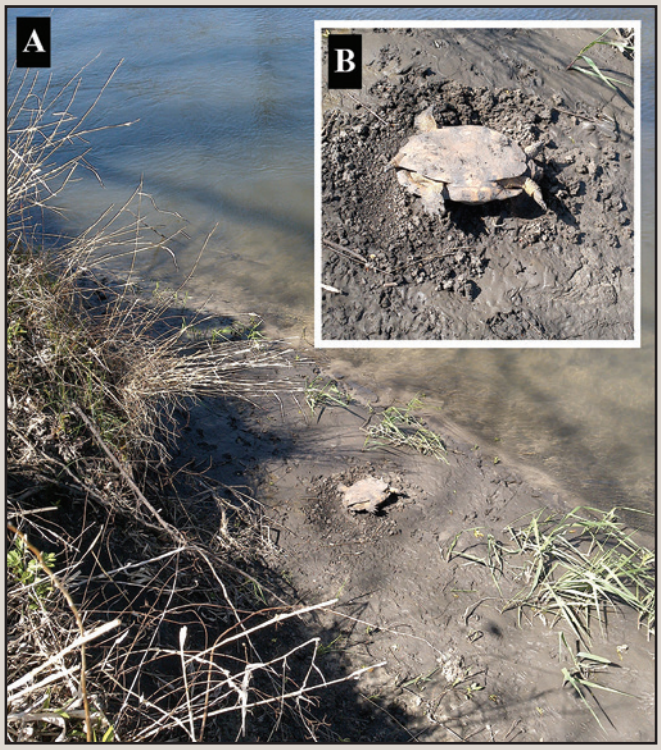


Fig. 2. A) Adult female *Glyptemys insculpta* (IA106) from Iowa found stuck upside down on saturated mud on 1 May 2023; B) close-up view.

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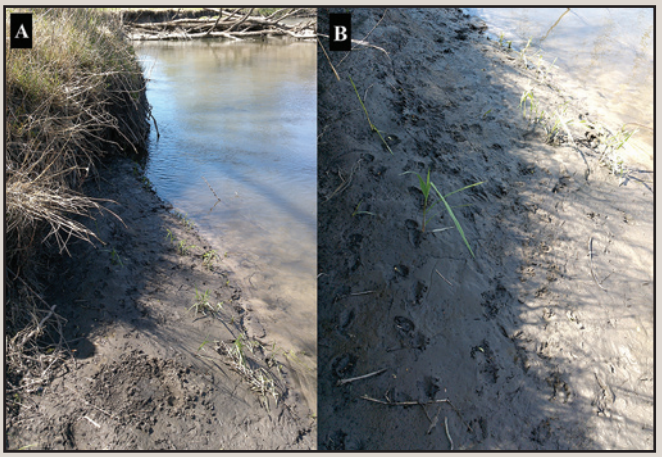


Fig. 3. A) Tracks of adult female (IA106) and adult male (IA129) *Glyptemys insculpta* from Iowa on 1 May 2023 indicating that the male was mounted on the female, who then fell backwards and became stuck upside down in the mud after attempting to climb the riverbank; B) tracks on the left are deeper due to the male being mounted on the female, while tracks on the right were made by the male as he returned to the stream. The male was still in the river at this location when these photos were taken.

The third Iowa observation occurred at 1526 h on 12 July 2018 in Black Hawk County, when an approximately 25–29-yr-old adult female (IA119; 186.81 mm CL, 177.49 mm PL; 967.4 g) was found overturned on her back in saturated mud 10.0 m from the stream edge, near a steep bank along an ephemeral pool that is periodically connected to the primary stream in the area. The turtle was located under 50% canopy cover on a fully exposed, mostly bare mud surface with scattered woody debris on a warm sunny day with 5% cloud cover. Her cloacal temperature was 32.5°C when the ambient air temperature was 26.7°C. After being rescued by field researchers, she behaved normally and was again located in the same area on 20 July 2018. This turtle had been previously encountered at this same location on 28 June 2018. IA119 was first encountered as a 21–25-yr-old adult on 21 October 2014 and was radio tracked through 31 May 2021.

The fourth Iowa observation occurred at 1424 h on 1 May 2023 in Butler County when an approximately 24-yr-old adult female (IA106; 188.47 mm CL, 173.32 mm PL; 937.7 g) was found overturned on her back on wet mud, 0.50 m from the south bank of the stream edge (Fig. 2). She was located at the base of a steep, vertical bank with exposed soil adjacent to a large field of Reed Canary (*Phalaris arundinacea*) grass that she frequently utilizes. Her cloacal temperature was 18.2°C when the ambient air temperature was 13.7°C on a cool sunny day with no cloud cover and strong winds. This was the first observation of her on land in 2023. She had recently moved 250 m upstream (Northwest) from her brumation site. Tracks in the mud suggest that the female emerged from the river with adult male IA129 mounted on her carapace, then fell backward while attempting to climb up the adjacent steep bank (Fig. 3). The male then re-entered the stream, where he was located 7.5 m from the female as the field team arrived at the scene. The female had become stuck upside down and was unable to dislodge and right herself. After field researchers freed her, she subsequently entered the stream and was next encountered 16.5 m upstream on 18 May 2023. IA106 was first encountered on 18 May 2014 as an approximately 15-yr-old recently matured adult. She is still alive in 2025 and is currently being radio tracked.

At 1507 h on 4 June 2025 in St. Louis County, Minnesota, a >20-yr-old adult male (MN4028) was observed overturned on his back on a muddy sand flat, approximately 1 m from the stream edge near a steep riverbank (Fig. 4). In trying to free himself, the turtle had dug a small trench around himself and was found on an elevated section of muddy sand and was not able to dislodge and right himself. The turtle was fully exposed with 0% canopy cover on a sunny day with an air temperature of 22°C. When this turtle was rescued by field researchers, it appeared lethargic and displayed partially flaccid limbs. The turtle was held in the river for a few minutes to ensure that it was healthy and then was released and swam away normally. This turtle was first encountered on 23 August 2023 and has not yet been recaptured during subsequent, although minimal, field site visits.

Given that we are tracking only a subset of individuals at several field sites, we speculate that these situations must occur more frequently than the five times we have observed them. Increased stream flow, more frequent flooding events that augment bank erosion, and agriculturally related siltation of streams in recent decades may have introduced a new source of mortality among Midwestern Wood Turtle populations. Although we rescued each of these turtles before death, these occurrences may lead to mortality from either exposure or from a subsequent depredation event when a predator encounters these immobile turtles. We also speculate that some of our observed depredation mortalities may have originally stemmed from these occurrences, but after the predator removes and consumes the carcass, the original source and site of the encounter may not be clearly identified by field researchers.

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PHOTOS BY GAEA CROZIER.

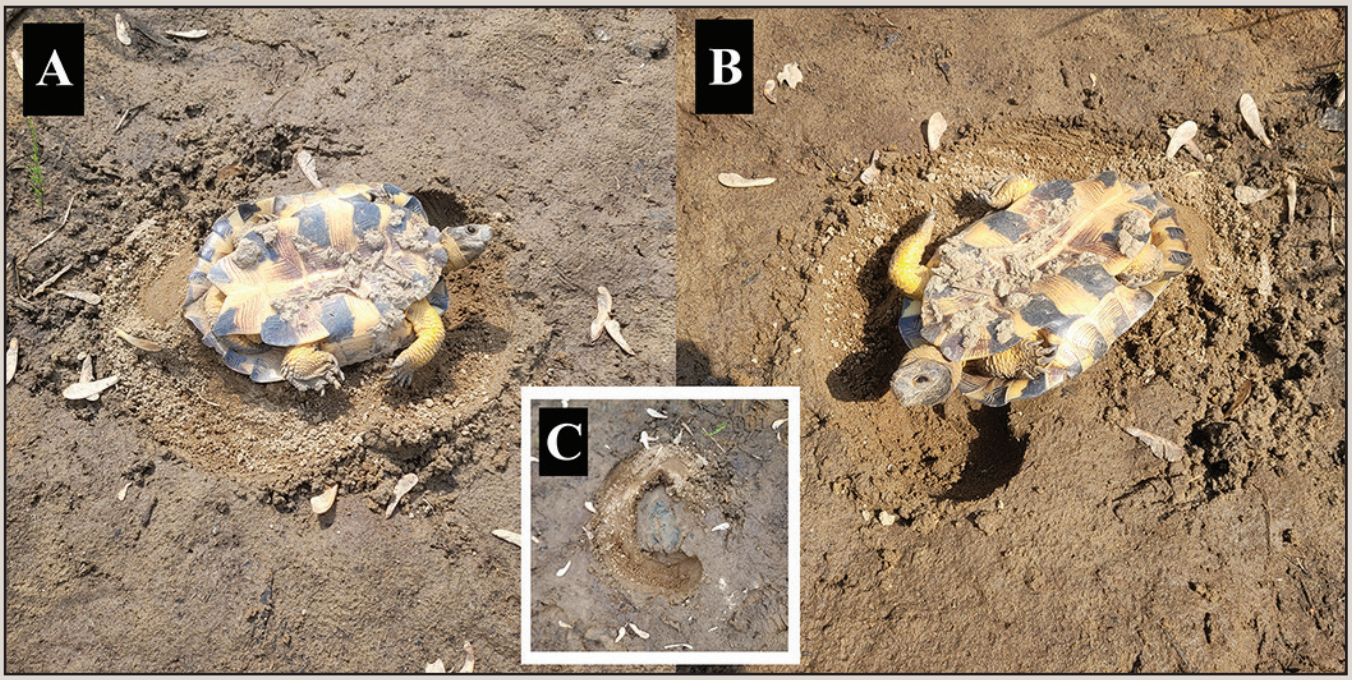


FIG. 4. A) Adult male *Glyptemys insculpta* (MN4028) from Minnesota found stuck upside down on wet, muddy sand on 4 June 2025; B) close-up view showing trench dug by turtle; and C) view after rescue, showing the depression left in the sand.

Program (Minnesota observation). Handling of turtles was conducted under scientific collection permit SC648 from the Iowa Department of Natural Resources and under special permit No 36026 from the Minnesota Department of Natural Resources.

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***GOPHERUS POLYPHEMUS* (Gopher Tortoise). BURROW ASSOCIATE.** Over 362 species of animals are associated with burrows created by *Gopherus polyphemus* (Gopher Tortoise), including over 300 species of invertebrates (Jackson and Milstrey 1989. Florida Game and Fresh Water Fish Commission, Nongame Wildlife Program Technical Report No. 5). Here, for the first time, we describe two instances of *Latrodectus geometricus* (brown widow spider) using a Gopher Tortoise burrow.

At 1934 h on 11 July 2024, we observed and photographed a single adult *L. geometricus* on a roadside along the southbound side of US 41 in Citrus County, Florida, USA (28.68418°N, 82.32125°W; WGS 84). The roadside was adjacent to rural residential areas with fragmented longleaf sandhill habitat. The spider, a female with an egg sack, was located just inside the drip line of a Gopher Tortoise burrow entrance. The web was positioned at the top of the burrow. The burrow width at the entrance was 30.0 cm. The burrow was classified as inactive (McCoy and Mushinsky 1992. Herpetologica. 48:402-407), meaning that while it had been used in recent months, it had no signs of having been used in recent days or weeks.

At 1541 h on 21 February 2025, we found a *L. geometricus* egg sack, uniquely identified due to the appearance of spikes on the egg sack and the webbing type holding the egg sack, just inside of the drip line of a tortoise burrow (Makover et al. 2019. J. R. Soc. Interface. 16:20180581). The tortoise burrow was located along the northbound side of state road 589 near Crews Lake Park in Pasco County, Florida, USA (28.37355°N, 82.54217°W; WGS 84). The web was positioned across the top of the entrance. The spider was not present. The burrow was classified as abandoned (McCoy and Mushinsky 1992, *op. cit.*).

We thank Mikie Green for confirming our identifications.

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***KINOSTERNON CRUENTATUM* (Atlantic Red-cheeked Mud Turtle). DIET.** *Kinosternon cruentatum* is a recently resurrected species (McCranie 2018. Bull. Mus. Comp. Zool. 15:1–129) with two species in the former *K. s. cruentatum* group, one in Pacific facing drainages and the other (this species) in Caribbean facing drainages (Hurtado-Gomez et al. 2024. Mol. Phylogen. Evol. 197:108083). The resurrected species, named as *K. cruentatum* has a distribution in southern Mexico, Guatemala, and Belize (Turtle Taxonomy Working Group 2025. Turtles of the World. Chelonian Research Monograph 10:1–596). Reported as part of the former *K. scorpioides* group, its diet was generally considered omnivorous, with documented consumption of aquatic invertebrates, carrion, algae, and occasional plant material (Carvalho et al. 2008. Herpetol. Rev. 39: 283–285; Cassano and Alcalde 2022. Chelonian Conserv. Biol. 21:232–245). However, instances of frugivory and its potential roles in seed dispersal remain largely undocumented for this taxon.

In July 2025, at the Belize Foundation for Research and Environmental Education (BFREE) within the lowland tropical forest of southern Belize, we captured 27 *K. cruentatum* individuals in emergent wetlands and ponds that are surrounded by Craboo Trees (local vernacular; likely *Byrsonima crassifolia*,



FIG. 1. Partially digested Craboo seeds defecated by *Kinosternon cruentatum* in Belize.

Malpighiaceae) in the savannah habitats just outside of the BFREE property. Craboo Trees are a dominant tree species in the savannah habitats, and an adult female *K. cruentatum*, was observed defecating partially digested Craboo fruits during our measuring and health assessment process. The seeds were abraded and looked partially digested but remained structurally intact (Fig. 1).

This finding suggests the potential for *K. cruentatum* to act as a seed dispersal agent, either incidentally or through facultative frugivory. While seed ingestion has been reported in other kinosternids, e.g., *Kinosternon integrum* consuming grass and guava seeds (Macip-Rios et al. 2010. Chelonian Conserv. Biol. 9:90–97), and *K. subrubrum* consuming large numbers of seeds of Yellow Pond-lily (*Nuphar luteum*; Graham and Sorrell 2008. Herpetol. Rev. 39:218), it has not been previously documented for the *K. scorpioides* group, to which *K. cruentatum* previously belonged. Similar roles in seed dispersal are well-known among frugivorous reptiles, especially tortoises (Strong and Fragoso 2006. Biotropica 38:683–686) but have rarely been associated with freshwater turtles (Munscher et al. 2019. Herpetol. Rev. 50:356–357).

Given the Craboo Tree's ecological dominance in the pine savannah and savannah ecosystems, any contribution to its seed dispersal network may be significant. Future research should assess seed viability post-passage, movement patterns of turtles in relation to fruiting trees, and potential impacts on forest regeneration dynamics. This observation adds to the growing body of evidence that freshwater turtles may provide underappreciated ecological functions within tropical ecosystems.

Disclaimer: The findings and conclusions in this article are those of the author(s) and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

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***KINOSTERNON SUBRUBRUM* (Eastern Mud Turtle). ALLIGATOR NEST ASSOCIATE.** Turtles in the families Emydidae, Trionychidae, Podocnemididae, Chelidae, and Kinosternidae are known to utilize crocodilian nests and nesting sites for oviposition (Escobedo-Galván et al. 2019. North West J. Zool. 15:96–100). Occasional associate nesting occurs in *Crocodylus* nests, mainly between Neotropical crocodiles and turtles in the genus *Trachemys* (Escobedo-Galván et al. 2019, *op. cit.;* Platt et al. 2021. J. Nat. Hist. 55:133–149). However, interspecific communal nesting between turtles and crocodilians has been most frequently reported within the family Alligatoridae, particularly for *Alligator mississippiensis* (American Alligator) (Escobedo-Galván et al. 2019, *op. cit.*). Of these occurrences, *Pseudemys nelsoni* (Florida Redbelly Turtle) is the most documented secondary nest user (Goodwin and Marion 1977. Fla. Sci. 40: 237–238; Deitz and Jackson 1979. J. Herpetol. 13:510–512; Kushlan and Kushlan 1980. Copeia 930–932; Enge et al. 2000. J. Herpetol. 34:497–503), while other observed species include *T. scripta*, *Sternotherus odoratus*, *Kinosternon subrubrum*, *K. baurii*, *K.* sp., *Apalone ferox*, and *Pseudemys concinna* (Escobedo-Galván et al. 2019, *op. cit.* and references therein). Oviposition by *K. subrubrum* in *A. mississippiensis* nests has been observed in Florida, USA (Deitz and Jackson 1979, *op. cit.*; Enge et al. 2000, *op. cit.*), and suspected in South Carolina (Rainwater et al. 2024. Animals. 14:620), USA. Here, we confirm nesting by *K. subrubrum* in an *A. mississippiensis* nest in coastal South Carolina.

On 13 July 2025 at 1630 h, we discovered an adult *K. subrubrum* with three eggs in an active (containing eggs) alligator nest mound on the edge of a managed impounded wetland at the Tom Yawkey Wildlife Center, Georgetown County, South Carolina (33.2035°N, 79.2566°W; WGS 84; 1 m elev.). The turtle and her eggs were both completely buried in nest material ca. 20 cm from the top of the nest, positioned slightly toward the outer periphery of the nest mound, and located ca. 25 cm above the alligator clutch (Fig. 1). The turtle (95 mm carapace length, 88 mm plastron length, 37 mm shell depth) and eggs (mean [± SE] length = 27.67 ± 0.33 mm; width = 16.0 ± 0.58 mm; N = 3) were temporarily removed from the nest (Fig. 2) while the remainder of the nest was inspected. The upper surface of each egg was marked with a graphite pencil to avoid rotation while handling, and each egg appeared to be fertile as evidenced by an opaque band around the middle of the eggshell (Fig. 2). The turtle and each egg were measured, placed back into the nest in their original location and orientation, and re-covered with nest material.

Crocodilian nest mounds are considered favorable nesting sites for other reptiles because they provide adequate nesting material, are elevated and reduce risk of egg inundation from flooding (Enge et al. 2000, *op. cit.*; Elsey et al. 2016. Southeast. Nat. 15:653–668), exhibit relatively stable internal temperatures and humidity conditions favorable for eggs of other reptile species (Hall and Meier 1993. Copeia 219–222; López-Luna et al. 2015. J. Therm. Biol. 50:66–73) and are often defended against predators by attending female alligators, which may provide incidental protection to the clutches of nest associates (Grigg and Kirshner 2015. Biology and Evolution of Crocodylians. Cornell University Press, Ithaca, New York. 649 pp.; Platt et al. 2021, *op. cit.*).



FIG. 1. An adult female *Kinosternon subrubrum* (Eastern Mud Turtle) and three eggs (adjacent to ruler) found in an *Alligator mississippiensis* (American Alligator) nest in coastal South Carolina, USA, on 13 July 2025. Arrow indicates location of the turtle and eggs before being temporarily removed. The top portion of the alligator clutch is visible in the bottom of the nest cavity.



FIG. 2. Close-up view of an adult female *Kinosternon subrubrum* (Eastern Mud Turtle) and three eggs found in an *Alligator mississippiensis* (American Alligator) nest in coastal South Carolina, USA, on 13 July 2025. Note the opaque bands on the eggs, indicating fertility.

Potential disadvantages to *K. subrubrum* (and other reptiles) from using alligator nests as oviposition sites include predation of the maternal female (Enge et al. 2000, *op. cit.*; Kellogg 1929. U.S. Department of Agriculture, Technical Bulletin 147:1–36; Giles and Childs 1949. J. Wildl. Manage. 13:16–28) and inadvertent destruction of turtle eggs by the maternal female alligator during nesting or post-hatch nest excavation (Enge et al. 2000, *op. cit.*; Deitz and Jackson 1979, *op. cit.*). Partial nest disturbance or destruction may particularly affect *K. subrubrum* because hatchlings of this species overwinter in the nest and emerge the following spring (Gibbons and Nelson 1978. Evol. 32: 297–303). Our observation of turtle eggs located above the alligator eggs within the nest mound differs from previous studies which reported most turtle eggs below or at the same level with alligator eggs (Goodwin and Marion 1977, *op. cit.*) and most turtle egg deposition occurring at times when mounds lacked alligator eggs (Kushlan and Kushlan 1980, *op. cit.*). Despite varying hypotheses on the ecological consequences of communal nesting, turtle clutch survivorship in crocodilian nest mounds is yet to be documented (Goodwin and Marion 1977, *op. cit.*; Deitz and Jackson 1979, *op. cit.*; Kushlan and Kushlan 1980, *op. cit.*; Escobedo-Galván et al. 2019, *op. cit.*).

In Florida, Deitz and Jackson (1979) found eggs of *K. subrubrum* in one alligator nest and several adult female *K. subrubrum* buried in alligator nests (presumably nesting) but with no associated eggs. In addition, Kushlan and Kushlan (1980, *op. cit.*) found *K. baurii* eggs in one alligator nest in the Everglades, and Enge et al. (2000, *op. cit.*) found 28 clutches of unidentified kinosternid eggs in several alligator nests in central and southern Florida. In South Carolina, Rainwater et al. (2024) observed *K. subrubrum* at multiple alligator nest sites and one turtle partially burrowed (possibly nesting) into the side an alligator nest. To our knowledge, our report is the first to document an adult female *K. subrubrum* with associated eggs inside an alligator nest, confirming alligator nests as egg oviposition sites for *K. subrubrum* in South Carolina, ca. 500 km north of the previous northernmost observations in Florida. In conclusion, our observations and those from Florida suggest *K. subrubrum* probably uses alligator nest mounds as nesting substrates wherever the two species are sympatric.

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***KINOSTERNON SUBRUBRUM SUBRUBRUM* (Southeastern Mud Turtle). MAXIMUM SIZE.** On 9 March 2025, during a multi-year study, we captured a notably large adult female *Kinosternon subrubrum subrubrum* (Southeastern Mud Turtle) in Congaree National Park, Richland County, South Carolina, USA. As part of our research, we conducted active trapping using collapsible baited PRO-mar traps to study sympatric turtle species in the park, resulting in the capture of 31 *K. s. subrubrum* in 2025. Using measuring terminology from Iverson and Lewis (2018. Herpetol. Rev. 49:453–460), we measured the maximum carapace length (SCL_{max}) of the notably large female *K. s. subrubrum* as 132 mm. We also recorded the minimum carapace length (SCL_{min} or midline carapace length) of this individual as 129.4 mm. The midline plastron length was 123.7 mm. We measured midline plastron length from the integument between the anal scutes to the center of the anterior hinge (86.2 mm) and then from the center of the anterior hinge to the gular scute (37.5 mm).

Iverson (1977. Cat Amer. Amphib. and Reptiles. 193:1–4) noted the maximum carapace length for this species to be 125 mm, which Ernst and Lovich (2009. Turtles of the United States and Canada, Second Edition, Johns Hopkins University Press, Baltimore, Maryland. 827 pp.) postulated to be for a female individual. Thus, the SCL_{max} of our individual surpassed the previous record by 7 mm. The more conservative SCL_{min} also surpassed the previously recorded maximum carapace length by 4.4 mm. Ernst and Lovich (2009, *op. cit.*) reported the SCL_{max} for male Eastern Mud Turtles as 110 mm. Gibbons (1983. Herpetologica 39:254–271) posited

that the size structure of individuals of this species does not differ significantly across its range or between sexes.

At Congaree, we recorded the mean SCL_{min} of sexually mature male and female turtles as 97.7 mm (N = 23; 86.1–108 mm) and 102.8 mm (N = 8; 90.2–129.4 mm), respectively. For our sample, we included only adult turtles with an SCL_{min} of ≥ 80 mm, which is consistent with sexual maturity seen in other South Carolina populations (Gibbons 1983, *op. cit.*). Across both sexes, we recorded an average SCL_{min} of 99.0 mm (N = 31). Thus, the SCL_{min} of the large female reported here exceeds the average length for females at this site by 26.6 mm and exceeds the average length of males by 31.7 mm. Gibbons and Lovich (1990. Herpetol. Monogr. 4:1–29) reported that average carapace lengths of multiple *K. s. subrubrum* populations in South Carolina ranged between 85–90 mm for males and 81–89 mm for females. Thus, the population at Congaree may be reaching comparatively larger sizes than other South Carolina populations. However, the relatively high average carapace lengths recorded here may be confounded by the small sample sizes, particularly for females. While an additional large female was captured on 15 March 2025 with an SCL_{min} of 121.8 mm, all other females captured in 2025 had an SCL_{min} under 100 mm (90.2–99.8 mm). Handling and measuring of turtles were approved by the Virginia Tech and National Park Service Institutional Animal Care and Use Committees (23–266).

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***MANOURIA EMYS* (Asian Brown Giant Tortoise). MYCOPHAGY.** *Manouria emys* is a pan-tropical Asian testudinid, with a distribution from Northeast India to Sumatra and Borneo (Das 2010. A Field Guide to the Reptiles of South-east Asia. New Holland Publishers [UK], Ltd., London. 376 pp.). While widespread in appropriate habitats, particularly, hill dipterocarp forests, its natural history has remained poorly studied in the wild, and of its diet, little has been recorded (Das 2010, *op cit.*; Lim and Das 1999. Turtles of Borneo and Peninsular Malaysia. Natural History Publications [Borneo] Sdn Bhd, Kota Kinabalu. xii + 151 pp.). Anecdotal accounts of wild diet include bamboo shoots and tubers (Nutphand 1979. The turtles of Thailand. Siam Farm Botanical Garden, Bangkok, Thailand. 222 pp.), seedlings and leaves and roots of understory plants, fallen *Ficus punctata*, several species of mushrooms, including two unnamed species of *Russula* (Lambert and Howes 1994. Malayan Nat. J. 48:125–131), as well as invertebrates and frogs (Humphrey and Bain 1990. Endangered Animals of Thailand. CRC Press, Boca Raton, Florida. 480 pp.). While fungus is known to be an important component of the diet of wild tortoises (Elliott et al. 2019. Mycosphere 10:776–797), including of the two living *Manouria* species (Heiss et al. 2011. J. Morphol. 272:1217–1229), and members of the genus *Russula* have been specified, no specific species of the genus are known for *M. emys*. Nonetheless, the two species have been considered to be primarily fungivores (e.g., Chan-ard et al. 1996. Chelonian Conserv. Biol. 2:109–113; Wanchai et al. 2013. Trop. Nat. Hist. 13:39–48), and a role in spore dispersal and nutrient cycling has been suggested.

On 26 September 2023, at ca. 0905 h, an adult (ca. 350 mm straight-line carapace length) *Manouria emys* was observed feeding on the fungus *Russula virescens* in the VIP Plot (5.1633°N, 118.1008°E; WGS 84; 191.39 m elev.), within the Danum Valley Conservation Area, Sabah, East Malaysia, in northeast Borneo. The habitat comprised lowland dipterocarp forest with closed canopy, within Danum Valley, an area comprises 438 km^2 of lowland and hill dipterocarp forest, managed as a conservation area by Yayasan Sabah, a statutory body whose role is to improve the quality of life in the State. Fig. 1 shows the tortoise face with spores attached to postnasal region as well as mandible. The fungal species is a basidiomycete mushroom, sometimes referred to as the Pale Green Pileus Russula (Fig. 2; Borneensis Collection of Universiti Malaysia Sabah, Kota Kinabalu, Malaysia; BORH(F) 03071). Mycophagy from the site was previously recorded from the site by Høybye-Mortensen (2004. M.S. Thesis, Syddansk Universitet, Odense, Denmark. iv + 100 pp.), without a specific identification of the food plant. The genus has been previously reported in the diet of the geoemydid turtle *Heosemys spinosa*, which occurs in sympatry with *M. emys* over much of its distributional range (Baizurah and Das 2020. Herpetol. Rev. 51:831–832), as well as the east Asian *Cuora galbinifrons* and *C. mouhotii* (Xiao et al. 2017. Chelonian Conserv. Biol. 16:236–238); the North American emydid turtles, *Glyptemys insculpta* (Tuttle and Caroll 1997. Chelonian Conserv. Biol. 2:447–449), and *Terrapene carolina* (Klimstra and Newsome 1960. Ecology 41:639–647; Dodd 2001. North American Box Turtles. A Natural History. University of Oklahoma Press, Norman, Oklahoma. xvii + 231 pp.). Members of the genus *Russula* are also known to be part of the diet of testudinids, including the Neotropical *Chelonoidis denticulata* (Lodge et al. 2016. Herpetol. Rev. 47:443), and two additional Asian species, *Manouria impressa*



PHOTO BY JAYA SEELAN SATHIYA SEELAN

FIG. 1. Adult *Manouria emys* from Borneo with large patches of *Russula* spores attached to postnasal and mandibular region.



PHOTO BY TAN GIM SIEW

FIG. 2. The fungus *Russula virescens*, showing mature fruit body.

(Chan-Ard et al. 1996, *op cit.*) and *Indotestudo elongata* (Ihlow et al. 2016. Chelonian Res. Monogr. 5:096.1–14). These observations reiterate the importance of fungus in the diet of terrestrial turtles and tortoises, and of their possible importance in their dispersal within lowland rainforest ecosystems.

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***STAUROTYPUS SALVINII* (Pacific Giant Musk Turtle). FIELD REPRODUCTIVE OUTPUT.** Clutch size of the Pacific Giant Musk Turtle (*Staurotypus salvinii*) in captivity has been well-studied (6–10 eggs (mean 8.7): Schmidt 1970. Salamandra 6:3–10; Sachsse and Schmidt 1976. Salamandra 12:5–16; 3–10 eggs: Zimmermann 1986. Breeding Terrarium Animals. Amphibians and Reptiles. TFH Publications, Neptune, New Jersey. 384 pp.; 1–9 eggs (mean 5.4): Goode 1994. *In* Murphy et al. [eds.], Captive Management and Conservation of Amphibians and Reptiles, pp. 275–295 Contributions to Herpetology 11. Soc. Study Amphib. Rept., Ithaca, New York; 6 eggs: Sátorhelyi and Farkas 2006. *In* Artner et al. [eds.], Turtles: Proc. Intern. Turtle Tortoise Symposium, pp. 292–297, Vienna, Frankfurt au Main, Germany. 618 pp.; 2–10 eggs (mean 4–5): Pellegrin 2011. Reptilia 77:29–34; 3–6 eggs: Carlino 2012. Radiata 21:23–35). However, only two unpublished reports of field data on clutch size are available for this species.

Dean (1980. M.S. Thesis, Texas A&M University, College Station) examined reproductive tracts of ten female *S. salvinii* from Chiapas, Mexico, and reported an average of 11.3 total follicles of > 6.2 mm diameter per female, likely representing at least two clutches. He found no corpora lutea. Legler and Moll (unpublished, *In* Legler and Vogt 2013. The Turtles of Mexico, Land and Freshwater Forms. University of California Press, Berkeley. 416 pp.) found 6–19 enlarged follicles in female *S. salvinii* (number and other data unreported) from El Salvador, with distinct size classes suggesting two to three clutches of 6–10 eggs annually. No individual clutch mass estimates were reported. Details of follicle sizes were not reported in either study. Hence, despite much data on captive clutch size in *S. salvinii*, estimates from the field are still quite vague.

This report supplements the data from the Dean (1980, *op. cit.*) study based on my dissection of two females from his study population at Puerto Ariste, Chiapas, Mexico. In October of 1979, Dean sent me four recently captured living *S. salvinii* (two females and two males) from his study population. He sent them to me to measure and weigh in life, to dissect the turtles for reproductive tracts (and preserve the viscera), to prepare them as skeletons, and to return the skeletons and viscera to him for his studies. These specimens were returned to him in November 1979. Hence, my dissections supplement the data reported in Dean (1980, *op. cit.*).

In the right ovary, the smaller female (138 mm maximum carapace length [CL]; 86 mm maximum plastron length [PL]; 417 g) bore enlarged ovarian follicles of 13, 12, 12, and 9 mm diameter. In the left ovary, it bore follicles of 14, 13, 13, and 10 mm. Assuming that the four smallest follicles were not yet of ovulatory size, the estimated next clutch would have included four eggs, with a possible second clutch of four eggs. No corpora lutea were evident, as expected since the female was collected just before the reproductive season commenced (Dean 1980, *op. cit.*). This female had likely matured recently since Dean reported three mature females at the sizes of 129, 136, and 137 mm CL and reported three presumably immature females at the sizes of 118, 134, and 138 mm CL. However, in captivity, Goode (1994, *op. cit.*) reported the smallest mature female at 146 mm CL.

In the right ovary, the larger female (164 mm CL; 104 mm PL; 709 g) bore enlarged ovarian follicles of 14 and 13.5 mm. In the left ovary, it bore follicles of 16, 15, 14, 14, 14, 14, 12, 12, and 8 mm. Assuming that the smallest three follicles were not yet of ovulatory size, the estimated clutch size would have been eight, with uncertainty as to the production of a second clutch. Again, no corpora lutea were evident.

If egg mass is assumed to be 10.34 g (Goode 1994, *op. cit.*), estimated clutch mass of the two females would have been 41.36 g and 82.72 g, respectively, and estimated relative clutch mass (RCM; clutch mass/gravid female mass) would have been 9.92% and 11.67%, respectively. This RCM is nearly twice that reported by Goode (1994, *op. cit.*) for captive females (6.4% RCM).

The data from Dean (1980, *op. cit.*), Legler and Vogt (2013, *op. cit.*), and my dissections suggest *S. salvinii* has a typical clutch frequency (CF) of two in the field. However, in captivity, Schmidt (1970, *op. cit.*) and Sachsse and Schmidt (1976, *op. cit.*) estimated CF at up to three per year. Zimmermann (1986, *op. cit.*) also reported up to three per year, Goode (1994, *op. cit.*) found 2–5 clutches per year (mean 3.6), Sátorhelyi and Farkas (2006, *op. cit.*) reported two clutches in a year in one female, Pellegrin (2011, *op. cit.*) reported CF of 2–3, and Carlino (2012, *op. cit.*) found 3–4 clutches per year.

Optimal temperature and food conditions in captivity might contribute to the higher clutch frequency, greater size at maturity, and lower RCM than in the field. These discrepancies argue strongly for the need of additional fieldwork on this endangered species while it is still possible.

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***STERNOTHERUS ODORATUS* (Common Musk Turtle). PENILE PROLAPSE.** At 1218 h on 25 April 2025, during a routine monthly capture-mark-recapture turtle survey at Spring Lake, San Marcos, Hays Co., Texas, USA (29.89288°N, 97.93196°W; WGS 84; 180.4 m elev.), we captured a mature male *Sternotherus odoratus* (Amphibian and Reptile Diversity Research Center, The University of Texas at Arlington [UTADC] 10101 [photo voucher]; 8.6 cm CL; 96 g) in a shrimp baited hoop-net trap, exhibiting a penile prolapse (Fig. 1A, B). The prolapse was coincident to swelling of the cloacal region. The individual was marked using a Passive Integrated Transponder (PIT) tag. Photographic documentation of the condition was obtained using an iPhone 14 Pro. Following processing, the turtle was released at the location of capture.

While prolapse-related injuries in wild kinosternids have not been described to date, penile prolapses have been previously documented in several wild and captive chelonian species and

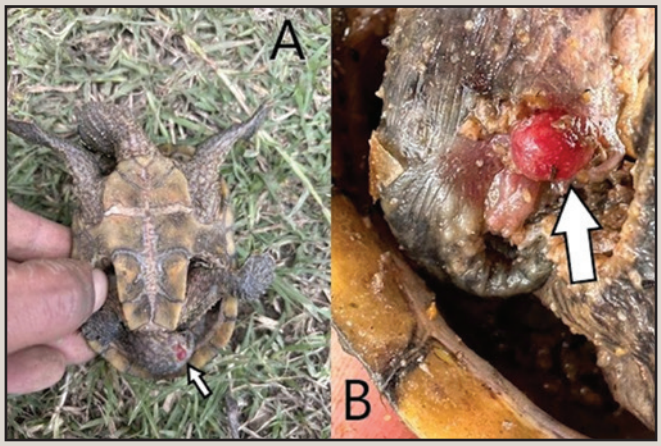


FIG. 1. Male *Sternotherus odoratus* from Texas, USA (UTADC 10101), captured during a population survey: A) ventral view with an arrow directing toward the penile prolapse; B) a zoomed in image with an arrow directing towards the penile prolapse with cloacal swelling.

is reported more frequently than in other reptile groups (Ojeh and Adetunji 1980. Afr. J. Ecol. 18:187–190; Hedley and Eatwell 2014. J. Small Anim. Pract. 55:265–268; Sirsi et al. 2017. Herpetol. Rev. 48:180; Talukdar et al. 2019. Indian Vet. J. 96:65–66). This observation occurred during the expected increased breeding activity in wild populations of *S. odoratus* (Ernst 1986. J. Herpetol. 20:341–352) and it has been suggested that stress from excessive reproductive activity may induce this condition (Innis and Boyer 2002. Vet. Clin. Exot. Anim. 5:555–578; Nisbet et al. 2011. Herpetol. Rev. 42:123; Miller 2020. *In* Garner and Jacobson, Noninfectious Diseases and Pathology of Reptiles, pp. 231–272. CRC Press, Boca Raton, Florida).

A visually less severe case was reported in a wild *Pseudemys gorzugi* that survived with a penile prolapse for at least nine months after initial capture, with minimal impact on overall body condition during that time (Sirsi et al. 2017. Herpetol. Rev. 48:180). However, the severity of the *P. gorzugi* individual's prolapse condition increased over time. Monitoring under the ongoing Spring Lake turtle surveys may allow for recapture of the *S. odoratus* noted above and continuing assessment of the prolapse progression or healing.

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***TRACHEMYS SCRIPTA ELEGANS* (Red-eared Slider). FORAGING ASSOCIATION.** Interspecific foraging associations are known to occur among numerous taxa, including between marine and freshwater fish, birds, and mammals, between cephalopods and fish, and between birds and mammals (reviewed by Platt and Rainwater 2021. Southeast. Nat. 20:N108–N114). In contrast, interspecific foraging associations involving chelonians are poorly studied. However, interspecific foraging association has been reported between fish and both marine and freshwater turtles (Newman 1906. J. Comp. Neurol. Psychol. 16:126–152; Sazima et al. 2004. Cybium 28:47–53; Platt and Rainwater 2021, *op. cit.*). Interspecific foraging associations are typically characterized by "follower" species that take advantage of food resources

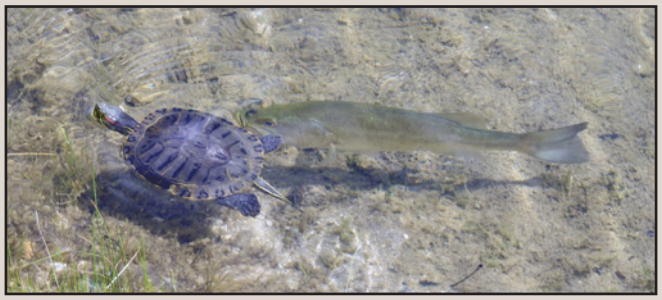


FIG. 1. *Micopterus nigricans* (Largemouth Bass) following a male *Trachemys scripta elegans* at an urban lake in Indianapolis, Indiana, USA (27 July 2025).

exposed or disturbed by a "leader" species. This usually results in a commensal relationship, although parasitic and mutualistic associations are also possible outcomes (Thornton et al. 2018. Canadian J. Zool. 96:769–773). Net benefits to individuals involved in these associations result from an increase in foraging efficiency, a decrease in predation risk, or both (Stensland et al. 2003. Mammal Rev. 33:205–223; Thornton et al. 2018, *op. cit.*). We here report a previously undescribed interspecific foraging association between *Trachemys scripta elegans* and *Micopterus nigricans* (Largemouth Bass).

Our observations were made at an urban lake (39.91611°N; 86.10277°W; 220 m elev.) adjacent to the White River and Interstate Highway 485 in Indianapolis, Marion County, Indiana, USA. This lake (ca. 12 ha) is a former limestone quarry characterized by clear water, an abundance of submerged vegetation (*Elodea*, *Cabomba*, *Utricularia*, and algae), and scattered stands of *Typha* sp. along the shoreline. Our first observation occurred on 27 July 2025 (1545–1550 h) when we encountered three *M. nigricans* closely following a male *T. scripta* (ca. 120 mm CL) as it swam parallel to the shore in clear, shallow (30–40 cm) water. The turtle was swimming slowly on and just below the surface and appeared to be foraging (head periodically submerged and scanning from side-to-side). Two of the *M. nigricans* soon veered away, while the remaining fish continued following the turtle for 14–15 m (Fig. 1). When the turtle moved into deeper water, the fish swam away, and both were lost to view.

Our second observation occurred on 29 July 2025 (1505–1520 h) when we encountered a loose aggregation of eight *T. scripta* (males and females) in shallow water (ca. < 1.0 m deep). One male was pursuing a female, while the remaining turtles were foraging among submerged vegetation and dense algae, including one turtle excavating the substrate. While watching this group of turtles, we observed a *M. nigricans* about 2 m away. It was motionless in the water column but oriented towards the turtles. Moments later, this fish swam forward and into the group of turtles. The fish then began closely trailing one turtle as the group swam together in shallow water. At this point, a second hitherto unobserved *M. nigricans* also moved into the group, selected another turtle and began trailing it. Unfortunately, we quickly lost track of the second turtle-fish pair while attempting to keep the first pair in view. The latter swam together for about 10 m before moving into deeper water and disappearing from sight.

Our observations suggest that *M. nigricans* is a "follower" attracted to the nuclear *T. scripta* by opportunities to capture prey inadvertently flushed by the turtles while foraging. In effect, *T. scripta* is acting as a "beater" (*sensu* King and Rappole. 2000. Condor 102:664–672), flushing concealed prey and potentially

increasing the foraging success of *M. nigricans*. While *M. nigricans* seemingly benefits from the foraging activities of *T. scripta*, there are no readily obvious advantages to the turtle, suggesting this nuclear-follower relationship is a commensal association rather than one of mutualism or kleptoparasitism. This is typical for nuclear-follower relationships among fish because followers benefit from increased foraging efficiency, while few if any benefits accrue to the nuclear species (Lukoschek and McCormick. 2000. Proc. 9th Internat. Coral Reef Symp. 9:467–474).

We earlier reported a similar nuclear-follower relationship involving *M. nigricans* and *Apalone spinifera* (Spiny Softshell Turtle). In that case, the fish closely followed as the turtles probed and then excavated the substrate in search of invertebrate prey (Platt and Rainwater 2021, *op. cit.*). Likewise, Newman (1906, *op. cit.*) observed *M. nigricans* following large *A. spinifera* and speculated the fish were feeding on: 1) prey dislodged from the substrate and 2) "minnows of various sorts" that accompanied the foraging turtles. Interestingly, professional fishermen seemed to be well-aware of this interspecific foraging association, telling Newman (1906, *op. cit.*) that swimming turtles meant large bass were "not far away." Based on our observations and previously published reports, we posit that nuclear-follower foraging associations between fish and turtles are almost certainly more widespread than currently recognized. We attribute the current paucity of reports on chelonian foraging associations to the difficulties associated with observing these behaviors, which generally occur underwater.

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CROCODYLIA — CROCODILIANS

***CAIMAN LATIROSTRIS* (Broad-snouted Caiman). NEST MORTALITY.** Predation, flooding, and desiccation are major causes of nest and egg loss in crocodilians (Somaweera et al. 2013. Herpetol. Monogr. 27:23–51; Simoncini et al. 2016. Phyllomedusa

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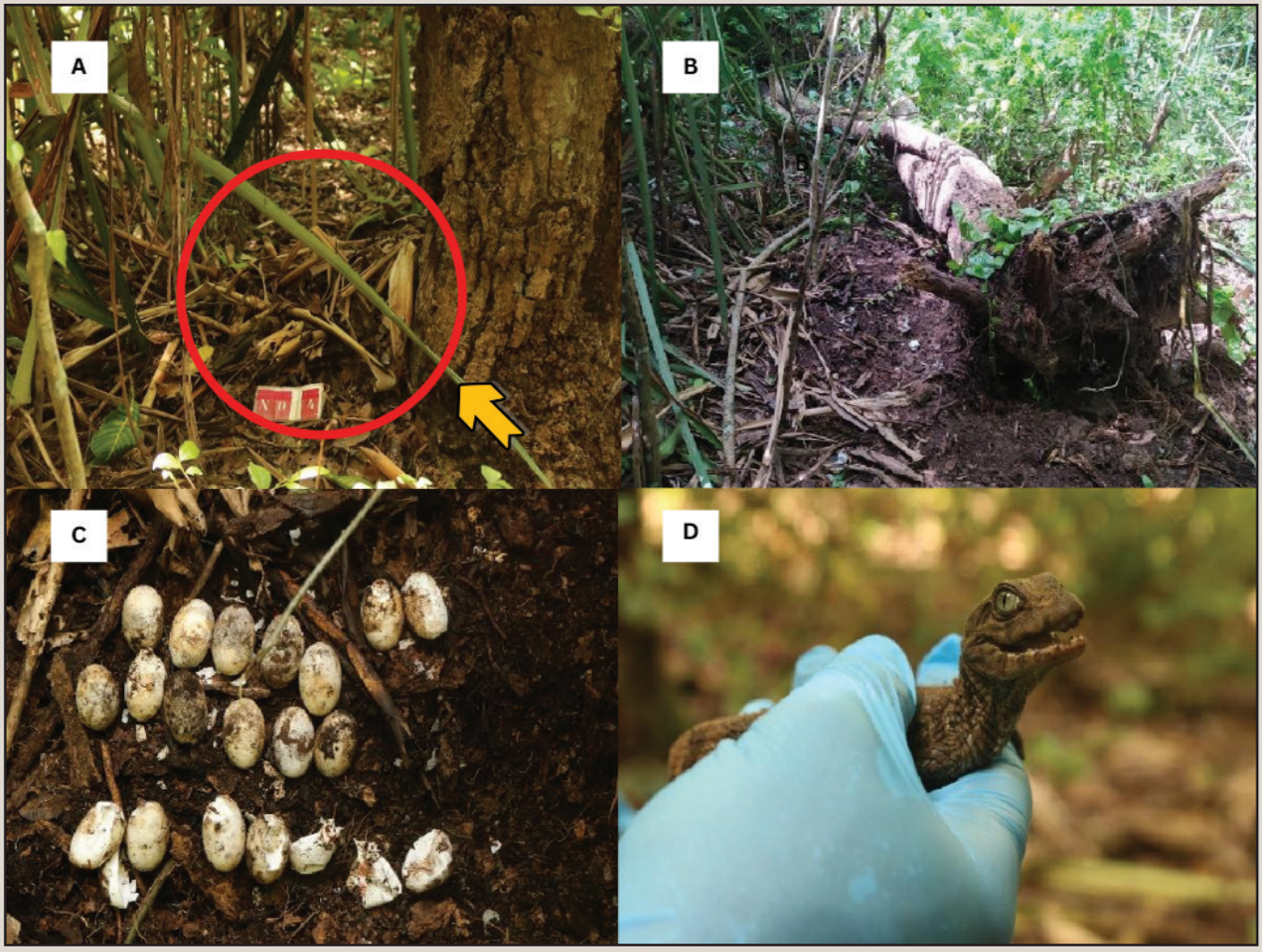


FIG. 1. A) *Caiman latirostris* nest built at the base of an *Anadenanthera* sp. tree in a forested area around the Tapacurá reservoir, Brazil; B) Tree fallen onto the nest; C) Eggs and shells removed from the nest destroyed by the tree fall; D) Surviving hatchling that hatched unaided.

15:137–146). However, nests may also be vulnerable to stochastic events such as tree falls. In forested environments, caimans commonly nest in close proximity to trees, typically selecting more concealed sites (Allsteadt 1994. J. Herpetol. 28:12–19). Here, we report an instance of *Caiman latirostris* nest mortality caused by a tree fall in northeastern Brazil.

On 8 March 2023, in a forested area in São Lourenço da Mata, Pernambuco, Brazil (8.0518°S, 35.1816°W; WGS 84; 103 m elev.), we found a *C. latirostris* nest (dimensions: height = 0.37 m, width = 1.45 m, length = 1.40 m) with 29 eggs. The nest was located 31 m from the forest edge, 38 m from the water, and 1.4 m above the water level. The female (152 cm total length; 76 cm SVL) was nearby at a distance of 11 m from the nest, exhibiting typical parental nest guarding behavior (Barboza et al. 2024. Anim. Welfare 33:e56). The nest was constructed under a 15 m high Angico Tree (*Anadenanthera* sp.; Fig. 1A, 1B). On 22 April 2023, during a regular monitoring visit, we found the Angico Tree had fallen on top of the nest site, destroying it (Fig. 1B). Due to the weight and impact of the fallen tree, the nest was severely compressed beneath the trunk, making egg removal extremely difficult and requiring near-excavation from beneath the compacted soil. A total of 28 eggs were removed from the nest, of these, 10 eggs (34%) were completely crushed by the compression, while the remaining 18 eggs (62%) were structurally intact and successfully hatched a few minutes later following the rescue (Fig. 1C). In addition, we found one hatchling vocalizing within a small cavity formed by the tree root, which we were able to rescue (Fig. 1D). The hatchling was partially buried by sediment, including inside its oral cavity.

To our knowledge, this is the first report of a tree falling causing partial nest mortality in *C. latirostris*. However, at least one hatchling and 10 eggs survived this stochastic event naturally. While such events are rarely documented, our observation suggests tree falls in crocodilian nesting areas can be a source of mortality.

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SQUAMATA — LIZARDS

***AMEIVA AMEIVA* (Giant Ameiva). DIET.** *Ameiva ameiva* is an active and opportunistic forager that consumes a broad spectrum of prey that is dominated by invertebrates such as grasshoppers, roaches, beetles, spiders, and insect larvae (Vitt and Colli 1994. Can. J. Zool. 72:199–212). Its diet also includes small vertebrates such as small frogs and lizards (Nino et al. 2021. Herpetol. Notes 14:617–620). Here, we report a novel frog species in the diet of *A. ameiva* from Brazil.

On 30 August 2019 at 1030 h, we observed an adult *A. ameiva* chase down and prey upon an adult *Leptodactylus macrosternum* in a rural area near Senador José Porfírio, Pará, Brazil (2.7144°S, 51.9547°W; WGS 84; 10 m elev.). The lizard flushed the frog from the leaf litter before initiating the chase. Once captured, the lizard bit the frog in its abdominal region (Fig. 1) and repeatedly struck it against the ground. During this time, the frog attempted to fight back, inflated itself, and emitted loud intense vocalizations. After ca. 20–30 min, the frog ceased resisting and appeared dead, and at this point, the lizard consumed mainly the head, forelimbs, and viscera and discarded the vertebral column, hind limbs, skin, and other organs (Fig. 2). From start to finish, the entire event lasted ca. 1 h.



FIG. 1. Adult *Ameiva ameiva* preying upon an adult *Leptodactylus macrosternum* in a rural area of Senador José Porfírio, Pará, Brazil.



FIG. 2. Partial remains of the *Leptodactylus macrosternum* showing the discarded hind limbs, vertebral column, and viscera left over after being fed upon by the *Ameiva ameiva*.

To our knowledge, this is the first observation of *A. ameiva* preying on *L. macrosternum*. However, *A. ameiva* has been reported to prey on the related *L. fuscus* (Silva et al. 2013. Herpetol. Notes 6:51–53). The frog from the da Silva et al. (2013, *op. cit.*) report came from the stomach contents of an adult *A. ameiva* and appeared to be an entire frog. However, in our observation, the *A. ameiva* did not consume the entire frog and instead consumed only portions of it, which appears to also be a novel aspect of our observation.

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***FURCIFER PARDALIS* (Panther Chameleon). DIET.** *Furcifer pardalis* is native to Madagascar and occurs on neighboring Reunion Island, where it was introduced in the 1830s (Bourgat 1972. Herpetologica 28:22–24; Grbic et al. 2015. Mol. Ecol. 24:3455–3466). *Furcifer pardalis* is a large lizard, with males reaching 229 mm SVL (Andreon et al. 2005. Trop. Zool. 18:209–225), and is considered an opportunistic predator of invertebrates and small vertebrates in its native range, with its diet including cannibalism on juveniles (Bourgat 1972. Ceylon J. Sci. 10:1–5). The species has also occasionally been found to be frugivorous on Reunion Island (Sanchez et al. 2021. Herpetol. Rev. 52:857–858). Here, I report on two novel records of predation by *F. pardalis* on two vertebrate species from Reunion Island.

The first event took place on the morning of 27 January 2025 at ca. 0900 h in a private garden in Saint-André (20.9720°S, 55.62596°E; WGS 84; 200 m elev.) when "Monsieur Hill" observed an adult *F. pardalis* attempting to prey on an adult *Zosterops borbonicus* (Reunion Grey White-eye), which is endemic to Reunion Island (Milá et al. 2010. BMC Evol. Biol. 10:1–13). The lizard was on a fig tree, perched near some fruit, as it lunged to attack the bird, even grabbing it before the observer intervened and stopped the predation attempt, which allowed the bird to escape. However, it appeared evident the lizard would have consumed the bird otherwise. The second event took place on 15 April 2025, at 1203 h, in a different private garden at Mont-Vert les Hauts (21.3146°S, 55.5497°E; WGS 84; 630 m elev.) where Marie Payet observed an adult male *F. pardalis* feeding on an adult *Calotes versicolor* (Oriental Garden Lizard). The *F. pardalis* was perched on top of a bush and was swallowing the *C. versicolor* headfirst (Fig. 1). When the observation was first made, the *F. pardalis* had already swallowed most of the prey.

Little has been reported on the diet of wild *F. pardalis*, and to my knowledge, these two species of prey have not yet been noted in the diet of *F. pardalis*. Although the first predation event was purposefully interrupted, due to the size discrepancy between the lizard and the Reunion Grey White-eye, a small bodied species, it appeared likely to have been successfully consumed otherwise. Bird predation by chameleons is rare but has been reported in *Furcifer oustaleti* (García and Vences 2002. Herpetol. Rev. 33:134–135).



PHOTO BY MARIE PAYET

FIG. 1. Adult male *Furcifer pardalis* eating an adult *Calotes versicolor* in Reunion Island on 15 April 2025.

I am thankful to Marie Payet and "Monsieur Hill" for bringing their backyard observations to my attention and providing me with the details. At their request, they declined authorship on this note.

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***GEKKO SWINHONIS* (Peking Gecko). ABERRANT COLORATION.** *Gekko swinhonis* is a moderately sized gecko endemic to China and was recently discovered at the Incheon Port of South Korea in 2021, likely introduced unintentionally via ship-mediated trade.

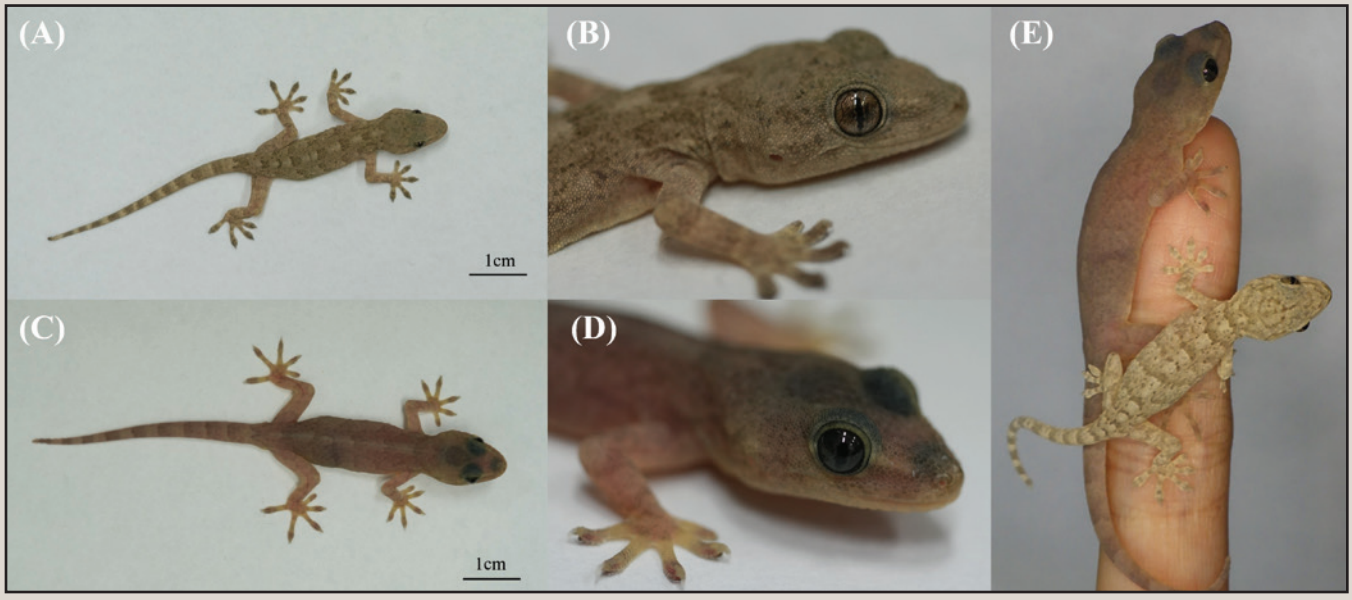


FIG. 1. Two color phenotypes of *Gekko swinhonis*: A) dorsal view of the typical coloration; B) magnified head and eye of the typical individual; C) dorsal view of the aberrant coloration; D) magnified head and eye of the aberrant individual; E) comparative photograph of both individuals.

It has since become established as a non-native species (Kwon et al. 2023. BioInvas. Rec. 12:1157–1171). The typical coloration of this species is light grayish brown with distinct patterns, and the iris matches the body color, contrasting with a dark vertical slit pupil with a crenulated margin (Zhang et al. 2023. Animals. 13:3796; Fig. 1A, B). Here we report on the aberrant coloration of *G. swinhonis* from South Korea.

On 17 September 2024, we found a juvenile *G. swinhonis* on the exterior wall of a building in Incheon, South Korea (37.4685°N, 126.6235°E; WGS 84; 7 m elev.; Fig. 1C, D). This lizard exhibited an atypical coloration phenotype that had markedly reduced body pigmentation, resulting in an overall translucent pale-violet coloration with only faint remnants of the dorsal pattern (Fig. 1C). Furthermore, the iris was entirely black and indistinguishable from the pupil, appearing fully dilated upon casual observation (Fig. 1D). This aberrant coloration persisted throughout one year of captivity, indicating that it was not a transient physiological color change for background camouflage. These unusual traits are presumed to represent an aberrant coloration variant due to hypopigmentation, potentially attributable to leucism or hypomelanism (Allain et al. 2023. IRCF Reptil. Amphib. 30:e18470-e18470).

Recently, the introduction and inland expansion of gecko species have been actively reported in South Korea, where native geckos are absent (Park et al. 2024. NeoBiota. 93:39–62). Nevertheless, basic information on these introduced geckos remains limited, including reports of aberrant coloration. *G. swinhonis* closely resembles another non-native species, *G. japonicus* (Kwon et al. 2023, *op. cit.*). Thus, field identifications relying heavily on coloration and dorsal patterning risk misidentification when aberrant color variants appear. Accordingly, the possibility of aberrantly colored individuals must be considered during field surveys. This observation provides the first documented case of aberrant coloration in *G. swinhonis*, contributing essential morphological data on coloration variation among introduced geckos in South Korea.

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***HEMIDACTYLUS MABOUIA*. (Tropical House Gecko). PREDATION.** *Hemidactylus mabouia* is a medium-sized nocturnal lizard native to Africa that has been widely introduced to the Neotropics, where it is commonly found in urban, rural, and natural habitats (Agarwal et al. 2021. Roy. Soc. Open Sci. 8:210749). Dozens of species of invertebrates and vertebrates have been reported to prey on *H. mabouia*, including 11 birds (Powell and Henderson 2008. Iguana. 15:8–12; Pedroso-Santos et al. 2019. Herpetol. Notes. 12:833–839; Borroto-Páez and Pérez 2020. IRCF Rept. Amphib. 27:120–128). Here we present a report on an additional bird predator on *H. mabouia* in Brazil, the Domestic Chicken (*Gallus gallus*).

On 11 June 2025, we observed a chicken preying on an adult *H. mabouia* in a chicken coop (Fig. 1) in an urban area of Ritápolis, Minas Gerais, Brazil (21.0233°S, 44.3200°W; WGS 84; 1023 m elev.). We walked in on the chicken already attacking the lizard by repeatedly striking it on the cement floor of the coop until it was subdued and no longer moving. The chicken then swallowed it whole with difficulty, even though it was partially fragmented.

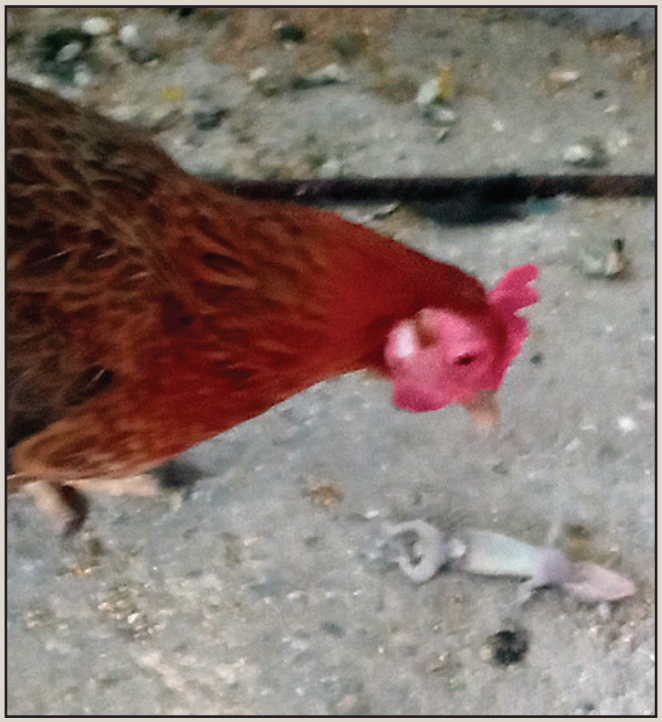


FIG. 1. *Gallus gallus* preying on *Hemidactylus mabouia* in an urban area in Brazil.

To our knowledge, this is the first record of a domestic chicken preying on *H. mabouia*. Chickens can be efficient predators of small lizards. For example, they have been known to feed on at least four lizard species in the West Indies (Powell and Henderson 2008, *op. cit.*).

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***OPHIODES* CF. *FRAGILIS* (Fragile Worm Lizard). PREDATION.** *Ophiodes fragilis* is a medium-sized legless lizard distributed in southern and southeastern Brazil into northeastern Argentina (Borges-Martins and Di-Bernardo 1999. Publ. Extra Mus. Nac. Hist. Nat. 50:39–39). This species is secretive and fossorial, and information on its predators remains scarce. Documented predators include three snake species: *Siphlophis pulcher* (Duarte and Sena 2007. Herpetol. Rev. 38:211), *Clelia plumbea*, and *Paraphimophis rusticus* (Gaiarsa et al. 2013. Pap. Avul. Zool. 53:261–283). There is also one record of cannibalism in which an adult male contained four nearly undigested juveniles (Montechiaro and Adams 2009. Herpetol. Rev. 40:89–90) and records of predation by two bird species, the Guira Cuckoo (*Guira guira;* Koski et al. 2017. Herpetol. Rev. 48:654–655) and the Red-legged Seriema (*Cariama cristata;* Dias et al. 2023. Caldasia 45:380–382). Here, we report a new predation record of *O.* cf. *fragilis* by a *Rupornis magnirostris* (Roadside Hawk) in southeastern Brazil.

On 12 April 2023 at 1627 h, near a dam on a rural property in the municipality of Quadra, São Paulo, Brazil (23.2916°S, 48.0943°W; WGS 84; 630 m elev.), we observed a juvenile Roadside Hawk perched in a tree and holding an adult *O.* cf. *fragilis* in its talons



FIG. 1. A juvenile *Rupornis magnirostris* holding an *Ophiodes* cf. *fragilis* by one of its claws in Quadra, São Paulo, Brazil.

(Fig. 1). The lizard showed no signs of movement and appeared to be dead at the time of observation. When we approached, the hawk flew out of sight carrying the prey, therefore, we were unable to observe prey handling or ingestion.

To our knowledge, this represents the first record of a Roadside Hawk preying upon *O.* cf. *fragilis*. The Roadside Hawk is a common medium-sized raptor with a broad trophic spectrum that includes invertebrates, amphibians, reptiles, birds and mammals (Panasci and Whitacre 2000. Wilson Bull. 112:555–558; Baladrón et al. 2011. J. Raptor Res. 45:257–261; Pommer Barbosa et al. 2022. Rev. Peruana Biol. 29:e21528).

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***PHELSUMA INEXPECTATA* (Manapany Day Gecko). PREDATION.** *Phelsuma inexpectata* is endemic to Reunion Island (Austin et al. 2004. Mol. Phylogenet. Evol. 31:109–122) with a small, fragmented distribution area (Sanchez et al. 2025. Oryx. 59:1–9). This species is considered critically endangered by the IUCN due to its low population numbers, habitat fragmentation, and predation and competition pressures from invasive species (Sanchez 2021. The IUCN Red List of Threatened Species:e. T17450049A17450059). For example, the invasive snake *Lycodon aulicus* has been observed chasing juvenile *P. inexpectata* (Deso and Probst 2007. Bull. Phaethon. 25:29–36), and the invasive spider *Heteropdoda venatoria* is reported to prey on juvenile *P. inexpectata* (Sanchez et al. 2021. Herpetol. Rev. 52:859–860). Here we report an observation of another non-native species, *Calotes versicolor*, preying on *P. inexpectata* on Reunion Island.

On the 28 November 2025, ca. 1400 h, we observed a group of adult lizards, two adult *C. versicolor*, one *P. laticauda*, both non-native (Probst et al. 2022. Bull. Soc. Herp. Fr. 56:57–87), and three *P. inexpectata*, perched on a palm tree trunk, all appearing to be thermoregulating in a private garden at Manapany-les-Bains (21.3748°S, 55.5901°E; WGS 84; 20 m elev.). All the lizards were about 50 cm apart, or less in some cases, and could thus be observed without moving for nearly 10 min. As the lizards basked there were no apparent signs of aggression or defensive behaviors until one of the *C. versicolor* sprinted ca. 15–20 cm towards the nearest *P. inexpectata*, bit it on the side, and immediately fled with the prey in its mouth and out of view.

To our knowledge this is the first record of *C. versicolor* preying on *P. inexpectata*, however, *C. versicolor* has been reported to prey on *P. laticauda* in Reunion Island (Souchet and Coquis 2025. Bull. Soc. Herpetol. Fr. 186:1–4). It is not clear how often *P. inexpectata* are preyed on by the invasive *C. versicolor* but considering the two species have overlapping ranges, more work is need to better understand this threat to an at-risk endemic species (Souchet and Coquis 2025, *op. cit.*).

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***PLESTIODON CALLICEPHALUS* (Mountain Skink). REPRODUCTION.** Reproductive habits of *Plestiodon callicephalus* are poorly known, with only a few published reports of which we are aware, most of which are from México (e.g., Campbell and Simmons 1961. Herpetologica 17:212–213; Zweifel 1962. Herpetologica 18:63–65; Hardy and McDiarmid 1969. Univ. Kansas Publ. Mus. Nat. Hist. 18:39–252; Tanner 1987. Great Basin Nat. 47:383–42; Cruz-Sáenz et al. 2011. Bull. Chicago Herp. Soc. 46:57–61; Penilla-Juárez et al. 2012. Bull. Chicago Herp. Soc. 47:141–143). In each instance, females were reported coiled around, or next to, a clutch of eggs, except for Tanner (1987, *op. cit.*) who found two nest sites containing females and neonates. Although Degenhardt et al. (1996. Amphibians and Reptiles of New Mexico. University of New Mexico Press, Albuquerque, New Mexico. 431 pp.) reported hatchlings of *P. callicephalus* appearing by 23 July in Guadalupe Canyon, New Mexico, USA, near the state line with Arizona, USA, there is only one published record of reproductive behavior of *P. callicephalus* in the USA, in which Taylor (1985. Herpetol. Rev. 16:27) reported a captive *P. callicephalus* from Arizona giving birth to live young. Herein, we report three observations of wild *P. callicephalus* females tending eggs and two observations of hatching at three sites < 1.3 km of one another in Madrean Evergreen Woodland (Brown 1994. Biotic Communities Southwestern United States and Northwestern Mexico. University of Utah Press, Salt Lake City, Utah. 342 pp.) near Sycamore Canyon in the Pajarito Mountains, Santa Cruz County, Arizona, USA.

On 24 July 2008, we found a female *P. callicephalus* tending three eggs in a cavity beneath a large rock in a canyon tributary to Sycamore Canyon (31.4315°N, 111.1842°W; WGS 84; 1233 m elev.). The shelter rock was located in an open oak (*Quercus* spp.) grassland near the base of an exposed southeast-facing slope above an arroyo. We collected the female and eggs, all of which hatched between the night of 27 July and the afternoon of 28 July (Fig. 1). On 25 July 2013, at ca. 0910 h, we found a second female *P. callicephalus* (55 mm SVL) tending two eggs (15 and 16 mm egg length, respectively) in a shallow canyon tributary to upper Sycamore Canyon (31.4417°N, 111.1772°W; WGS 84; 1260 m elev.). The eggs appeared quite dark (Fig. 2), which suggested they were near hatching. The nest was located beneath a rock (18 × 25 ×

PHOTO BY R.D. BABB



FIG. 1. *Plestiodon callicephalus* hatchlings, one of which is still emerging from the egg, 28 July 2008 at 0702 h. Eggs collected from Pajarito Mountains, Santa Cruz County, Arizona, USA.

PHOTO BY T.R. JONES



FIG. 2. Adult female *Plestiodon callicephalus* tending a clutch of eggs in the Pajarito Mountains, Santa Cruz County, Arizona, USA, 25 July 2013.

11 cm) below a low west-facing bluff under a relatively open oak (*Quercus* spp.) overstory. After measuring and photographing the female and eggs, we returned them to the nest. The third nest was found on 19 July 2016, with a female tending four eggs in a small cavity under a large rock at the base of a live oak (*Quercus* sp.), again on a west-facing wooded slope adjacent to the upper reaches of Sycamore Canyon (31.4383°N, 111.1840°W; WGS 84; 1238 m elev.). One of the eggs was accidentally ruptured and contained a near-term individual with a conspicuous yolk sac. The remaining eggs were collected and hatched by 23 July.

Although one of the clutches we observed, with clutch size of two eggs, was smaller than all other previously published observations, the other two clutch sizes were consistent with reports from México: three eggs (Campbell and Simmons 1961, *op. cit.*; Cruz-Sáenz et al. 2011, *op. cit.*) and four eggs (Tanner 1987, *op. cit.*). Other clutch sizes reported from México are larger: six eggs (Zweifel 1962, *op. cit.*; Hardy and McDiarmid 1969, *op. cit.*; Penilla-Juárez et al. 2012, *op. cit.*) and seven eggs (Cruz-Sáenz et al. 2011, *op. cit.*). There may be clinal variation in clutch size trending to larger clutches farther south, but more data is necessary to explore that hypothesis.

Reproduction in Arizona *P. callicephalus* appears to coincide with the North American monsoon, which generally begins in late June and often extends to mid-September (Adams and Comrie 1997. Bull. Amer. Meteor. Soc. 78:2197–2213). Increased moisture levels of subsurface soil layers brought on by rains likely provide sufficient humidity needed for successful incubation of eggs. Thus far there is no evidence to confirm the suggestion by Goldberg (2014. Sonoran Herpetol. 27:20–29) that *P. callicephalus*, like many other western North American lizards, lays eggs in the spring. Finally, although Tanner's (1987, *op. cit.*) observations of young in the nest do not allow identification of reproductive mode, our observations and most of those made in México are of oviparous *P. callicephalus*, whereas Taylor (1985, *op cit.*) reported live birth in an animal that was also found in the Pajarito Mountains, ca. 10 km southeast of our sites. Facultative viviparity, i.e., a condition in which some members of a species are viviparous while others are oviparous, is exceedingly rare in squamate reptiles (Laird et al. 2018. Biol. Lett. 15:20180827), and the contrasting observations of *P. callicephalus* reproductive modes in Arizona require additional investigation.

All animals were manipulated or collected under the authority of the Arizona Game and Fish Department.

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***SPHENOMORPHUS CRANEI* (Crane's Skink). REPRODUCTION.** *Sphenomorphus cranei* is endemic to the Solomon Islands and is an uncommon, crepuscular, secretive species found in the vicinity of forest streams (McCoy 2006. Reptiles of the Solomon Islands. Pensoft, Sofia. 147 pp.). Adults average 62 mm SVL and 2.64 g (Rodda 2020. Lizards of the World: Natural History and Taxon Accounts. Johns Hopkins University Press, Baltimore. 801 pp.), and Greer and Shea (2004. J. Herpetol. 38:79–87) reported a clutch size of 2–5 eggs (mean 2.8) based on five *S. cranei* females. Here I present additional information on the reproductive biology of *S. cranei* from a histological examination of their gonads from museum specimens.

I examined nine *S. cranei,* four male and five female specimens, from the Solomon Islands collected between June and August 1968 and now housed at the Museum of Comparative Zoology (MCZ), Cambridge, Massachusetts, USA. Three specimens (females R-113205 and R-113225 and male R-118652) were from Malaita, Malaita Province (8.8833°S, 160.7330°E; WGS 84; 280 m elev.), two specimens (female R-113237 and male R-113238) were from Malikuna, Guadalcanal Province (9.6293°S, 160.0297°E; WGS 84; 39 m elev.), and four specimens (females R-116820 and R-116822 and males R-116819 and R-116824) were from Mataruka, Guadalcanal Province (9.5025°S, 160.0673°E; WGS 84; 24 m elev.).

The lizards were initially preserved with 10% neutral buffered formalin and later maintained in 70% ethanol. A slit was made in the abdomen, and a gonad was removed from each lizard and embedded in paraffin. Sections were cut at 5 µm and stained by Harris hematoxylin followed by eosin counterstain. Histology slides were deposited at the MCZ. Male maturity was established by the observation of sperm formation in progress, and female maturity was recognized by the presence of oviductal eggs or vitellogenic follicles.

All four males (mean SVL = 64.3 mm ± 6.1 SD, range: 59–73 mm) were undergoing sperm formation (spermiogenesis) in which lumina of the seminiferous tubules were lined by sperm or rows of metamorphosing spermatids. Monthly distribution of mature males was three from July and one from August. The smallest mature male was 59 SVL (R-113238) collected in July, which is the first information on the minimum size for mature males of *S. cranei*. I cannot speculate on the duration of the period of spermiogenesis for *S. cranei*. However, data from other species of *Sphenomorphus* from Oceania, *S solomonis*, *S. darlingtoni*, *S.* meyeri, shows these species have extended periods of sperm production which may be typical for this genus (Goldberg 2023. Herpetol. Rev. 74:301–302; (Goldberg 2023. Sauria 45:32–34; Goldberg 2024. Sauria 46:42–44).

Four of the five females were reproductively mature (mean SVL = 66.2 mm ± 7.3 SD, range = 58–77 mm). One female *S. cranei* from May (R-113205; 61 mm SVL) contained two oviductal eggs and was the smallest reproductively active female, which is the first information on the minimum size of mature females for this species. Two other mature females, one from June (R-116822; 67 mm SVL) and one from July (R-116820; 68 mm SVL), exhibited early yolk deposition in the form of microscopic vitellogenic granules. One other female (R-113237, 77 mm SVL) from July was not reproductively active (no yolk deposition) and may have been between clutches. Another reproductively inactive female (R-133225, 58 mm SVL) from August may have been a subadult. Additional monthly samples of both sexes of *S. cranei* warrant examination to learn the timing of all events in its reproductive cycle.

I thank Stevie Kennedy-Gold (MCZ) for permission to examine *S. cranei* and for facilitating the loan 2025–25.

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***TILIQUA SCINCOIDES* (Eastern Blue-tongued Lizard). NOCTURNALITY.** *Tiliqua scincoides* is a large species of skink (37 cm maximum SVL) found in northern, central, and eastern Australia and the Tanibar Islands of Indonesia (Frynta et al. 2021. Biologia 76:1445–1455). It occurs in a variety of habitats, including gardens and green spaces of built-up cities and suburban areas (Koenig et al. 2002. J. Herpetol. 36:62–68). *Tiliqua scincoides* is widely recognised as diurnal, exhibiting bimodal peaks of activity in the morning and late afternoon (Koenig et al. 2001. Wildl. Res. 28:215–227; Kerr and Bull 2006. J. Zool. 275:79–88), though one telemetry study showed that the species is not exclusively diurnal but may also be somewhat crepuscular, substantially reducing activity by 1900 h (Price-Rees et al. 2014. Funct. Ecol. 28:440–449). Here I report nocturnal activity in *T. scincoides* from in a suburban garden in Australia.

On 8 January 2026, at 2214 h, I observed an adult *T. scincoides* active and not in proximity of a retreat site in Illawong, southern Sydney, New South Wales, Australia (33.9904°S, 151.0606°E; WGS 84; 42 m elev.). This individual was traversing along the edge of a sandstone rock formation in a suburban garden (Fig. 1), pausing when illuminated by the spotlight beam. After ca. 2 min it slowly continued to traverse along the edge of the rock formation, flicking out its tongue and probing the ground and rock surface intermittently. After ca. 1 min, it retreated inside a gap between the ground surface and the rock formation.

To my knowledge, this is the first report of nocturnal activity in *T. scincoides* being directly observed. This observation was more than 3 h later than the afternoon peak in activity previously noted (Price-Rese et al. 2014, *op. cit.*) and 2 h after sunset, which is 2009 h for this time of year. It's not clear why this lizard was active at night, but I have two hypotheses. First, the site was artificially illuminated throughout the night by street lighting, and such artificial lighting has been shown to alter lizard activity patterns to being active at night (Russart and Nelson 2018. J. Exp. Zool. 329:401–408; Kolbe et al. 2021. Urban Ecosyst. 24:1035–1045). Second, normally diurnal species are known to exhibit nocturnality in response to warmer weather conditions (Vidan et al. 2017. Glob. Ecol. Biogeogr. 26:1316–1325; Rutschmann et al. 2024. Biol. Rev. 99:598–621). During the observation, ambient temperature at the site was 21°C at 2214 h, however, the day period prior had a maximum temperature of 40.6°C in the afternoon according to the nearest weather station 9 km away (Holsworthy Aerodrome Automatic Weather Station; https://www.bom.gov.au/climate/data, 19 Jan 2026). Thus, it's possible this lizard was active this night in response to the warm daytime temperature.



FIG. 1. A *Tiliqua scincoides* active at night along the base of a sandstone rock formation.

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SQUAMATA — SNAKES

***ATRACTUS SNETHLAGEAE* (Snethlage's Ground Snake). DEFENSIVE BEHAVIOR.** *Atractus snethlageae* is a small fossorial dipsadid snake that feeds on earthworms and insects. It is distributed in lowland Amazonian forests in Bolivia, Brazil, Colombia, Ecuador, and Peru (Camper and Zard. 2014. Herpetol. Rev. 45:704; Nogueira et al. 2019. S. Am. J. Herpetol. 14:1–274). Its secretive and fossorial behavior makes it difficult to obtain detailed information about the species' natural history. Although *Atractus* species are known to exhibit a wide range of defensive behaviors such as locomotor escape, mimicry, tail display, head hiding, body dorsolateral compression, body thrashing, cloacal discharge, and balling, *A. snelageae* has only been observed displaying body thrashing, escape, and cloacal discharge (Martins 1996. Anais de Etologia 14:185–199; Santos-Costa et al. 2015. Herpetol. Notes 8:69–98; Tozetti et al. 2021. Phyllomedusa 20:3–13).

On 13 March 2024, at 1112 h, we retrieved an adult *A. snethlageae* (500 mm SVL) from its night burrow within the forest floor of a "terra firme" primary forest fragment in the Institute of Biodiversity and Conservation of Amazonia (IBCAM) near the town of Presidente Figueiredo, Amazonas, Brazil (1.75568°S, 60.14314°W; WGS 84). The individual was being gently


PHOTO BY GABRIEL SPANGHERO

FIG. 1. An adult female *Atractus snethlageae* displaying dorsolateral compression of its body.


PHOTO BY RAFAEL GABRIEL MOUNZON-NARVÁEZ

FIG. 1. *Boa constrictor* consuming an endemic bird, *Ara glaucogularis*, in the Llanos de Moxos basin, Beni, Plurinational State of Bolivia.

manipulated by one of us when it suddenly raised the anterior third of its body and compressed its entire trunk dorsoventrally (from the neck to the cloaca), adopting a flattened posture (Fig. 1). This display lasted approximately 5 s. Prior to exhibiting this posture, the snake attempted to flee and performed several vigorous body thrashes. This is the first documented occurrence of dorsoventral body compression in *A. snethlageae*, contributing to the growing list of antipredator behaviors known for the species and the genus.

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***BOA CONSTRICTOR* (Red-tailed Boa). DIET.** *Boa constrictor* is a geographically widespread snake in South America with a broad range of habitats and four formally recognized subspecies (Henderson et al. 1995. Herpetol. Nat. Hist. 3:15–27; Reynolds and Henderson 2018. Bull. Mus. Comp. Zool. 162:1–58). Likewise, the diet of this snake throughout its geographic distribution is diverse and includes reptiles (Acosta-Ortiz et al. 2021. Rev. Latinoam. Herpetol. 4:164–166), birds (Boback 2005. Copeia 2005:880–885; Reinert et al. 2021. Herpetol. Conserv. Biol. 16:211–224), small mammals, and even larger mammals (Arendt and Anthony 1986. Caribb. J. Sci. 22:219–220; Tokuda and Mota da Costa 2021. Rev. Latinoam. Herpetol. 4:206–207; Leite et al. 2023. Mammal. Notes 9:326). However, little is known of its diet in the Plurinational State of Bolivia (Aparicio et al. 2021. *In* Ripa Landajo and Naoki [eds.], Historia Natural de Sara Ana. Estación Experimental Agroecológica de Alto Beni, Bolivia, pp. 249–269. Plural Editores, La Paz; Rivas et al. 2022. Guía Ilustrada de Anfibios y Reptiles de la Ciudad de Trinidad, Beni. Universidad Autónoma del Beni José Ballivián, Wildlife Conservation Society and Grupo de Trabajo para los Llanos de Moxos, Trinidad. 255 pp.).

On 31 January 2023, at 0930 h, we observed a *Boa constrictor* constricting an adult *Ara glaucogularis* (Blue-throated Macaw; male; 78 cm SVL; Fig. 1) along the route from Trinidad City to Loreto town in the Municipality of Loreto, Marbán Province, southern Beni, Bolivia (15.1803°S, 64.7591°W; WGS 84; ca. 165 m elev.). Additional *A. glaucogularis* were present, which we shooed away. The recovered material of *A. glaucogularis* was deposited in the Colección Boliviana de Fauna (CBF 5785), La Paz, Plurinational State of Bolivia. This note constitutes the first record of predation on *A. glaucogularis* by *B. constrictor*.

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***BOA CONSTRICTOR ORTONII* (Peruvian Coastal Boa/Orton's Boa). XANTHISM.** Despite the low frequency of chromatic aberrancies in the wild, various aberrant colorations have been reported in wild snakes, including a few reports of aberrant coloration in the genus *Boa* (Travaglia-Cardozo et al. 2014. Herpetol. Bras. 3:88–89; Borteiro et al. 2021. Salamandra 57:124–138). Some of these expressions are presumed to compromise protection against predators or thermoregulation, lowering fitness and survivorship (Krecsák 2008. Russ. J. Herpetol. 15:97–102; Thakur and Trivedi 2018. Rept. Amphib. 25:63–67; Borteiro et al. 2021, *op. cit.*).

Boa c. ortonii was initially described as *B. ortonii* but later relegated to a historically scientifically accepted subspecies of *B. constrictor* characterized by having a pale coloration and sandy brown color in association with the dry habitats it inhabits (Schmidt and Walker 1943. Zool. Ser. Field Mus. Nat. Hist. 24:297–324; Stimson 1969. Das Tierreich 89:1–49). Its range is restricted mainly to the Ecuadorian Dry Forest ecosystems of northern Peru in the departments of Amazonas, Cajamarca, La Libertad, Lambayeque, and Piura, including the inter-Andean valley of the Marañón River, and is found at elevations of 0–2000 m a.s.l. (Carrillo de Espinoza and Icochea 1995. Publ. Mus. Hist. Nat. UNMSM 47:1–27; Koch et al. 2018. Zootaxa 4385:1–101; Reynolds & Henderson 2018. Bull. Mus. Comp. Zool. 162:1–58).

PHOTOS BY OSCAR VALVERDE (A) AND IAN BRELAND (B)



FIG. 1. A) Freshly killed *Boa constrictor ortonii* exhibiting xanthism; B) normal coloration of an adult *B. c. ortonii* photographed *in situ* in Porta Verde, Piura Province, Piura, Peru.

At 1530 h on 5 March 2025, a specimen of *B. c. ortonii* (Fig. 1) of at least 150 cm total length was killed by local villagers in the hamlet of Villa Vicus, Chulucanas District, Morropon Province, Piura, Peru (5.16222°S, 80.14019°W; WGS 84). As shown in the photograph (Fig. 1A) of the deceased snake, the snake had aberrant coloration due to the lack of characteristic brown and grey coloration (see Fig. 1B) and the overexpression of yellow pigment. Following Borteiro et al. (2021, *op. cit.*), we identified this mutation as xanthism or overexpression of the yellow coloration. The absence of red eyes rules out the non-expression of melanin, and the lack of brown and black coloration rules out other aberrant forms (e.g., hypomelanism, piebaldism, anerythrism, axanthism). To our knowledge, this is the first record of aberrant coloration of any type in *B. c. ortonii*.

We thank Oscar Valverde for providing the picture of the individual and Ian Breland for the comparison picture.

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***BUNGARUS FLAVICEPS* (Red-headed Krait). DIET.** *Bungarus flaviceps* is a terrestrial elapid that occurs in southeast Asia, including Sumatra and Borneo (Manthey and Grossmann 1997. Amphibien & Reptilien Südostasiens. Natur und Tier Verlag, Münster. 512 pp.; Orlov et al. 2003. Russ. J. Herpetol. 10:217–240; Wallach et al. 2014. Snakes of the World: A Catalogue of Living and Extinct Species. CRC Press, Boca Raton, Florida. 1227 pp.). The diet of this species is known to include snakes, including conspecifics, *Trimeresurus albolabris* (White-lipped Pitviper), and *Ahaetulla* sp. (Campden-Main 1970. A Field Guide to the Snakes of South Vietnam. Smithsonian Institution Press, Washington, DC. 114 pp.; Slowinski 1994 Herpetol. Rev. 25:52–53).

At 1917 h on 22 July 2024, in Taman Negara Gunung Mulu, Sarawak, Malaysia (4.04143°N, 114.81420°E; WGS 84), an adult *B. flaviceps* was observed mid-way through consuming a live *Boiga dendrophila* (Mangrove Snake). The *B. dendrophila* was swallowed head-first, with head movements clearly visible through the body wall of the *B. flaviceps* during the extended ingestion process. The *B. flaviceps* struggled to consume its prey, which continuously gripped vegetation with its tail, impeding consumption. Both animals were observed and documented without intervention for an additional 9 min until the *B. dendrophila* had been completely consumed. Photography and video of the predation event are deposited at the Museum of Southwestern Biology (MSBObs:Herp:11–12). This interaction represents the first reported record of *B. dendrophila* in the diet of *B. flaviceps*.

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***CARPHOPHIS AMOENUS AMOENUS* (Eastern Wormsnake). PREDATION.** *Carphophis amoenus* is a small semi-fossorial dipsadine found in mesic woods throughout the eastern and central United States (Ernst & Ernst 2003. Snakes of the United States and Canada. Smithsonian Institution Press, Washington DC. 668 pp.). Predators of *Carphophis* include a wide variety of reptiles, birds, and mammals, including shrews (Clark 1970. Univ. Kansas Publ. Mus. Nat. Hist. 19:85–194). *Blarina brevicauda* (Northern Short-tailed Shrew) is a species of shrew native to the northern regions of central and eastern USA as well as southern parts of

PHOTO BY KYLIE MORRISON



FIG. 1. Five dead specimens of *Carphophis amoenus amoenus* found in proximity to a *Blarina brevicauda* individual under an artificial cover object in South Carolina, USA.

Canada. *Blarina brevicauda* is known to be a fierce predator of various species of reptiles, amphibians, and arthropods. It is equipped with sharp teeth and potent, venomous saliva that quickly causes respiratory arrest and death to its prey once bitten (Pearson 1942. J. Mammal. 23:159–166).

During a research study that took place at Table Rock State Park (Pickens County, South Carolina, USA) at sites where *C. a. amoenus* was abundant, *B. brevicauda* was observed displaying a peculiar behavior that has not yet been documented. Underneath a coverboard that was being used for the research project, a food cache was found (Fig. 1) along with an adult specimen of *B. brevicauda*. While it is known that this species commonly caches food (Churchfield 1990. The Natural History of Shrews. Cornell University Press, Ithaca, New York. 178 pp.), it has not been recorded caching *C. a. amoenus* prior to this finding. The food cache consisted of five deceased adult *C. a. amoenus* individuals. No other food sources were observed. Each snake had visible gnaw-marks along the length of the body, and several of the snakes were decapitated (Fig. 1). The heads were not located despite searching. While caching behavior is a part of this species' behavioral repertoire, caching such a large number of *C. a. amoenus* is something that should be explored further.

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***CERASTES CERASTES* (Horned Viper). DIET.** *Cerastes cerastes* is a medium-sized, adaptable viper that occurs throughout the Sahara Desert in most sandy habitats as well as regs (desert pavements) and oasis. Juvenile *C. cerastes* usually feed on lizards and large insects (Geniez 2018. Snakes of Europe, North Africa, and the Middle East. Princeton University Press, Princeton, New Jersey. 384 pp.), while adults exhibit a generalist diet, feeding on relatively large prey. Field observations and stomach content analyses conducted on a few individuals across various habitats show that its food spectrum comprises geckos, agamids, skinks, lacertids, small rodents, and birds (Hartert 1913. Reptiles and Batrachians. Novitates Zoologicae 20:83–84; Barnestein et al. 2013. Boletín de la Asociación Herpetológica Española 24:25–26). Schleich et al. (1996. Amphibians and Reptiles of North Africa. Koletz Scientific Books, Koenigstein, Germany. 627 pp.) indicate that *C. cerastes* also preys on small monitors and "occasionally" on young or small snakes.

In May 2025, within a cistern made of concrete that was partially filled with sand in the province of Smara, southern Morocco (26.66098°N, 11.74574°W; WGS 84), we found a desiccated dead *C. cerastes* with another snake partially ingested (Fig. 1). Due to abandonment, the roof had collapsed, leaving a large opening through which both animals had likely fallen. Although both specimens were found as skeletal mummies, they were easily identifiable (Fig. 2) The *C. cerastes* was identified primarily due to the presence of two cephalic horns, and the ingested snake was identified as *Rhagerhis moilensis* (False Cobra) based on the lack of fangs and the pale yellowish to brownish or grayish background coloration, which featured a series of poorly defined and irregular dorsal blotches, as well as smaller spots along the flanks (Martínez de Mármol et al. 2019. Amphibians and Reptiles of Morocco. Edition Chimaira, Frankfurt am Main, Germany. 478 pp.). In addition to the *R. moilensis*, necropsy revealed bones of a micromammal within the stomach of the *C. cerastes* (Fig. 2). It is unclear whether the *C. cerastes* died for unrelated reasons while ingesting its prey or whether, when suffering the throes of death, it was unable to fully regurgitate the snake.



PHOTO BY RODRIGO BUSTOS

FIG. 1. Deceased *Cerastes cerastes* found in a cistern in southern Morocco.



PHOTO BY RODRIGO BUSTOS

FIG. 2. Whole specimen found and its gut contents after the necropsy: *Cerastes cerastes* (left), *Rhagerhis moilensis* (right), micromammal bones (top right).

Our note provides new insight into the feeding ecology of *C. cerastes* in southern Morocco. The species' dietary plasticity underscores its ecological significance and potential resilience to certain environmental changes. However, in arid and semi-arid regions of Morocco, traditional water storage systems such as cisterns are common features of both rural settlements and remote desert landscapes. While these structures are essential for water management and human subsistence, they often act as ecological traps for wildlife (Zdunek et al. 2024. Herpetol. Notes 17:821–826). The ecological impact of these anthropogenic traps remains poorly quantified and, as demonstrated here, warrants further study (García Cardenete et al. 2014. Environ. Cons. 41:341–349).

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***CHILABOTHRUS INORNATUS* (Puerto Rican Boa). DIET.** *Chilabothrus inornatus* is one of 14 species in the genus *Chilabothrus*, which is distributed across the Bahamas and the Greater Antilles (Tolson and Henderson 1993. The Natural History of West Indian Boas. R & A Publishing, Ithica, New York. 128 pp.). The species is endemic to Puerto Rico and has been considered endangered since the 1970s. *Chilabothrus inornatus* is more frequently seen in northern Puerto Rico, where some populations use caves for shelter and bat predation. Stomach content analyses indicate that most of its diet consists of rats (*Rattus* spp.), but frequent predation on bats has been documented (Wiley 2003. Carib. J. Sci. 39:189–194; Puente-Rolón et al. 2016. Life: The Excit. Bio. 4:88–99). As a top predator on the island, it also preys on birds and other reptiles.

Iguana iguana (Green Iguana) is an invasive species introduced to Puerto Rico in the 1970s through the commercial pet trade (Rivero 1998. The Amphibians and Reptiles of Puerto Rico. Second Edition. Editorial de la Universidad de Puerto Rico, Barcelona. 510 pp.) Since its introduction, the species has successfully established populations across the main island, particularly in lowlands and coastal regions, as well as on smaller islands and keys. Here we report a case of predation on *I. iguana* by *C. inornatus*.

On 19 February 2024, at a rural water treatment facility between the municipalities of Camuy and Hatillo, Puerto Rico (18.4731°N, 66.8290°W; WGS 84; 13 m elev.), a group of construction workers contacted us to identify a snake preying on an iguana. High in the tree canopy, a *C. inornatus* was observed employing an arboreal hunting strategy similar to that used to capture bats. The boa constricted the iguana and later extended itself off the branch, using its body's full extension to accommodate the prey item. We observed the predation event via video call and recorded footage. To avoid disturbing the snake, no measurements of the boa or iguana were taken. Although this is the first record of *I. iguana* being preyed upon by *C. inornatus*, this behavior may be relatively common. Observations such as this contribute valuable insights into the dietary plasticity and ecological adaptability of *C. inornatus*, emphasizing its significance as a top predator within the ecosystems of Puerto Rico.

PHOTOS BY AXEL BURGOS



FIG. 1. A) *Chilabothrus inornatus* camouflaged among dense foliage, its tail securely wrapped around a branch while constricting its prey, an *Iguana iguana* (Green Iguana), with two coils; B) *C. inornatus* hanging from a branch after successfully constricting the iguana, adjusting its position to facilitate full consumption of its prey.

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***CHIRONIUS QUADRICARINATUS* (Central Sipo). BRACHYGNATHIA.** Morphological anomalies in reptiles result from both environmental and congenital factors. These conditions can negatively impact survival, impairing locomotion and feeding while increasing vulnerability to predation (Billy 1986. Can. J. Zool. 64:2418–2424; Frye 1991. *In* Reptile Care: An Atlas of Diseases and Treatments, pp. 393–419. TFH Publications, Neptune City, New Jersey; Wallach 2007. Bull. Maryland Herpetol. Soc. 43:57–95; Sant'Anna et al. 2013. J. Comp. Path. 149:503–508). These anomalies are potential indicators of environmental stressors, reflecting imbalances that affect species' ecology and the health of their habitats (Telemeco et al. 2013. Integ. Zool. 8:197–208).

A common morphological anomaly reported across various vertebrate taxa is brachygnathia, a reduction in the length of the lower jaw relative to the upper jaw, resulting in occlusal misalignment (Harvey and Emily 1993. *In* Harvey and Emily [eds.], Small Animal Dentistry, pp. 266–296. Mosby, St. Louis, Missorui). In snakes, brachygnathia has been reported in Boidae, Colubridae, Elapidae, and Viperidae (Bellairs and Boyd 1957. Proc. Zool. Soc. London 129:525–539; Fox et al. 1961. Zoologica 46:57–71; Turner 1998. Mon. J. Vic. Herpetol. Soc. 10:15–17; Rothschild et al. 2012. Herpetological Osteopathology: Annotated Bibliography of Amphibians and Reptiles. Springer, New York. 450 pp.; Sant'Anna et al. 2013, *op. cit.*; Carvalho et al. 2018. J. Comp. Path. 167:73–81; Tavares-Pinheiro et al. 2021. Herpetol. Notes 14:873–875; Najbar et al. 2022. Herpetozoa 35:115–120). We present the first case of brachygnathia in *Chironius quadricarinatus*, a semi-arboreal, diurnal colubrine with a broad distribution across south-central Brazil and into bordering areas of Bolivia and Paraguay (Bailey 1955. Occas. Pap. Mus. Zool. Univ. Mich. 571:1–21; Nogueira et al. 2019. S. Am. J. Herpetol. 14:1–274).

On 1 April 2005, a *C. quadricarinatus* was captured during a wildlife rescue operation conducted for the installation of a hydroelectric power plant on the Corumbá River, Brazil. The individual was found in a typical Cerrado environment near the Rio das Antas in the Municipality of Alexânia, Goiás, Brazil (16.32329°S, 48.45887°W; WSG 84; 878 m elev.). The snake exhibited pronounced brachygnathia, characterized by a visibly shortened lower jaw, rendering it unable to achieve proper occlusion (Fig. 1). The overall assessment indicated a moderate body condition, suggesting that the deformity did not significantly hinder feeding. After photographic documentation, the animal was released into a permanent preservation area. During the same wildlife rescue, another 33 *C. quadricarinatus* were recorded. However, none of them exhibited morphological anomalies.

Cases of brachygnathia in snakes are rare and, in most instances, have been reported in captive specimens, neonates, and embryos (Bellairs and Boyd 1957. Proc. Zool. Soc. London 129:525–539; Carvalho et al. 2018, *op. cit.*). This prevalence in early life stages is associated with the difficulty of such individuals reaching adulthood, as the reduced jaw length impairs their ability to capture and ingest prey (Mulder 1995. Deinsea 2:41–50). However, this study documents a case of a juvenile *Chironius quadricarinatus* found in the wild. The specific causes of this

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FIG. 1. Close-up view of a brachygnathous specimen of *Chironius quadricarinatus*.

malformation remain unknown. Brachygnathia has been linked to temperature fluctuations during the embryonic development of snakes (Fox et al. 1961, *op. cit.*). Additionally, significant renal alterations have been detected in individuals of *Bothrops jararaca* (Lancehead) with this anomaly (Carvalho et al. 2018, *op. cit.*). Further records and studies are essential to comprehend how these conditions influence the evolution and ecology of snakes.

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***CLELIA EQUATORIANA* (Equatorial Mussurana). PREDATION.** *Clelia* species are large ophiophagous snakes. *Clelia clelia* is distributed throughout Colombia up to 2000 m elev. but is mostly found under 1500 m. *Clelia equatoriana* is a slightly smaller species, and, in Colombia, it is restricted to the Andean regions at sites up to 2600 m elev. (Bernal 2025. Serpientes de Colombia-Guía de Campo. Serie de Guías Tropicales de Campo. 19. Conservación Internacional Colombia, Bogotá. 396 pp.). The juveniles of both species have a bright red dorsum with black scale tips, and the head of juveniles is black with a yellow or cream nuchal collar bordered by a black band.

The Andean Motmot (*Momotus aequatorialis*) is a large motmot species living in the Central Andean region of Colombia between 1500 and 3200 m elev. The diet of *Momotus* species includes arthropods, fruits, frogs, reptiles, small birds, marsupials, and small rodents (Gomez-Hoyo et al. 2015. Mammal. Notes 2:23). Another publication refers to *M. aequatorialis* preying on a colubrid snake, *Atractus manizalesensis,* in the Department of Caldas, Colombia (Zuniga-Baos 2023. Herpetol. Rev. 54:307). Here, we present the first report of an *M. aequatorialis* preying on a juvenile *Clelia equatoriana.*

On 26 July 2025, at ca. 1618 h, at the Santa Rita Reserva Natural, Boquia, Municipality of Salento, Quindio, Colombia (4.65466°N, 75.57209°W; WGS 84; 1868 m elev.), a *M. aequatorialis* was spotted siting on a branch next to a hiking trail with a small lifeless snake in its beak. Based on the reddish coloration and black head with cream nuchal collar and black band, the snake was identified as a juvenile *Clelia* sp. Only a few quick photos could be taken, but we presume it was a juvenile *C. equatoriana*, since observations of *C. clelia* are rare at this elevation. RDP has observed two *C. equatoriana* at nearby locations with similar elevation. Checking



FIG. 1. Andean Motmot (*Momotus aequatorialis*) observed with a lifeless *Clelia equatoriana* in its beak in Quindio, Colombia.

on iNaturalist, we found no observations of *C. clelia* in the region, although several *C. equatoriana* were pinpointed in Filandia, Salento (Quindio), and on the border with the Department of Riseralda.

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***COLUBER CONSTRICTOR PALUDICOLA* (Everglades Racer) and *BOA CONSTRICTOR* (Red-tailed Boa). PREDATOR/PREY INTERACTION.** The only known breeding population of the non-native *Boa constrictor* in Florida, USA, is at the Deering Estate at Cutler, Miami, Miami-Dade County (Snow et al. 2007. *In* Henderson and Powell [eds.], Biology of the Boas and Pythons, pp. 416–438. Eagle Mountain Publishing, Eagle Mountain, Utah). Female *B. constrictor* captured at the Deering Estate at Cutler give birth in May–August, and most neonates have been captured in August and September (Snow et al. 2007, *op. cit.*). We are unaware of any documented predators of *B. constrictor* in Florida, but snake predators of the invasive and more geographically widespread *Python bivittatus* (Burmese Python) in southern Florida are *Agkistrodon conanti* (Florida Cottonmouth), *Coluber constrictor paludicola*, and *Drymarchon couperi* (Eastern Indigo Snake; Andreadis et al. 2018. Herpetol. Rev. 49:341–342; Bartoszek et al. 2021. Herpetol. Rev. 52:860–862; Currylow et al. 2023. Manage. Biol. Invas. 1:107–122; Bartoszek et al. 2024. Herpetol. Rev. 55:583–584).



FIG. 1. Non-native neonate *Boa constrictor* constricting an adult *Coluber constrictor paludicola* following a suspected failed predation attempt by the *C. constrictor paludicola* in Florida, USA.

On 1 August 2022 at 1930 h, we observed a neonate *B. constrictor* (ca. 36 cm total length) constricting an adult (ca. 122 cm total length) *C. constrictor paludicola* along a walking path between horse stables and the Palmetto Bay Branch Library (25.6071°N, 80.3110°W; WGS 84), which is 0.4 km south of the Deering Estate South Addition. Two coils of the *B. constrictor* pressed the double-backed head of the *C. constrictor* to its body (Fig. 1). After separating the snakes, the *C. constrictor* appeared exhausted but recovered within 1 min and crawled away. We suspect the *C. constrictor* attempted to predate the *B. constrictor*, which retaliated by coiling and constricting. *Coluber constrictor* is a non-constrictor that preys on a variety of prey, including snakes (Ernst et al. 2003. Snakes of the United States and Canada. Smithsonian Institution Press, Washington, D.C. 668 pp.), whereas *B. constrictor* kills lizards, birds, and mammals by constriction (Reinert et al. 2021. Herpetol. Conserv. Biol. 16:211–224).

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***CONIOPHANES IMPERIALIS* (Regal Black-striped Snake). DIET.** *Coniophanes imperialis* occurs from extreme southern Texas, USA, southward along the eastern coast of Mexico, throughout the Yucatán Peninsula, and into northern Honduras



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FIG. 1. Adult *Coniophanes imperialis* from Cameron County, Texas, USA, with two recently regurgitated neonatal *Neotoma* sp. (surmised to be *N. micropus*).

(Campbell 1998. Amphibians and Reptiles of Northern Guatemala, the Yucatán, and Belize. University of Oklahoma Press, Norman, Oklahoma. xiii + 380 pp.; Werler and Dixon 2000. Texas Snakes: Identification, Distribution, and Natural History. University of Texas Press, Austin, Texas. xv + 437 pp.; Heimes 2016. Herpetofauna Mexicana Vol 1: Snakes of Mexico. Edition Chimaira, Frankfurt am Main, Germany. 572 pp.). This species is active during the day and night (McKay 2024. Reptiles of Oaxaca: Turtles, Crocodiles, Lizards, and Snakes of Mexico's Most Biodiverse State. Edition Chimaira, Frankfurt am Main, Germany. 544 pp.), allowing it to exploit a wide range of prey. Furthermore, *C. imperialis* is opisthoglyphous, possessing enlarged rear maxillary fangs that may aid in subduing prey (Werler and Dixon 2000, *op. cit.*). While not considered dangerous to humans (Schmidt and Davis 1941. Field Book of Snakes of the United States and Canada. The Cornwall Press, Inc., Cornwall, New York. xi + 357 pp.; McKay 2024; *op. cit.*), *C. imperialis* possesses mild venom that assists in immobilizing its prey (Brown 1937. Copeia 1937:234; Lemos-Espinal and Dixon 2012. Amphibians and Reptiles of San Luis Potosí. Eagle Mountain Publishing, Eagle Mountain, Utah. xii + 300 pp.)

The diet of *C. imperialis* is diverse, primarily consisting of amphibians, reptiles, and, to a lesser extent, rodents (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Books, Washington, D.C. ix + 668 pp.). Authors have documented the consumption of frogs, including species from the families Bufonidae, Eleutherodactylidae, Hylidae, Leptodactylidae, and Microhylidae (Campbell 1998, *op. cit.*; Lee 2000. A Field Guide to the Amphibians and Reptiles of the Maya World: the Lowlands of Mexico, Northern Guatemala, and Belize. Cornell University Press, Ithaca, New York. xi + 402 pp.; Lemos-Espinal and Dixon 2012, *op. cit.*; Valencia-Herverth et al. 2021. Herpetol. Rev. 52:151). Reptilian prey includes species in the families Scincidae and Typhlopidae (Conant 1955. Am. Mus. Novit. 1726:1–6; Campbell 1998, *op. cit.*; Lemos-Espinal and Dixon 2012, *op. cit.*), as well as lizard eggs (Frazier et al. 2007. Herpetol. Rev. 38:86); additionally, an instance of attempted cannibalism has been reported (Oakley and Núñez-Robles 2023. Rept. Amphib. 30:e18991). There are also records of *C. imperialis* consuming insects and invertebrates (Campbell 1998, *op. cit.*). Though rodents are not commonly mentioned as prey, there is a report of "young mice" being regurgitated,

and captive individuals have consumed unidentified rodents (Conant 1955, *op. cit.*). Otherwise, little information exists on the presence of rodents in the diet of *C. imperialis*. Here, we provide new information on rodent consumption in wild *C. imperialis*.

On 16 October 2017, CJG collected an adult *C. imperialis* (SVL ca. 373 mm, tail length ca. 91 mm) in northeastern Cameron County, Texas, USA (26.19214°N, 97.39006°W; WGS 84). The individual was found crawling in the open at 1647 h, moving awkwardly due to a large food bolus. The snake was collected to be photographed, and ca. 1 h later, the snake regurgitated two neonatal rodents (Fig. 1; photo voucher TNHC 117493, Biodiversity Collections, The University of Texas at Austin). The rodents appeared to have been recently consumed and constituted ca. 75% of the snake's total body mass. The rodents were identified as members of the genus *Neotoma* (Cricetidae; packrat or woodrat) and surmised to be *N. micropus* (Southern Plains Woodrat) based on being the sole member of this genus in the region. After photographing the snake, it was released back at the site of capture. Though *C. imperialis* is primarily recognized as consuming anurans (Tennant 1984. The Snakes of Texas. Texas Monthly Press, Austin, Texas. 561 pp.), this observation helps expand what is known about the diet of this species.

We thank M. Pons, Jr. for his efforts identifying the rodent specimens, T. LaDuc for accessioning the photo into the TNHC collections, and members of the Davis Herpetology Lab for their feedback. Specimen was collected and photographed under a Texas Parks and Wildlife Department Zoological Permit (ZOO-0790-004).

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***CROTALUS ATROX* (Western Diamond-backed Rattlesnake). COLORATION.** *Crotalus atrox* is a large rattlesnake species that is characterized by large diamond or hexagonal-shaped dorsal spots against a grey, brown, or light gray dorsal coloration (Heimes 2016. Herpetofauna Mexicana Vol. I Snakes of Mexico, Edition Chimaira Frankfurt am Main, Germany. 431 pp.). Atypical red coloration (erythrism) is caused by an over expression of orange and red pigments in skin cells (erythrophores). In reptiles, erythrism has primarily been reported in snakes, with a few reports in lizards and none in crocodiles and turtles (Watson and Vaughan 2004. Herpetol. Rev. 35:178; Maèát et al. 2015. Russ. J. Herpetol. 23:7376; Borteiro et al. 2021. Salamandra 57:124–138). Here, we report a case of erythrism in *C. atrox*.

During a herpetological survey in Majoma, Municipality of Mazapil, Zacatecas, México (23.87203°N, 101.54980°W; WGS 84; 2295 m elev.), at 1513 h on 7 July 2025, we found an abnormally colored adult male *C. atrox* (ca. 130 cm SVL). This individual (Fig. 1) was predominantly red and orange colored around the dorsal hexagonal spots as well as on the caudal surface and close to the rattle. The rest of the body exhibited coloration typical of the species, resulting in a case of partial erythrism.

Erythrism has previously been reported in captive bred *C. atrox* and on social media and citizen science platforms, but to our knowledge, this is the first formal report of partial erythrism in a wild *C. atrox*. In Mexico, there are reports of partial and total erythrism in reptiles of the families Colubride, Anguidae, and Elapidae, some of which are associated with disturbed habitats or other adverse environmental conditions (Hidalgo-Licona 2023. Herpetol. Notes 16:175–177; Arzate-Garay 2024. Rev. Latinoam. Herpetol. 7:52–55).



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FIG. 1. Male *Crotalus atrox* with partial erythrism.

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***CROTALUS SCUTULATUS* (Mohave Rattlesnake). DIET.** *Crotalus scutulatus* is distributed from Nevada, Utah, and Texas, USA, and south through the Mexican Plateau, reaching Puebla and Veracruz (Heimes 2016. Herpetofauna Mexicana Vol. 1: Snakes of Mexico. Edition Chimaira, Frankfurt am Main, Germany. 435 pp.). It feeds mostly on small mammals, lizards, and rarely on birds, snakes, amphibians, and arthropods (Vázquez-Díaz and Quintero-Díaz 2005. Anfibios y Reptiles de Aguascalientes, Gob. Edo. Aguascalientes y CIEMA. 318. pp.; Heimes, *op. cit.*). It is documented that *C. scutulatus* consumes amphibians like toads (*Anaxyrus* sp.), spadefoots (*Scaphiopus* sp. and *Spea* sp.), and frogs (Ernst and Ernst 2012. Venomous Reptiles of the United States, Canada, and Northern Mexico. Vol. 2. The Johns Hopkins University Press, Baltimore. 391 pp.; Holycross and Mitchell 2020. Snakes of Arizona. ECO Publishing: Rodeo, New Mexico. 837 pp.), but species-level identification of amphibian prey has not been published.

On 28 July 2022, we found two recently born *C. scutulatus* killed by local people, at San José el Alto, Municipality of Asientos, Aguascalientes, Mexico (22.09378°N, 102.15878°W; WGS 84; 2062 m elev.) The vegetation present was xerophilous scrubland. The first *C. scutulatus* was a neonate female (248 mm SVL, 17 mm tail length, 10 g without prey; UAAREP-1061; Fig. 1) that contained a partially digested juvenile *Spea multiplicata* (Mexican Spadefoot, 40 mm SVL, 3 g), which had been ingested headfirst. The mass ratio (prey mass/snake mass) was 0.3. The second rattlesnake was another neonate female (234 mm SVL, 13 mm tail length, 9 g without prey; UAAREP-1062), which contained the distal part

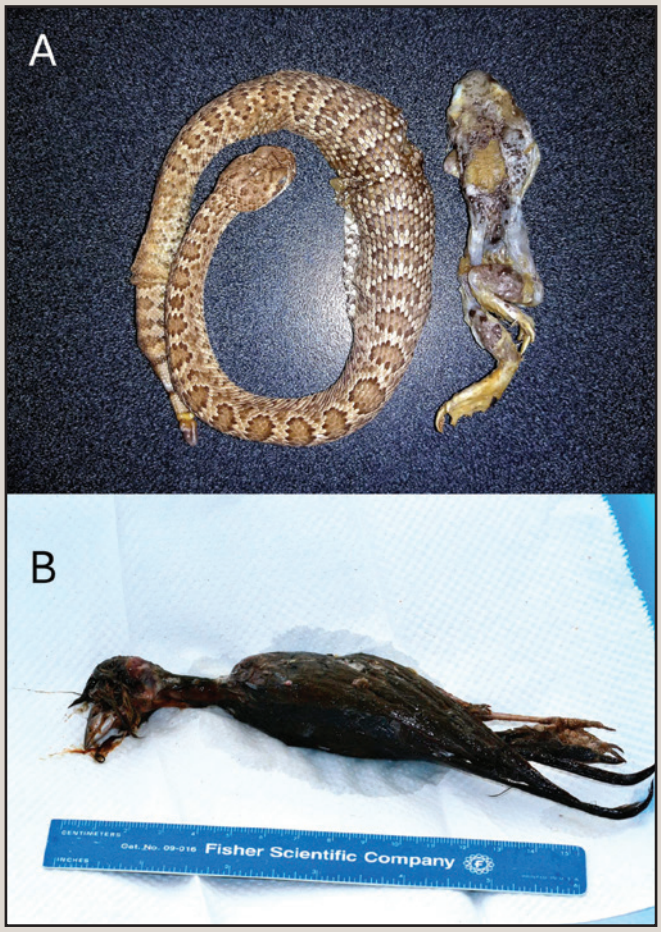


FIG. 1. A) Neonate female *Crotalus scutulatus* and its prey, a *Spea multiplicata* (Mexican Spadefoot) from Asientos, Aguascalientes, Mexico; B) a *Molothrus aeneus* (Bronzed Cowbird) consumed headfirst by an adult female *C. scutulatus* from San Jerónimo, Zacatecas, Mexico.

of the left hind leg of another *S. multiplicata*. These two prey items represent the first records of *S. multiplicata* in the diet of *C. scutulatus*. Both prey were identified based on the spades present on the feet of the specimens and because *S. multiplicata* is the only Scaphiopodidae known in the area.

In addition, on 17 August 2010, we found a live adult female *C. scutulatus* (726 mm SVL, 59 mm tail length; Fig. 1) at San Jerónimo, Municipality of Guadalupe, Zacatecas, Mexico (22.648024°N, 102.488688°W; WGS 84; 2283 m elev.). The vegetation present was xerophilous scrubland. After gentle palpation, the snake regurgitated a partially digested *Molothrus aeneus* (Bronzed Cowbird), which had been ingested headfirst. The rattlesnake was released at the site of the encounter. To the best of our knowledge, this is the first record of *M. aeneus* in the diet of *C. scutulatus*. Although *C. scutulatus* frequently consumes rodents, it rarely consumes birds or amphibians, so it is worth documenting these prey items.

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***CROTALUS SIMUS* (Central American Rattlesnake). PREDATION.** Few observations of predation on *Crotalus simus* have been documented in the literature and even fewer have been associated with avian predators. Indigo snakes are well-known predators of rattlesnakes, with *Drymarchon melanurus* (Central American Indigo Snake) having been documented predating *C. simus* on numerous occasions (Castro et al. 2012. Herpetol. Rev. 43:659). Among birds, hawks and falcons represent predators of many snake species (Greene 1997. Snakes: The Evolution of Mystery in Nature. University of California Press, Berkeley, California. 366 pp.). Herein, we present a predation event on *C. simus* by a novel avian predator.

On 8 June 2025, at 1513 h, an adult *Herpetotheres cachinnans* (Laughing Falcon) was observed as it flew from the ground up to a low perch in a tree (Fig. 1). The observation occurred in a regenerating tropical dry forest adjacent to cattle pastures in the Estación Experimental Forestal Horizontes, Liberia, Costa Rica (10.71394°N, 85.59592°W; WGS 84). The falcon was observed carrying a decapitated juvenile *C. simus* (total length ca. 45 mm). The falcon proceeded to consume the entire snake. Laughing Falcons exhibit a snake-specialized diet that includes a wide range of viperid and other venomous species (Costa et al. 2014. North-Western J. Zool. 10:445–453). This observation represents the first record of predation on *C. simus* by *H. cachinnans* and adds to the short list of known avian predators of *C. simus*.



FIG. 1. *Herpetotheres cachinnans* (Laughing Falcon) preying upon *Crotalus simus* in Liberia, Costa Rica.

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***DENDROPHIDION PERCARINATUM* (Brown Forest Racer). DIET.** If food resources are scarce, consumers might ingest members of their own species even if doing so constrains potential interactions in the future (e.g., mating; Fox 1975. Ann. Rev. Ecol. Syst. 6:87–106). Cannibalism is more likely to occur among predatory taxa that are dietary generalists or that occupy habitats where conspecifics are abundant (Takatsu and Kishida 2015. Ecology 96:1887–1898; Dugas et al. 2016. Am. Nat. 188:124–131).

The guild of colubrine snakes broadly classified as racers (*Coluber, Dendrophidion, Drymobius, Masticophis, Mastigodryas*, etc.) actively forage through potentially variable habitats in which a variety of prey species might be encountered. For racer species in which diets have been systematically examined, other snake species typically constitute fewer than 5% of the ingested prey items (e.g., *Coluber*: Fitch 1963. Univ. Kansas Publ. Mus. Nat. Hist. 15:351–468; *Masticophis*: Grismer 2002. Amphibians and Reptiles of Baja California, Including its Pacific Islands and the Islands of the Sea of Cortés. University of California Press, Berkeley, California. 399 pp.).

Dendrophidion percarinatum is a diurnal snake that occurs in forested habitats from Honduras to northwestern Ecuador, including both the Caribbean and Pacific slopes of Panama (Ray 2017. Snakes of Panama. CreateSpace Independent Publ., Scotts Valley, California. 214 pp.; Leeders 2019. Reptiles of Costa Rica. Cornell University Press, Ithaca, New York. 625 pp.). Previous dietary records for this genus include anurans and lizards (Stafford 2003. Herpetol. J. 13:101–111; Oliviera et al. 2019. Herpetol. Rev. 50:591–592). Fragments of arthropods have also been recovered from museum specimens, but these are suggested as resulting from secondary ingestion (Prudente et al. 2007. So. Am. J. Herpetol. 2:53–58).

At 1430 h on 20 June 2025, we encountered a fresh carcass of *D. percarinatum* on the roadbed of Via hacio Río Indio in El Valle de Anton, Coclé province, Panama (8.636160°N, 80.121597°W; WGS 84; 848 m elev.). We had not observed this specimen when passing the same location at 0915 h that morning, and vehicular traffic is relatively light (<1 car/min). Conditions at the time of encounter were overcast with light drizzle and an air temperature of 24.5°C. Among the traits visible on this specimen, we used presence of a divided anal plate and everted hemipenes to diagnose the species and sex (Leenders 2019, *op. cit.*). Impacts either at the time the snake was killed or from other vehicles prior to our encounter had dissected the specimen's body wall along ca. 35% of its SVL. Within the exposed viscera, a tear in the gut wall revealed a conspecific female (287 mm SVL, ca. 5 g). With the prey item removed, the male specimen measured 988 mm SVL and 200 g. To our knowledge, this is the first documentation of snakes in the diet of *D. percarinatum* and the first record of cannibalism in the species.

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***DRYMARCHON CORAIS* (South American Indigo Snake). DIET.** *Drymarchon corais* is a diurnal, semi-arboreal snake that is widely distributed in South America (Nogueira et al. 2019. South Am. J. Herpel. 14:1–274). It is a dietary generalist that feeds on amphibians, lizards, birds, eggs, small testudines, small mammals, and other snakes (Bernarde and Abe 2010. Biota Neotrop. 10:167–173; Prudente et al. 2014. Herpetol. Notes 7:99–108; Lee and Richter 2014. Herpetol. Rev. 45:484). Regarding snakes only, species of the genera *Atractus, Bothrops, Crotalus, Epicrates, Erythrolamprus, Helicops, Leptodeira*, and *Pseudoboa* have been recorded as prey of *D. corais* (Bernarde and Abe 2010, *op. cit.*; Prudente et al. 2014, *op. cit.*; Pelegrini et al. 2019. Herpetol. Notes 12:1193–1195; Lock and Entiauspe-Neto 2020. Herpetol. Rev. 51:617–618). Previously recorded Boidae in the diet of *D. corais* include *Epicrates cenchria* (Western Rainbow Boa; Bernarde and Abe 2010, *op. cit.*). *Boa constrictor* has been previously recorded in the diet of the sister taxon of *D. corais*, *D. melanurus*, but not for *D. corais* (Central American Indigo Snake) in Central America (Duellman 1963. Univ. Kansas Publ. Mus. Nat. Hist. 15:205–249). Here we present the first record of *D. corais* preying upon *B. constrictor* in the Brazilian Amazon.



FIG. 1. *Drymarchon corais* from Belterra, Pará, Brazil, showing the ingested *Boa constrictor* specimen: top) general dorsal view of the *D. corais* (UFOPA-H 3349; male; 1108 mm SVL); bottom) dorsal view of prey (626 mm SVL).

On 17 July 2014, an adult male *D. corais* (1108 mm SVL, 384 mm tail length) was found run over on km 80 of BR 163 highway in the municipality of Belterra, western Pará, Brazil (3.01694° S, 54.92968° W; WGS 84; 132 m elev.) A juvenile *Boa constrictor* was projecting out of the abdominal cavity due to an injury in the stomach region. The prey had been ingested head-first and was 626 mm SVL with a tail length of 84 mm. Both specimens (predator and prey) were deposited under the same voucher (UFOPA-H 3349) in the herpetological collection of the Universidade Federal do Oeste do Pará in the municipality of Santarém, Pará, Brazil.

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***ECHIS CARINATUS* (Indian Saw-scaled Viper). HYPOMELANISM.** Hypomelanism refers to a condition in which individuals exhibit diminished expression of melanin with normally pigmented eyes (Borteiro et al. 2021. Salamandra 57:124–138). Such color aberrancies are rare in nature due to increased predation, lack of crypsis, and reduction in thermoregulatory abilities. Noting them can provide insight into environmental physiology (Arietta et al. 2020. Northeast Nat. 27:641–648).

PHOTOS BY MAYUR GAWAS

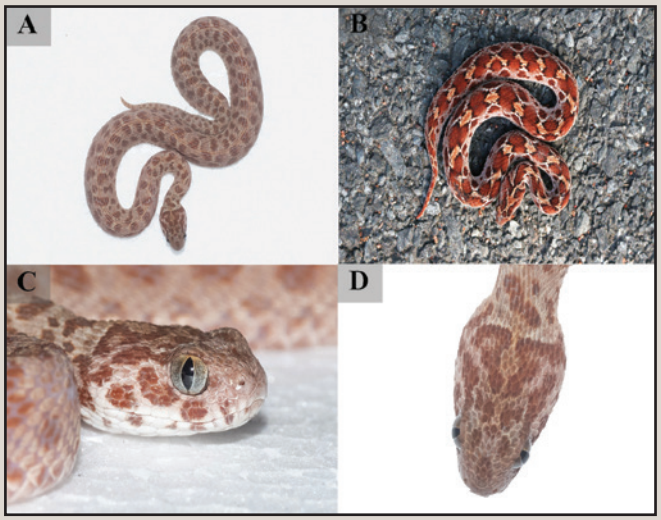


FIG. 1. A) Full body dorsal view of hypomelanistic *Echis carinatus* from Goa, India; B) full body dorsal view of a normally colored individual from the region; C) right lateral head portrait of hypomelanistic *Echis carinatus;* D) dorsal head portrait of hypomelanistic *Echis carinatus*.

Echis carinatus carinatus is a viperid found in dry, open areas of southern India, having an average length of 500 mm (Whitaker and Martin 2015. *In* Gopalakrishnakone et al. [eds.], Clinical Toxinology in Asia Pacific and Africa, pp. 115–136. Springer Netherlands, Dordrecht). Typical dorsal coloration ranges from light or dark brown to brick red or gray with conjoined rhomboidal blotches middorsally, giving a zigzag appearance. It has a stout body with strongly keeled scales and is a medically important snake species in the region (Whitaker and Captain 2004. Snakes of India: The Field Guide. Draco Books, Tamil Nadu, India. pp. 385).

At 0213 h on 21 November 2020, an aberrantly colored snake was discovered in the lateritic bricks stored on the periphery of a house in Chandor Village, Salcete Taluka, South Goa District, Goa, India (15.26420°N, 74.03956°E; WGS84; 23 m elev.). The unidentified snake was removed by a local rescuer and sent to Goa University, where it was identified as a male *E. carinatus* upon everting the hemipenes. The individual (246 mm SVL; 33 mm tail length) had a whitish ventral side with light brown markings on both sides of the ventral scales. The dorsum was pale brown with a faint pale orange vertebral stripe overlaying light brown rounded vertebral spots and light brown blotches on the flanks (Fig. 1A), in contrast to the typical black and dark reddish-brown spots (Fig. 1B). The head bore a pale pattern of small blotches (Fig. 1C, D). This observation is the first report of hypomelanism in *E. carinatus*.

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***HELICOPS ANGULATUS* (Brown-banded Watersnake). PARENTAL CARE.** Parental care, defined as any behavior increasing offspring survival (Shine 1988. *In* Gans and Huey [eds.], Biology of the Reptilia, Vol. 16: Ecology B, Defense and Life History, pp. 275–329. Alan R. Liss, New York), is rarely observed in snakes, with reports exceptionally rare within the neotropical subfamily Dipsadidae (Somma 2003. Parental Behavior in Lepidosaurian and Testudinian Reptiles: a Literature Survey. Krieger Publishing Company, Melbourne. 174 pp.). *Helicops angulatus* (Linnaeus 1758) is a widely distributed semi-aquatic snake found across the Amazon basin (Uetz et al. [eds.] 2025. The Reptile Database; www.reptile-database.org, May 2025). This note documents the first evidence of parental care in this species.

PHOTOS BY VITOR SOUZA BORGES



FIG. 1. Left) Adult *Helicops angulatus* in situ positioned at the entrance of the burrow on a steep igarapé bank; Right) clutch of eggs visible inside the burrow after gentle removal of the adult, at Estação Ecológica Serra dos Três Irmãos, Porto Velho, Rondônia, Brazil.

On 16 September 2020, at Estação Ecológica Serra dos Três Irmãos, Porto Velho, Rondônia, Brazil (9.0204°S, 63.9213°W; WGS 84), an adult female *Helicops angulatus* was visually located in a burrow (ca. 75° slope, compacted clay, ca. 30 cm deep) on a steep bank near an Igarapé with low water level. This area comprises well-preserved terra firme forest with numerous small Amazonian streams (Igarapés). Within the burrow, the adult *H. angulatus* was discovered resting directly on top of at least five eggs. The specimen was briefly handled for photographs and identification. Upon gentle removal for photographic documentation, the snake displayed marked reluctance to abandon the nest, repeatedly attempting to return to the cavity entrance. After its release, it quickly returned to its burrow, assuming its original position covering the eggs, which strongly supports the hypothesis of parental care. No other adults were observed nearby. The defensive and site fidelity behaviors observed are consistent with criteria for parental care. This observation represents the first known case of parental care in *H. angulatus* and, to our knowledge, in any member of the genus *Helicops*.

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***HYPSIRHYNCHUS PARVIFRONS PARANIGER* (Cope's Antilles Snake). COURTSHIP BEHAVIOR.** *Hypsirhynchus parvifrons* is a Hispaniolan endemic colubrid. Although information on its reproduction is limited, records from different subspecies indicate a broad breeding season from March to December (Henderson and Powell 2009. Natural History of West Indian Reptiles and Amphibians. University of Florida Press, Gainesville, Florida. 496 pp.).

On 24 August 2017, at ca. 1729 h, while conducting a reptile search along the Malecón de Santo Domingo, Distrito Nacional, Dominican Republic (18.45744°N, 69.91028°W; ca. 2 m elev.), we encountered 5–6 *H. p. paraniger* individuals, all adults, at the base of a limestone retaining wall on a terrace ca. 30 cm below the level of the adjacent waterfront walkway. The terrace consisted



FIG. 1. Cluster of adult *Hypsirhynchus parvifrons paraniger* at a crevice entrance in a limestone retaining wall, Malecón de Santo Domingo, Distrito Nacional, Dominican Republic.

mostly of paved sections with some sandy soil mixed with small rocks, leaf litter, and human debris. It was bordered by shrubs and almond trees (*Terminalia cattapa*). The site sits within a few meters of the Caribbean Sea and directly across from Malecon Center, a large shopping mall. The snakes were moving in and out of a crevice at the base of the wall. When outside, they were moving along the wall, maintaining physical contact, rubbing their bodies against one another, and passing over or under each other. Their movements appeared deliberate, and nothing resembling defensive postures, striking, or feeding behavior was observed. The number of visible individuals fluctuated as some retreated into the crevice and others emerged. Upon returning to the site around 1900 h, the same snakes were found tightly intertwined at the crevice entrance (Fig. 1). The individuals showed minimal movement during the brief observation period (ca. 5 min). During both encounters, this usually wary species appeared little concerned by our presence.

Based on the sequence of events we observed during the encounters, we hypothesize this represented either communal sheltering or, more likely, courtship behavior. There appeared to be an initial stage of mate-searching, possibly following a pheromone trail as they went in and out of the crevice and rubbed against one another, followed by the formation of a cluster resembling the "mating balls" formed by other species (e.g., *Thamnophis sirtalis parietalis*, Joy and Crews 1985. J. Comp. Psychol. 99:145–150; *Chrysopelea paradisi*, Amarasinghe et al. 2014. Herpetol. Notes 7:613–617), where several males attempt to physically remain in contact, and mate, with a female. We did not observe copulation, tail wrapping, or male combat, so our interpretation rests on prolonged contact behaviors and subsequent clustering.

Aggregation behavior in *H. parvifrons* had already been reported by Franz and Gicca (1982. J. Herpetol. 16:419–421), who encountered several groups of 4–5 individuals of *H. p. alleni* coiled together while working in Île de la Gonâve, Haiti. The males they dissected (in January) were found not to be sexually active, but Schwartz and Henderson (1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. University of Florida Press, Gainesville, Florida. 720 pp.) reported finding females of *H. p. alleni* with mature follicles or eggs in January, possibly suggesting asynchronous male-female reproductive cycles or possible sperm storage. Although there is no specific data for *H. p. paraniger*, this observation falls within the known breeding season, with hatchlings reported in early to mid-August (Henderson and Powell 2009, *op. cit.*). Thus, our late-August observation may reflect courtship within a protracted breeding period or delayed/late-season mating, but confirmation will require sexing individuals and assessing reproductive condition.

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***LATICAUDA COLUBRINA* (Yellow-lipped Sea Krait). REPRODUCTION.** *Laticauda colubrina* is a marine species that occurs throughout the Andaman and Nicobar Islands, India (Bhaskar 1996. Hamadryad 21:27–35). It exhibits sexual dimorphism, with females attaining a much larger size than males and possessing relatively shorter tails (Gorman 1981. J. Herpetol. 15:335–354). Courting by males is done through tongue flicking and twitching of their bodies with the female's body (Shetty and Shine 2002. Herpetologica 58:170–180). During mating, males align their body with the female's and start rhythmic contact with the female. Other males remain motionless near the female. In the Andaman Islands, small mating aggregations of *L. colubrina* on land, near the shore, have the usual composition of one female with multiple males, either two or three males (Bhaskar 1996, *op. cit.*). Here we describe an instance of courtship in *L. colubrina* that extends the known reproductive season for this species.

During a herpetofauna survey during low tide conditions at 2250 h on 19 May 2023, near Chota Enaka Village on the eastern coast of Kamorta Island, Nicobar Islands, we reached the beach known locally as 9 km (8.05449°N, 93.31536°E; WGS 84), wherein we observed two male individuals and one female individual of *L. colubrina* in a mating assemblage (Fig. 1). The snakes were inside rock crevices in the intertidal zone, coinciding with a new moon. The tide height was 1.7 m at 2250 h (high tide recorded at 1.9 m at 2126 h). The female and male sea kraits were distinguished by differences in their body size. During 40 min of observation, one male individual was seen lying above the female, posturing its body over the female, while both individuals were seen flicking their tongues (Fig.1). The female was constantly moving her upper body, especially her head, circling the area. The other male was entangled with the female's body and remained motionless near the tail of the female. The site of observation was a wave-washed rocky recess located along the seaward extension of the coastal cliff ridge, where the sandy beach gradually disappears into a narrow, rocky shoreline. The snakes were found within a concave, pocket-like hollow on the cliff's lower section, partially enclosed by jagged rock faces. This depression acts as a natural trap for floating debris, including driftwood, coconut husks, shell fragments, and marine waste delivered by incoming tides and wave action. Our observations from Kamorta Island indicate variation in the mating season of *L. colubrina*, with mating occurring earlier in the season (May), compared to Andaman Island populations, where mating was reported from September–December (Tyabji et al. 2018. J. Threat. Taxa 10:43–50; Sivapushanam et al. 2023. Reptiles Amphib. 30:e18979).

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FIG. 1. Two male (blue) and a single female (pink) *L. colubrina* comprising a mating aggregation on Kamorta Island.

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***LEPTODEIRA ANNULATA* (Banded Cat-eyed Snake). DIET.** *Leptodeira annulata* is a nocturnal and arboreal snake that inhabits a variety of habitats across Central and South America, ranging from southern Mexico to northern Argentina (Nogueira et al. 2019. S. Am. J. Herpetol. 14:1–274). Predation by *L. annulata* often involves maintaining its grip while secreting venom. This venom effectively disrupts the amphibian central nervous system, reducing movement and leading to paralysis and death (Torres-Bonilla et al. 2016. Toxicon 119:345–351). The snake holds firm throughout, ensuring the prey is fully subdued before consumption. Previous literature highlights the primarily anuran diet of *L. annulata*, particularly the consumption of Pristimantinae, Bufonidae, Phyllomedusidae and Leptodactylidae (Jiménez-Bolaño et al. 2024. Rev. Latinoam. Herpetol. 7:54–65).

At 1900 h on 23 October 2024, within the protected land of Hoja Nueva along the Las Piedras River, Madre de Dios, Peru (12.05459°S, 69.53355°W; WGS 84), we observed an adult *L. annulata* in the leaf litter biting and firmly holding on to the posterior limb of an adult *Leptodactylus didymus* (Madre de Dios Thin-toed Frog) (Fig. 1). We observed the interaction for ca. 10 min. During the predation event, distress calls were issued by the *L. didymus*. Although we did not view the conclusion of the interaction, the *L. didymus* was within the size range of frogs successfully ingested by *L. annulata*. Due to the distribution and

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FIG. 1. An adult *Leptodeira annulata* preying on *Leptodactylus didymus* in Madre de Dios, Peru.

abundance of *L. didymus*, it is likely a large contributor to the diet of *L. annulata* in this region.

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***LEPTOPHIS MARGINATUS* (Parrot Snake). FORAGING BEHAVIOR.** Artificial refugia have become increasingly popular in conservation efforts, being implemented in response to habitat destruction (Watchorn 2022. Front. Ecol. Environ. 20:301–309). In addition to being an effective conservation strategy, PVC pipes as artificial refugia are an efficient sampling method for hylid frog species (Campbell 2010. Florida Sci. 73:78–88). Refugia passively attract hylid frogs by mimicking the natural cavities they utilize as diurnal shelters (Hoffmann 2009. Herpetol. Rev. 34:68–69). In Paraguay, this methodology has been used in a study of *Scinax nasicus* (Caballero-Gini 2021. Wetl. Conserv. Restor. 41–63). However, no predation events were recorded. Here, we report a case of predation of a hylid frog, *S. nasicus* (Lesser-snouted Tree Frog), by a *Leptophis marginatus* from a PVC pipe refugia set up

PHOTO BY OLIVIA ATLAS FLORES



FIG. 1. A *Leptophis marginatus* perched on artificial pipe refugia, holding a *Scinax nasicus* in its mouth, in the Ñeembucú Wetlands Complex, Paraguay.

at Estancia Santa Ana, in the Ñeembucú Wetlands Complex, Paraguay (26.8445°S, 58.0356°W; WGS 84).

At 1222 h on 1 August 2025, we observed a *L. marginatus* removing a *S. nasicus* from an artificial pipe refugia (Fig. 1). The snake was perched across the top of the six PVC pipes with its head in the pipe on the far right (5 cm wide, 60 cm long). Within 2 min, the snake removed its head, holding onto the hind legs of the frog. Over the next 15 min, the snake moved across the pipes while holding the frog and then retreated up the adjacent tree with the frog secured in its mouth.

To our knowledge, this is the first reported use of pipe refugia for foraging by a snake. *Leptophis marginatus* is a recognized predator of *S. nasicus,* with dietary analysis of 21 specimens of *L. marginatus* indicating that hylid frogs constitute the majority of prey items and *S. nasicus* accounting for 18.75% of identified remains (Lopez 2003. Herpetol. Rev. 68:75). Since the predation event, no *S. nasicus* have been observed at the same study site, suggesting that repeated predation could be occurring or the event altered frog occupancy behavior.

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***MASTICOPHIS BILINEATUS* (Sonoran Whipsnake) and *SONORA SEMIANNULATA* (Western Groundsnake). DIET and PREDATION.** *Masticophis bilineatus* is a diurnal, fast-moving, semiarboreal snake widely distributed across the Sonoran Desert of the USA and Mexico, where it occupies a variety of habitats ranging from Upland Sonoran Desertscrub to Madrean Evergreen Woodland (Brennan and Holycross 2006. A Field Guide to Amphibians and Reptiles in Arizona. Arizona Game and Fish Department, Phoenix, Arizona. 150 pp.; Jones and Sullivan 2020. *In* Holycross and Mitchell [eds.], Snakes of Arizona, pp. 240–251. ECO Publishing, Rodeo, New Mexico). It is known to prey upon lizards, snakes, frogs, birds, and mammals (Jones and Sullivan 2020, *op. cit.*). Snakes recorded in the diet of *M. bilineatus* include *Crotalus atrox* (Jones and Sullivan 2020, *op. cit.*), *Crotalus molossus* (Enderson 1999. Sonoran Herpetol. 12:72–73), *Crotalus scutulatus* (Klauber 1972. Rattlesnakes: Their Habits, Life Histories, and Influence on Mankind. Second Edition. University of California Press, Berkeley. 1533 pp.), *Masticophis flagellum* (Jones et al. 2013. Herpetol. Rev. 44:518), *Salvadora hexalepis* (Stitt 2003. Herpetol. Rev. 34:375–376), *Oxybelis microphthalmus* (Cowles 2018. Herpetol. Rev. 49:345–346), and *Thamnophis cyrtopsis* (Jones and Sullivan 2020, *op. cit.*). Here, we report an additional snake prey item for *M. bilineatus*.



Fig. 1. Road-killed *Masticophis bilineatus* from Arizona, USA, with *Sonora semiannulata* protruding from its stomach.

On 28 September 2018, we discovered a road-killed adult *M. bilineatus* (832 mm SVL, 1237 mm total length) on Indian Route 8, Graham County, Arizona, USA (33.38885°N, 110.27291°W; WGS 84). Partially protruding from the body of the *M. bilineatus* was an adult *Sonora semiannulata* (199 mm SVL, 256 mm total length; Fig. 1), which had been consumed head-first. Further examination of the *M. bilineatus* revealed no additional prey items. This is the first record of *S. semiannulata* in the diet of *M. bilineatus*, though the closely related *Masticophis taeniatus* (Striped Whipsnake) is also known to prey upon *S. seminannulata* (Camper and Dixon 2000. Texas J. Sci. 52:83–92).

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***MICRURUS HEMPRICHII* (Hemprich's Coral Snake). PREDATION.** Species of the *Micrurus hemprichii* group are readily distinguished from other congeners by the presence of a single cloacal plate, which is divided in all other *Micrurus* species, and by a distinctive color pattern consisting of five to ten black or gray triads separated by brownish or orange-yellow rings (Roze 1996. Coral Snakes of the Americas: Biology, Identification, and Venoms. Krieger Publishing Co., Malabar, Florida. 328 pp.; Campbell and Lamar 2004. Venomous Reptiles of the Western Hemisphere. Cornell University Press, Ithaca, New York. 870 pp.). Spiders are among the most abundant predators in terrestrial ecosystems and exhibit a wide range of foraging strategies. In a recent global review of spider–snake predation events, Nyffeler



Fig. 1. Predation of *Micrurus hemprichii* by *Acanthoscurria simoensi* observed on the forest floor in a non-riparian plot of the RAPELD system at the Universidade Federal do Amazonas (UFAM), Manaus, Amazonas, Brazil.

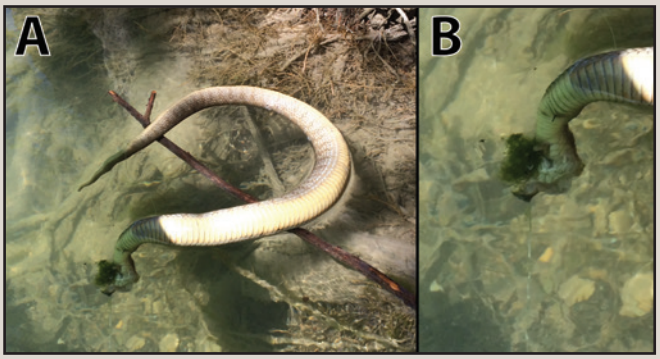
and Gibbons (2021. J. Arachnology 49:1–27) documented more than 300 interactions, but only three involved species of *Micrurus*, including two records attributed to Theraphosidae and one to Theridiidae. Within Theraphosidae, predation on snakes by spiders of the genus *Acanthoscurria* has been reported only twice (Nyffeler and Gibbons 2021, *op. cit.*).

At 0830 h on 15 December 2025, one of us (SSB) observed a large theraphosid spider (*Acanthoscurria simoensi*) preying upon an adult *Micrurus hemprichii* in a non-riparian forest plot (PNR_2) of the RAPELD monitoring system at the Universidade Federal do Amazonas (UFAM) campus, Manaus, Amazonas, Brazil. The event occurred on the forest floor, where the spider had already subdued the snake and was holding it with the chelicerae while anchoring the snake's body with its legs. The snake showed no signs of movement at the time of observation. No voucher specimen was collected.

Theraphosid spiders are typically nocturnal, but adult males are often active during daylight hours, particularly during the reproductive period (Pérez-Miles et al. 2005. J. Nat. Hist. 39:483–498). Although primarily invertebrate predators, large theraphosids are capable of subduing small vertebrates, including amphibians, mammals, lizards, and snakes (Nyffeler and Gibbons 2022. J. Arachnol. 50:121–134). More than 30 cases of snake predation by theraphosid spiders have been reported to date (Nyffeler and Gibbons 2021, *op. cit.*), and the present observation represents an additional record of predation on *Micrurus* by Theraphosidae, the first involving *Micrurus hemprichii*, and the third documented instance of snake predation by spiders of the genus *Acanthoscurria*.

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***NERODIA ERYTHROGASTER* (Plain-bellied Watersnake). MORTALITY.** The effect and prevalence of ingested fishhooks has been examined in some reptiles, such as turtles (Steen et al. 2014. PLoS ONE 9:e91368; Work et al. 2015. Dis. Aquat. Org. 115:103–115), but few studies specifically examining snakes exist. Although reports of snakes ingesting foreign objects are common (Jacobson et al. 1980. Vet. Med. Small Anim. Clin. 5:879–880; Zwart et al. 1986. Tijdschrift voor Diergeneeskunde 111:925–927; Souza et al. 2004. J. Herpetol. Med. Surg. 14:4–5; Scott et al. 2021. J. Am. Vet. Med. Assoc. 258:1135–1141), reports of snakes ingesting fishhooks are sparse. Reported instances of snakes ingesting a fishhook include *Sistrurus catenatus* (Eastern Massasauga; Gilbert et al. 2015. Herpetol. Rev. 46:107), *Nerodia rhombifer* (Diamond-backed Watersnake; Kofron 1978. J. Herpetol. 12:543–554), and *Xenochrophis piscator* (Checkered Keelback; Nath et al. 2011. Indian J. Vet. Surg. 32:154), and none of these instances were reported as fatal. A *Pantherophis* sp. (North American Ratsnake) was reportedly admitted to a wildlife center in Virginia, USA, with either a swallowed or implanted fishhook, but the fate of this snake is unknown (Brown and Sleeman 2002. J. Wildl. Dis. 38:699–755). In reported cases of snakes ingesting foreign objects, it is often believed that the snake mistook the object as a food source or did not recognize the object's presence when consuming a perceived food item (Souza et al. 2004, *op. cit.*). Here, we report mortality in an adult *Nerodia erythrogaster* that was likely caused by ingestion of a fishhook.



PHOTOS BY GERARD T. SALMON

FIG. 1. Adult *Nerodia erythrogaster* found deceased in Kendall County, Texas, USA, with a fishhook attached to a tangled fishing line visibly protruding through ventral scales: A) full-body view; B) magnified anterior view.

At 1044 h on 17 July 2016, GTS, Gary Heyroth, and Jeff Heyroth observed a deceased adult *N. erythrogaster* floating belly-up on the edge of the Guadalupe River, ca. 0.1 km downstream from FM 1376 bridge, Kendall County, Texas, USA (29.95746°N, 98.71635°W; WGS 84). The snake was bloated and estimated to have died >2 d prior to the observation. A fishing hook, connected to a tangled fishing line, was visibly protruding from a ventral scale in the anterior region of the snake. We believe that the *N. erythrogaster* attempted to swallow bait that had been attached to the hook, leading to it being impaled. The combination of the ingested hook and the tangled fishing line attached to the hook likely resulted in this snake drowning. To the best of our knowledge, this is the first reported observation of snake mortality due to ingestion of a fishhook, but we believe this situation is more common than the number of reported observations suggests.

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***OOCATOCHUS RUFODORSATUS* (Frog-eating Rat Snake). PREDATION.** *Oocatochus rufodorsatus* is a widely distributed colubrid in East Asia, typically inhabiting riparian environments such as rivers and reservoirs. It mainly preys on fishes, frogs, tadpoles, and occasionally *Eremias argus* (Mongolian Racerunner) (Li et al. 2021. The IUCN Red List of Threatened Species 2025:e.T177427A1485422). Although predatory behaviors of *O. rufodorsatus* have been frequently documented, cases of this species being preyed upon are rarely reported.

At 1109 h on 14 November 2025, a *Lanius bucephalus* (Bull-headed Shrike) was observed holding a snake in its bill in Wangjing-myeon, Yeoncheon-gun, Gyeonggi Province, South Korea (38.10572°N, 127.00159°E; WGS 84). The observation site, known as "Pyeonghwa Farmland," is an artificially created wetland-type agricultural area located within the Civilian Control Zone (CCZ), which was established for the conservation of migratory and protected bird species. The snake captured by the shrike was identified as a juvenile *O. rufodorsatus* (Fig. 1). The



FIG. 1. A Bull-headed Shrike (*Lanius bucephalus*) eating a young *Oocatochus rufodorsatus* in Gyeonggi Province, South Korea.

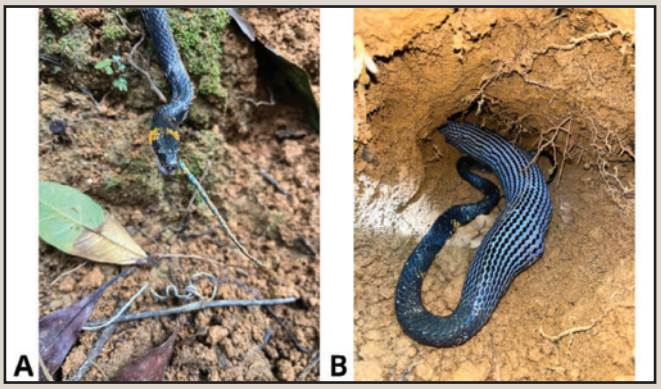


FIG. 1. A) *Oxyrhopus melanogenys* preying on an *Ameiva ameiva* from Parque Nacional Montanhas do Tumucumaque, Municipality of Pedra Branca do Amapari, Brazil; B) *Oxyrhopus melanogenys* partially concealed inside a small subterranean cavity.

shrike was seen holding the snake by its head, while the snake was still alive and resisting by coiling its body around a branch. Considering the well-known behavior of shrikes impaling or fixing prey on twigs before consumption (Valera et al. 2001. Behaviour 138:1421–1436), the capture of this *O. rufodorsatus* individual likely occurred immediately before the observation (Chang et al. 2025. Herpetol. Bull. 172:27–28). Although the actual predation event was not observed, snakes are among the principal prey items of the Bull-headed Shrike, suggesting that the captured *O. rufodorsatus* was likely utilized as food (Tanaka and Mori 2000. Curr. Herpetol. 19:97–111). This record represents a rare example of predation on *O. rufodorsatus* and provides useful insight into both the predator–prey relationship involving this species and the feeding ecology of the Bull-headed Shrike.

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***OXYRHOPUS MELANOGENYS* (Black-headed Calico Snake). DIET.** Snakes of the subfamily Pseudoboinae tend to feed primarily on lizards and small mammals; however, this behavior may vary depending on the species' microhabitat and ontogeny (Alencar et al. 2013. S. Am. J. Herpetol. 8:60–66). *Oxyrhopus melanogenys* (Tschudi 1845) is a nocturnal, semi-fossorial species frequently found near moist habitats in the Amazon region. It is considered a dietary generalist, showing a slight predilection for lizards but also consumes small and medium-sized rodents and frogs (Gaiarsa et al. 2013. Pap. Avulsos Zool. 53:261–283). Herein, we report a novel predation event involving this species preying on a lizard in the eastern Brazilian Amazon.

On 6 May 2025, at 1200 h, during a sunny day expedition in the Parque Nacional Montanhas do Tumucumaque (1.24242°N, 52.46114°W; WGS 84), Municipality of Pedra Branca do Amapari, Brazil, we observed an adult *O. melanogenys* preying on an *Ameiva ameiva*. The snake was found buried inside a small underground cavity (Fig. 1B) and was completing ingestion of the lizard, as only the lizard's tail was visible protruding from the snake's mouth (Fig. 1A). We left the specimen in situ.

To our knowledge, this is the first observation of *O. melanogenys* preying on *A. ameiva*. There are other records of lizards from the genera *Ameiva* and *Gonatodes* being preyed upon by *O. melanogenys*, as well as a recent report of predation of *Tretioscincus agilis* (Silva 2024. Bol. Mus. Paraense Emilio Goeldi – Cien. Natu. 19). Our observation provides further evidence that *Oxyrhopus melanogenys* is capable of ingesting relatively large prey in proportion to its body size, which enables a broad prey spectrum in its diet (Crnobrna et al. 2017. Salamandra. 53:126–130).

We thank ICMBio for granting us permission to enter the Parque Nacional Montanhas do Tumucumaque and to conduct expeditions.

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***PORTHIDIUM YUCATANICUM* (Yucatán Hognose Viper). MAXIMUM SIZE and REPRODUCTION.** *Porthidium yucatanicum* is a viperid endemic to the northern part of the Yucatán Peninsula, Mexico (Lee 1996. The Amphibians and Reptiles of the Yucatán Peninsula. Cornell University Press, Ithaca, New York. 500 pp.). The species shows sexual dimorphism, with mature males being smaller than females (368 vs. 462 mm mean SVL) (McCoy and Censky 1992. *In* Campbell and Brodie [eds.], Biology of the



PHOTO BY JOSÉ ROGELIO CEDEÑO VÁZQUEZ

FIG. 1. Adult gravid female *Porthidium yucatanicum* found in the vicinity of Dzibalchén, Municipality of Hopelchén, Campeche, Mexico.

Pitvipers, pp. 217–222. Selva Publishing, Tyler, Texas). It is a viviparous species of terrestrial and mainly nocturnal habits and can be found with relative ease in thorny forests, tropical deciduous forests, tropical evergreen forests, and xerophytic shrub vegetation (Campbell and Lamar 1989. The Venomous Reptiles of Latin America. Cornell University Press, Ithaca, New York. 425 pp.; Lee 1996, *op. cit.*). Copulation probably occurs between January and February and gestation between June and August, with four to ten offspring in a litter (McCoy and Censky 1992, *op. cit.*). Herein, we provide new data on the size and reproduction of *P. yucatanicum*.

On 14 February 1999, an adult gravid female *Porthidium yucatanicum* was collected by Alejandro Tuz Novelo in the vicinity of Dzibalchén, Municipality of Hopelchén, Campeche, Mexico (19.46361°N, 89.72500°W; WGS 84; Calderon et al. 2003. Herpetol. Rev. 34:269–272) and deposited in the herpetological collection (reptiles) (Record number: QNR.RE.034.0697; ECO-CH-H 1209) of the Museo de Zoología of El Colegio de la Frontera Sur. The specimen had an SVL of 517 mm and a total length of 585 mm (Fig. 1). Heimes (2016. Herpetofauna Mexicana Vol. I. Snakes of Mexico. Edition Chimaira, Frankfurt am Main, Germany. 572 pp.) reports that *P. yucatanicum* may attain total lengths up to 600 mm, yet we are unaware of the source of this measurement. Thus, our specimen may represent the maximum documented size for *P. yucatanicum*. In addition, our specimen contained 14 oviducal eggs, with a size of 9.82–14.00 mm (mean = 12.39 ± 1.25 SD) × 13.95–20.15 mm (mean = 17.19 ± 1.95 SD), which represents the maximum litter size reported for this species.

We are grateful to Comisión Nacional para el Conocimiento y Uso de la Biodiversidad for the financial support to conduct the research project "Inventario y monitoreo de anfibios, reptiles y mariposas de la Reserva de Calakmul, Campeche", from which this note is derived. The collection permit was issued by Dirección General de Vida Silvestre, Instituto Nacional de Ecología of the Secretaría de Medio Ambiente Recursos Naturales y Pesca of Mexico (Oficio No. DOO 750-12028/98).

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***PROTOBOTHROPS MUCROSQUAMATUS* (Brown Spotted Pitviper). DIET.** *Protobothrops mucrosquamatus* (Cantor 1839) is a venomous viper distributed across South and Southeast Asia. Its range includes Bangladesh, India (Assam, Mizoram, Arunachal Pradesh, Nagaland, and other regions), and Myanmar. It also occurs in northern and central Vietnam, Laos, Thailand, southern China, and Taiwan (Uetz et al. [eds] 2025. The Reptile Database. https://reptile-database.reptarium.cz; 30 Sept 2025). The diet of *P. mucrosquamatus* is diverse and includes amphibians, mammals (*Rattus* sp., Soricidae, newborn squirrels), birds, and reptiles such as snakes (*Amphiesma* sp., *Dinodon* sp.) (Orlov et al. 2002. *In* Schuett et al. [eds.], Biology of the Vipers, pp. 345–359. Eagle Mountain Publishing, Eagle Mountain, Utah). However, information on the feeding ecology of this species remains limited, particularly from field-based observations in northeastern India (Mao et al. 2025. Front. Amphib. Reptile Sci. 3:1609575).



FIG. 1. A shrew (*Suncus* sp.) extracted from the gut of a *Protobothrops mucrosquamatus* from Tamdil forest, Saitual District, Mizoram, northeastern India.

On 27 January 2024, at 0900 h, an adult male *P. mucrosquamatus* (90 cm total length; 140 g) was observed in a semi-natural garden patch adjacent to a rural cottage within the Tamdil National Wetland area, Saitual District, Mizoram, northeastern India (23.73755°N, 92.95169°E; WGS 84; 715 m elev.). The snake appeared to have a distended belly, suggesting recent feeding. It was transferred to a glass terrarium for temporary observation. Two days later, the specimen was found dead and was subsequently dissected for research purposes. Examination of the gut contents revealed a shrew (*Suncus* sp.; 14.0 cm SVL; 6.5 cm tail length) as prey (Fig. 1). The shrew was identified using morphological characters such as greyish-brown coloration, a short thick tail with bristles, small ears, and a long, pointed, beak-like snout with sharp teeth (Menon 2003. A Field Guide to Indian Mammals. Dorling Kindersley Pvt. Ltd., New Delhi, India. 200 pp.).

This observation represents a novel prey record for *P. mucrosquamatus*. Our findings contribute to the understanding of the feeding ecology of this species and emphasize the importance of field-based natural history observations for expanding knowledge of predator-prey interactions in northeastern India. This study was conducted under permit No. B. 19060/1/2024 CWLW/225 issued by the Chief Wildlife Warden, Environment, Forest and Climate Change Department, Government of Mizoram, India.

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***RHABDOPHIS HELLERI* (Heller's Keelback). ENDOPARASITISM.** *Rhabdophis helleri* is a mildly venomous colubrid with a distribution extending across Nepal, Bhutan, northeastern India (including Sikkim, Assam, Meghalaya, Mizoram, and Nagaland), Bangladesh, Myanmar, southern and central China, northern Vietnam, northern Laos, and extreme northern Thailand (David and Vogel 2021. Taprobanica 10:89–120). While gastrointestinal helminths have been reported in snakes from various regions (Akhila et al. 2018 Ann. Parasitol. 64:129–135), there are no published records of endoparasites in *R. helleri*.

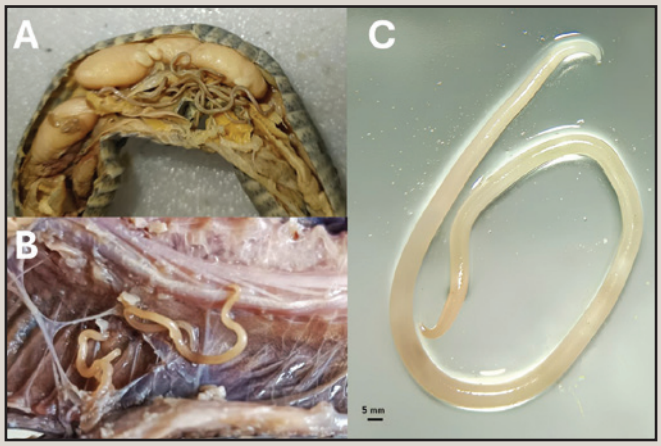


FIG. 1. A) Nematodes recovered from the lower small intestine of a *Rhabdophis helleri*; B) nematode attached to the intestinal mucosa; C) morphology of nematode observed under stereomicroscope: slender, cylindrical, slightly broad anterior end with faintly visible three lips, tapered posterior end, smooth cuticle with faint annulations.



PHOTO BY JIHO PARK

FIG. 1. Juvenile *Rhabdophis lateralis* preying upon adult *Bufo stejnegeri* hind limbs first in Seoraksan National Park, Republic of Korea.

At 1015 h on 8 April 2025, a gravid road-killed adult female *R. helleri* (47.3 cm SVL, 12.8 cm tail length, 54 g) was found near Tanhril, Aizawl District, Mizoram, India (23.73947°N, 92.66359°E; WGS 84; 785 m elev.). During dissection, six nematodes measuring 5–8 cm in length were recovered from the lower small intestine. Some were unattached in the intestinal lumen, while others were embedded in and attached to the mucosal lining (Fig. 1A, B). Nematodes were slender, elongated, and cylindrical with a slightly broad anterior end. Three lips were faintly visible under the stereomicroscope, and the posterior end tapered. The cuticle appeared smooth with faint annulations along the body (Fig. 1C). Based on visible morphological characteristics observed under stereomicroscope, the nematodes were identified as *Ophidascaris* species (Suwanti et al. 2018. Vet. World 11:1159–1163; Putri et al. 2024. J. Parasite Sci. 8:27–30). To the best of our knowledge, this constitutes the first record of *Ophidascaris* sp. nematode parasitism in *R. helleri*. The snake specimen is deposited in the Museum of Zoology, Mizoram University (MZMU 3721).

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***RHABDOPHIS LATERALIS* (Korean Tiger Keelback). DIET.** *Rhabdophis lateralis*, considered by some authorities to be a subspecies of *R. tigrinus*, is a medium sized colubrid distributed across the Korean peninsula, China, and far east Russia (Cai et al. 2006. Comp. Biochem. Physiol. A. Mol. Integr. Physiol. 147:57–63; Takeuchi et al. 2014. Curr. Herpetol. 33:148–153; Komori et al. 2017. Toxins 9:373). It has a generalist diet and feeds on many vertebrate taxa including mammals, amphibians, and reptiles but prefers amphibians as prey (Mori 2006. Can. J. Zool. 84:954–963; Choi et al. 2022. J. Asia. Pac. Biodivers. 15:495–499). As an active predator, *R. lateralis* seeks its prey during daytime by sight and subdues prey using the venom from its duvernoy's gland (Weinstein 2017. *In* Brent et al. [eds.], Critical Care Toxicology, pp. 1–41. Springer, Cham, Switzerland; Komori et al. 2017, *op. cit.*). Because this species lacks a specialized venom storage organ and possesses non-grooved fangs, repeated biting occurs throughout prey consumption to ensure envenomation (Komori et al. 2017, *op. cit.*).

At 1245 h on 31 May 2025, in Seoraksan National Park, Republic of Korea (38.07522°N, 128.38214°E; WGS 84; 590 m elev.), we observed a juvenile *R. lateralis* preying on an adult *Bufo stejnegeri* (Water Toad). *Bufo stejnegeri* is a poisonous small toad species inhabiting mountainous stream areas of the Korean peninsula and northeastern China (Lee and Park 2009. Zool. Stud. 48:334–332; Fong et al. 2020. Front. Ecol. Evol 7:523). This event occurred along a stream 3-5 m wide with a depth of around 1 m, which is the typical breeding site of *B. stejnegeri* (Lee and Park 2009, *op. cit.*). Weather conditions were clear, and the ambient temperature was 25°C. At first, the snake bit the midbody of its prey, with continuous biting action possibly intended for envenomation. After 16 min, the *R. lateralis* moved its head toward the hindlimbs and started swallowing the prey. At 18 min after the initial bite, the *R. lateralis* repositioned its head toward the prey's hindlimbs and began ingestion (Fig. 1). Consumption was completed after 22 min, thus taking ca. 6 min from the onset of ingestion. This hind-first swallowing behavior is commonly reported in its close relative, *R. tigrinus* (Mori 2006, *op. cit.*). After consumption, the snake remained stationary on a rock for 3 min before moving away. The prey remained alive and exhibited limb movements throughout most of the predation event. After the feeding event, we captured the snake, recovered the prey by forced regurgitation, and recorded measurements (*R. lateralis*: 421 mm SVL, 107 g; *B. stejnegeri*: 47.6 mm SVL, 38.7 g). To our knowledge, this is the first documented case of predation by *R. tigrinus* on *B. stejnegeri*, which could be helpful to understand the prey-predator relationship of the species. This research was supported by the Korea National Park Research Institute (NPRI 2025-03).

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***SINOMICRURUS NIGRIVENTER* (Black-bellied Coral Snake). THANATOSIS.** Thanatosis, or death feigning behavior, is documented in several snake species (Gehlbach 1970. Herpetologica 26:24–34; Pandey et al. 2022. Entomol. Ornithol. Herpetol. 11:292; Jones et al. 2024. Rept. Amphib. 31:e21459). Among coral snakes



FIG. 1. *Sinomicrurus nigriventer* from Uttarakhand, India, exhibiting thanatosis.

(Elapidae), such behavior is rarely observed and only occasionally reported (Moore et al. 2020. Integr. Org. Biol. 2:obaa006; Magallón et al. 2021. Rept. Amphib. 28:389–396). *Sinomicrurus nigriventer* is a cryptic and rarely observed elapid that is distributed patchily in the northwestern Himalayan region of India (Kumar et al. 2021. J. Threat. Taxa 13:18939–18942). Formerly treated as a variety of *S. macclellandi*, it is now recognized as a distinct species based on morphological and molecular evidence (Mirza et al. 2020. Zootaxa 4821:105–120). Here, we document the first report of thanatosis in *S. nigriventer*.

During a nocturnal trip in Pauri, Uttarakhand, India (30.1480°N, 78.7761°E; WGS 84; 1637 m elev.), an individual *S. nigriventer* was encountered on a paved road at 2230 h on 10 June 2024. The snake was spotted at the middle of a road passing through a coniferous-mixed forest comprising trees such as *Cedrus deodara*, *Pinus roxburghii*, and *Quercus* sp. The forest also has scattered village houses. When we approached to identify the snake, it immediately exhibited thanatosis. The body of the snake became limp, and the snake remained uncoiled and motionless for ca. 3–4 min (Fig. 1). After this period of immobility, the snake revived and actively attempted to flee from the location. The specific posture of immobility suggests variability in defensive strategy within the genus. Thanatosis is observed across major snake taxa including elapids (e.g. *Naja haje* and *Micrurus* spp.) (Azevedo 1960. Zool. 14:1–13; Gehlbach 1970, op. cit.; Almeida et al. 2016. *In* Silva Jr [ed], As Cobras-Corais do Brasil: Biologia, Taxonomia e Envenenamentos, pp. 168–215. PUC Goiás, Goiania, Brazil; Gonzalez and de Oliveira 2020. Herpetol. Notes 13:603–606). This observation in *S. nigriventer* aligns with similar anti-predator strategies documented in other elapid snake taxa. Observing this species in a urban setting also highlights the species' apparent tolerance of modified landscapes, challenging assumptions about its strictly forest-dwelling habits (Whitaker and Captain 2004. Snakes of India. The Field Guide. Draco Books, Chengalpat, India. 370 pp.).

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***THAMNOPHIS SIRTALIS* (Common Gartersnake) and *THAMNOPHIS PROXIMUS* (Western Ribbonsnake). CONSUMPTION OF NOXIOUS PREY.** Some amphibians have evolved toxins to combat predators, and predators of toxic amphibians such as some snakes have countered with increased toxin resistance, often resulting in an 'arms race' between predator and prey (Brodie and Brodie 1990. Evolution 44:651–659). A robust context of these co-evolutionary abilities requires revealing seldom-seen predator-prey interactions, examination of prey in predator stomach contents, and in particular, feeding trials (e.g., DiGiovanni and Brodie 1981. Herpetologica 37:234–237). Toxins can be deadly to predators, but in other cases, they are simply noxious (Brodie 1977. Copeia 1977:523–535).

Ambystomatid salamanders possess noxious skin toxins (granular gland secretions) in their tails that confer some protection against attacks by predators (Barach 1951. Herpetologica 7:58; Anderson 1964. Herpetologica 19:282–284; Brodie and Gibson 1969. Herpetologica 25:187–194; Howard 1971. American Zoologist 11:637; Brodie et al. 1979. Copeia 1979:270–274; DiGiovanni and Brodie 1981, *op. cit.*). However, experiments have demonstrated that the ability of *Ambystoma opacum* (Marbled Salamanders) to repel attacks was reduced after repeated attacks by a shrew (DiGiovanni and Brodie 1981, *op. cit.*). Herein, I serendipitously and opportunistically conducted two crude feeding experiments with syntopic *Thamnophis* spp. that were foraging in a dry pond depression used by breeding *A. opacum*.

Both experiments and observations occurred at Forest Community Park, a 47-ha suburban park in southeastern East Baton Rouge Parish, Louisiana, USA (30.42545°N, 91.02840°W; WGS 84; 15 m elev.). The park includes a small mature oak forest with three ephemeral ponds in which a large number of amphibians breed. The ponds typically begin filling in late October or November and are usually dry by late May (unpubl. data).

At ca. 1500 h on 22 October 1993, while monitoring the continued presence of female *A. opacum* on their eggs, mainly under logs, I noticed an adult (estimated 30 cm SVL) *T. sirtalis* moving slowly through the leaf litter in the dry pond bottom, approximately 8 m from me. At this moment I had turned a large log, revealing two *A. opacum* mothers on eggs as well as a male *A. opacum*. Knowing *A. opacum* can be noxious to vertebrates (DiGiovanni and Brodie 1981, *op. cit.*), I was curious as to the behavior of the snake when 'offered' a potentially noxious prey item. I quickly captured the male *A. opacum*, moved 1–2 m closer to the snake, and tossed the salamander towards the snake, the salamander landing about 30 cm from the snake's head. Although the snake noticed me, it immediately and quickly moved towards the salamander, grasped it, and swallowed it head-first, all of which occurred within about 1 min. The snake then began wiping each side of its mouth vigorously in the leaves and on vegetation, alternating which side it was wiping. The snake repeated this behavior for ca. 20 min and appeared uncomfortable, often opening and closing the mouth. Thereafter, the snake moved slowly away, and I did not see it again. I returned and searched the site the following day and did not see the snake or a (regurgitated) salamander.

At 1600 h on 4 November 1994, I was again looking for and monitoring nesting *A. opacum* when I chanced upon an adult *T. proximus* (35 cm SVL) foraging slowly in the dry pond bottom. I repeated the above experiment, but this time I had to search a few logs until I found another male *A. opacum*. As before, but from about 3 m, I tossed the salamander to the snake. It landed about 20 cm from the snake's head. As before, the snake immediately rushed the salamander, grasped it, and swallowed it head-first, which took ca. 3 min. During this time the salamander wagged its tail back and forth. In much the same manner as the *T. sirtalis*, the *T. proximus* spent the next ca. 15 min wiping its mouth vigorously

on the leaves and vegetation, also exhibiting gaping behavior. It appeared uncomfortable, wiping, gaping, and closing its mouth repeatedly. At that point I left the site but returned the following day and found no evidence of either the snake or a (regurgitated) salamander.

Although my crude experiments were anecdotal, my observations suggest that both snakes recognized *A. opacum* as prey, were able to easily consume them, and likely did not die from ingesting them, but they showed signs of discomfort after ingesting their prey (but see below).

Although the snakes seemed to recognize *A. opacum* as prey (they showed no hesitation in attacking and ingesting the prey), it is also possible that these snakes were naïve to *A. opacum*. These species of *Thamnophis* are mainly diurnal and *A. opacum* is strictly nocturnal (Rossman et al. 1996. The Garter Snakes. Evolution and Ecology. University of Oklahoma Press, Norman. 336 pp; D. Scott, pers. comm.). Garter snakes and particularly ribbon snakes occur in many habitats in south Louisiana, but *A. opacum* breeding sites are relatively uncommon. Yet, it is certainly possible that the snakes at the *A. opacum* breeding site have previously encountered the salamanders.

I could not find the snakes on the days following the predation events to confirm their fates, and though it is possible that the snakes crawled off and died nearby, their lack of hesitation to attack the salamanders suggests familiarity with a palatable prey item that is not dangerous to them. Furthermore, the effects of toxins from *A. opacum* would be expected to be sub-lethal based on our knowledge of the toxicity of the species (DiGiovanni and Brodie 1981, *op. cit.*). There was also no obvious evidence of delays in ingestion due to tail wagging, writhing, or toxin secretion (see Arnold 1982. Copeia 1982:247–253). There is a report that a juvenile cottonmouth (*Agkistrodon piscovorus*) regurgitated an *A. opacum* adult upon the snake's capture in Illinois, USA; however, the authors hypothesized that regurgitation was due to handling rather than the noxiousness of the prey item (Kuhns et al. 2018. Herpetol. Rev. 49:332–333).

The snakes' repeated wiping of their mouths for relatively long periods of time after feeding do suggest the prey items were distasteful. Garter snakes and water snakes (*Nerodia*) often gape and rub their labial scales against substrate after ingesting toxic frogs such as *Gastrophryne carolinensis*. These responses have been characterized as stereotyped distress behaviors in response to copious toxic secretions (Garton and Mushinsky 1979. Can. J. Zool. 57:1965–1973). However, head or labial rubbing and gaping can also occur in snakes after feeding on non-toxic prey. Several species of snakes, including *T. sirtalis*, exhibit these behaviors to remove mucus after feeding on earthworms (Cunningham and Burghardt 1999. Ethology 105:913–936). My observations may thus reflect behavior used to remove any sticky substance, regardless of toxins.

Although my observations were only semi-natural, they essentially reveal predator-prey relationships. Liner (1954. Louisiana Academy of Sciences 12:65–85) found two recently metamorphosed *A. opacum* inside the stomach of a *T. proximus* in Louisiana, and Hampton (2008. Southwestern Naturalist 53:115–118) palped an adult *A. opacum* from a *T. proximus* in Texas, USA. I could find only one published instance of *T. sirtalis* preying upon *A. opacum*: Brown (1979. Brimleyana 1:113–124) found one *A. opacum* in the stomach of *T. sirtalis* after examining 14 stomachs. *Thamnophis sirtalis* readily consumes salamanders, including *Ambystoma* (Carpenter 1952. Ecol. Monogr. 22:235–258). For example, Hamilton (1951) dissected 382 *T. sirtalis* from New York, finding stomach contents in 241 individuals, including two *A. maculatum*, and Vogt (1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Public Museum, Milwaukee. 205 pp.) reported *A. laterale* as prey of *T. sirtalis* but provided no details.

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***TRIMERESURUS ERYTHRURUS* (Red-tailed Bamboo Pit-viper). ENDOPARASITISM.** *Trimeresurus erythrurus* is a venomous species distributed across northeastern India (including Mizoram), Bangladesh, Myanmar, Bhutan, and Nepal, with additional records from peninsular India (Uetz et al. [eds.] 2025. The Reptile Database. https://reptile-database.reptarium.cz; 26 September 2025). Despite a wide distribution, there are no endoparasitic records for *T. erythrurus*.

In February 2025, two specimens of *T. erythrurus* were examined for endoparasitic infections. The specimens (MZMU 3673 and MZMU 3676) were collected from Mizoram University campus (23.73253°N, 92.66278°E; WGS 84; 826 m elev.) and are preserved in the Zoology Department Museum, Mizoram University. The snakes measured as follows: specimen MZMU 3673: 82 cm SVL, 14.5 cm tail length, 780 g; specimen MZMU 3676: 91 cm SVL, 16 cm tail length, 860 g. During dissection, 11 nematodes measuring 8–12 cm in length were recovered exclusively from the small intestine (Fig. 1A). The nematodes exhibited a robust cylindrical form with a thick cuticle, consistent with morphological features characteristic of *Ophidascaris* sp. (Fig. 1B) (Suwanti et al. 2018. Vet. World 11:1159–1163; Putri et al. 2024. J. Parasite Sci. 8:27–30). This represents the first record of nematode parasitism in *T. erythrurus*.

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FIG. 1. A) Nematodes recovered from the small intestine of *Trimeresurus erythrurus*; B) morphology under stereomicroscope: robust cylindrical body with thick cuticle.

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***VIPERA ASPIS HUGYI* (Southern Italian Asp Viper). DICEPHALISM.** Dicephalism (the presence of an axial bifurcation of two heads attached to the same body; Spadola and Insacco 2009. Acta Herpetol. 4:99–101), is a rare phenomenon in snakes (Pezdirc et al. 2013. Herpetozoa 26:94–95; Cavigioli et al. 2016.

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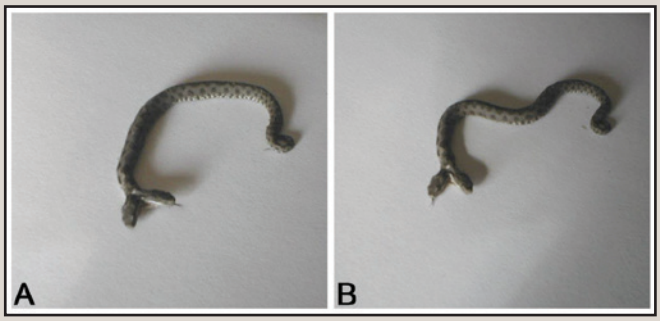


FIG. 1. Bicephalic *Vipera aspis hugyi*: A) Left head exhibiting tongue flicking; B) right head exhibiting tongue flicking.

Herpetozoa 29:85–86; Dewkota et al. 2020. Rept. Amphib. 26:226–229; Gvozdenović et al. 2022. Herpetol. Notes 14:649–651). Dicephalism may be due to several causes, such as incomplete division of a single embryo, partial fusion of two embryos, abnormally low or high temperature during incubation or gestation, regeneration after an embryonic lesion, anoxia during embryonic development, toxic effect of metabolic secretions during a prolonged sojourn in the oviduct, inbreeding depression from small population gene pools, hybridization, environmental pollution, chemical toxins in captivity, or exposure to radiation (Wallach 2007. Bull. Md. Herpetol. Soc. 43:57–95). This condition is most frequently observed in captivity (Wallach 2007, *op. cit.*), where the care of the owners prolongs survival. This condition is very rare in nature because of the low survival rate of two headed individuals (Devkota et al. 2020, *op. cit.*).

In the Palearctic genus *Vipera*, records of axial bifurcation are reported for four European species: *V. aspis, V. berus, V. ammodytes* and *V. ursinii*, with the most cases of dicephalism reported for *V. berus* due to the large range of this species (Wallach 2007, *op. cit.*; Cavigioli et al. 2016, *op. cit.*). Here we report the first photographic documentation of dicephalism in the subspecies *V. a. hugyi*. *Vipera a. hugyi* is endemic to southern Italy and the island of Montecristo (Zuffi and Bonnet 1999. Ital. J. Zool. 66:87–95), where it lives in a wide variety of habitats, such as coastal areas of Mediterranean scrub, clearings of beech and oak groves, stony ground, meadows, pastures, riverbeds, and marshy areas, up to a maximum altitude recorded of 1840 m asl (Di Nicola et al. 2021, Anfibi & Rettili d'Italia – Edizione aggiornata. Edizioni Belvedere, Latina, Italy. 576 pp).

On 28 August 2025, two photos and one video showing a living juvenile *V. a. hugyi* individual with two heads (Fig.1) were posted in the Facebook group "Identificazione Rettili d'Italia", in which one of the authors (IDHK) is an administrator. The animal was found in August 2002 basking on stony ground in a holm oak forest on the Tre Calli mountain in the Positano side, Agerola, Italy (ca. 40.62°N, 14.53°E; WGS 84). Since the quality of photos and videos is poor, the age and sex of the animal remain unknown; however, it appears not to be an animal of reproductive age. The two heads seem to separate from the rest of the body at the neck conjunction. It is unclear whether it had a dominant head, but the 58 second video shows an attempt from the left head (right head in frontal view) to dominate the right one.

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***VIPERA SEOANEI* (Iberian Adder). PREDATION.** *Felis silvestris* (European Wildcat) usually preys on small mammals but occasionally takes other vertebrates, including reptiles (Moleón and Gil-Sánchez 2003. J. Zool. 260:17–22). Reports of snakes in the diet are rare, and only one historic record exists of *V. seoanei* remains in wildcat scat from Lugo, Spain (Guitián and Bermejo 1989. Doñana, Acta Vertebr. 16:319–324).

On 6 September 2025, at 1905 h, we observed an adult male wildcat capturing a *V. seoanei* near Puerto de Leitariegos, León Province, Spain (42.9807°N, 6.4045°W; WGS 84; 1450 m elev.), close to the Asturian border. The cat was first seen in a semi-alpine meadow near burrows of a vole (*Arvicola* sp.). After several minutes, it pounced at the edge of the meadow (Fig. 1). Following ca. 1 min of struggle, the cat appeared with a snake in its jaws, dropped it to the ground, and delivered several rapid but cautious bites to the tail while maintaining a vigilant posture. Although the snake appeared dead, the cat manipulated it for ca. 5 min.

This appears to be the first direct observation of wildcat predation on *V. seoanei*. Previous work suggested mammalian predation on *V. seoanei* occurs mostly at night, while dorsal polymorphism of *V. seoanei* was linked to selection by diurnal raptors (Martínez-Freiría et al. 2017. Acta Oecol. 85:165–173). Our record indicates that diurnal predation by mammals also occurs, broadening the range of potential selective agents influencing antipredator traits in *V. seoanei*.

The observation was made together with Leyre Nieva Quesada. I thank Pablo Recio for revising the field notes and Max Benito, Luis Albero, and Pablo Recio for confirming the identification from photographs.

PHOTO BY J. GARCÍA-CAMPA



QFIG. 1. *Felis silvestris* (European Wildcat) preying on a *Vipera seoanei*: Top left) initial attack; Right) cat dropping the snake after holding it in its jaws, with a close-up of the adder.

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