NATURAL HISTORY NOTES

The Natural History Notes section is analogous to Geographic Distribution. Preferred notes should 1) focus on observations in the field, with little human intrusion; 2) represent more than the isolated documentation of developmental aberrations; and 3) possess a natural history perspective. Individual notes should, with few exceptions, concern only one species, and authors are requested to choose a keyword or short phrase that best describes the nature of their note (e.g., Reproduction, Morphology, Habitat, etc.). Use of figures to illustrate any data is encouraged but should replace words rather than embellish them. Articles submitted to this section will be reviewed and edited prior to acceptance.

Electronic submission of manuscripts is requested (as Microsoft Word or Rich Text format [rtf] files, as e-mail attachments). Figures can be submitted electronically as JPG, TIFF, or PDF files at a minimum resolution of 300 dpi. Please DO NOT send graphic files as imbedded figures within a text file. Additional information concerning preparation and submission of graphics files is available on the SSAR web site at: http://www.ssarherps.org/HRinfo.html. Manuscripts should be sent to the appropriate section editor: **Laine Giovanetto** (amphibians; lgiovanetto@ymail.com); **James Harding** (turtles; hardingj@msu.edu); **Mason J. Ryan** (crocodilians, lizards, and *Sphenodon*; MRyan@azgfd.gov); and **John D. Willson** or **Andrew M. Durso** (snakes; hr.snake.nhn@gmail.com).

A reference template for preparing Natural History Notes may be found here: ssarherps.org/ publications/herpetological-review/. Standard format for this section is as follows: SCIENTIFIC NAME in bold, capital letters; standard English name in parentheses with only first letter of each word capitalized (if available, for the United States and Canada as it appears in Crother [ed.] 2017. Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico, with Comments Regarding Confidence in Our Understanding, 8th ed. Herpetol. Circ. 43:1–102, available for download here: https://ssarherps.org/publications/); KEY WORD(S) referring to the content of the note in bold, capital letters; content reporting observations and data on the animal; place of deposition or intended deposition of specimen(s), and catalog number(s) if relevant. Then skip a line and close with author name(s) in bold, capital letters (give names and addresses in full—spell out state names—no abbreviations, e-mail address after each author name/address for those wishing to provide it—e-mail required for corresponding author). References may be briefly cited in text (refer to this issue or the online template for citation format and follow format precisely). One additional note about the names list (Crother 2017) developed and adopted by ASIH-HL-SSAR: the role of the list is to standardize English names and comment on the current scientific names. Scientific names are hypotheses (or at least represent them) and as such their usage should not be dictated by a list, society, or journal.

Recommended citation for notes appearing in this section is: Kelehear, C., and S. P. Graham. 2018. *Pseudoboa neuwiedii*: ectoparasite. Herpetol. Rev. 49:762–763.

CAUDATA — SALAMANDERS

***ANEIDES AENEUS* (Green Salamander). PREDATION.** Few predators have been reported for *Aneides aeneus* (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, D.C. 587 pp.). Pauley and Watson (2005. *In* Lannoo [ed.], Amphibian Declines: The Conservation Status of United States Species, pp. 656–658. University of California Press, Berkeley, California) reported *Diadophis punctatus* (Ring-necked Snake) and *Thamnophis sirtalis* (Common Gartersnake) as predators. Rossell et al. (2019. Amer. Midl. Nat. 181:40–52) reported 167 occurrences of at least 12 species of potential predators of either adult *Aneides* or their eggs during 2578 surveys of 74 rock outcrops containing *Aneides* in North Carolina, but predation was not directly observed.

On 14 June 2019, while monitoring a granitic outcrop known to be used as a breeding site by *A. aeneus* (DuPont State Recreational Forest, Henderson County, North Carolina, USA), one female *A. aeneus* was found ovipositing in a rock crevice. Two additional crevices on another portion of the same outcrop contained two gravid female *A. aeneus* each. When the site was checked again on 16 June 2019, the single female was attending her egg clutch, but of the two crevices containing salamanders on 14 June 2019, one was vacant and one contained a juvenile female *Pantherophis alleghaniensis* (Eastern Ratsnake: 416 mm SVL, 498 mm total length). The snake was collected, euthanized, and later dissected to reveal it had consumed two gravid female *A. aeneus* (Fig. 1). To our knowledge, this is the first documented record of predation on *A. aeneus* by *P. alleghaniensis*. Moreover,

Fig. 1. *Pantherophis alleghaniensis* and stomach contents consisting of two gravid female *Aneides aeneus*, Henderson County, North Carolina, USA.

while rat snakes are known to feed on a variety of anuran species (Ernst and Ernst. 2003. Snakes of the United States and Canada. Smithsonian Books, Washington, D.C. 668 pp.), this appears to be the first published record of a *Pantherophis* feeding on any salamander species. The crevice where the predation occurred was 53–64 cm above ground level, supporting the suggestion by Rossell et al. (2019, *op. cit.*) that brood crevices closer to the ground may be more susceptible to predation.

The specimens were collected under permit 19-ES0042 and are deposited in the herpetology collection of the North Carolina State Museum of Natural Sciences (NCSM 100950, 100951).

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BATRACHOSEPS ATTENUATUS **(California Slender Salamander). LEUCISM.** Albinism (absence of melanin including from the eyes) and leucism (the absence of body pigment but eyes normally pigmented) are not uncommon in some amphibian groups (Hensley 1959. Publ. Mus. Michigan State Univ., Biol. Ser. 1:133–159), but few instances of leucism have been reported for plethodontid salamanders. To my knowledge, leucism has not been reported with supporting documentation for any species in the plethodontid slender salamander genus *Batrachoseps*, a group of about 20 species in California, Oregon (USA), and Baja California (Mexico). Here I report an observation of an adult leucistic *B. attenuatus*, a widespread and abundant species that occurs north of about 36° latitude (Stebbins 2003. A Field Guide to Western Reptiles and Amphibians. Third edition. Houghton-Mifflin Company, Boston, Massachusetts. 560 pp.).

At ca. 1200 h on 3 March 2003, I found a leucistic *B. attenuatus* beneath a small granite boulder east of Monticello Dam in Putah Creek Canyon, Solano County, California, USA (38.51316°N, 122.10069°W; WGS 84; 59 m elev.). The salamander, an adult close to the maximum SVL of 4.7 cm reported for the species (Stebbins 2003, *op. cit.*), withdrew into a burrow beneath the boulder. I enlarged the burrow opening by hand to capture the animal. I photographed the salamander (Fig. 1), returned it to its burrow refuge, and carefully replaced the boulder. The salamander body color was pinkish white without any markings or other color variation, its eyes were fully pigmented, and it was quite active when disturbed. In 55 years of field work with amphibians and reptiles throughout California, including thousands of encounters with *B. attenuatus*, this was the only leucistic salamander of any species that I have observed. Leucism seemingly is maladaptive among animal species that rely at least in part on cryptic coloration to avoid detection, but the trait may have neutral adaptive value among highly secretive, fossorial species with limited surface activity, such as *B. attenuatus*. Neutral adaptive value might explain the trait's persistence in populations, and the population genetics of leucism in secretive, fossorial salamanders may warrant further investigation.

Fig. 1. Leucistic *Batrachoseps attenuatus* from Putah Creek canyon, Solano County, California, USA.

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GYRINOPHILUS PORPHYRITICUS **(Spring Salamander). DIET.** *Gyrinophilus porphyriticus* occurs in forested headwater streams, seepages, and springs throughout the Appalachian Highlands of eastern North America from southern Quebec in Canada to northern Alabama and northeastern Mississippi, USA (Beachy 2005. *In* Lannoo [ed.]. Amphibian Declines: The Conservation Status of United States Species, pp. 590–593. University of California Press, Berkeley, California). However, *G. porphyriticus* is also common in caves throughout much of the Appalachian and eastern Interior Low Plateau karst regions in the eastern United States (Niemiller and Miller 2009. Proc. 15th Int. Cong. Speleol.1:249–256; Miller and Niemiller 2011. *In* Niemiller and Reynolds [eds.] The Amphibians of Tennessee, pp. 178–181. University of Tennessee Press, Knoxville, Tennessee). *Gyrinophilus porphyriticus* is a generalist predator in surface habitats feeding on a variety of insects, crustaceans, annelids, gastropods, collembolans, diplopods, chilopods, arachnids, and salamanders (Bishop 1941. The Salamanders of New York. New York St. Mus. Bul. 324:1–365; Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, D.C. 587 pp.). In surface habitats of the southern Appalachians, there appears to be a shift from a more generalized diet of aquatic invertebrates and occasionally other salamander larvae as larvae to a more specialized diet of salamanders as adults after metamorphosis (Bruce 1979. Evol. 33:998–1000).

Reports on the diet of *G. porphyriticus* from subterranean habitats are few, with most reports from examination of stomach contents of larvae. Larvae are considered generalist predators in caves and are known to feed on earthworms, isopods, and

PHOTO BY MENDY THOMAS SWAIN

Fig. 1. An adult *Gyrinophilus porphyriticus* attempting to swallow an adult *Eurycea lucifuga* along a small pool in a cave in Union County, Tennessee, USA.

amphipods (MLN, unpubl. data; Culver 1973. Int. J. Speleol. 5:369–377; Culver 1975. Int. J. Speleol. 7:229–245; Osbourn 2005. M.S. Thesis, Marshall University, Huntington, West Virginia. 207 pp.). The most comprehensive study to date on the diet of adult *G. porphyriticus* in caves is by Osbourn (2005, *op. cit.*) from West Virginia; the most common prey in the stomach contents of 39 salamanders from three caves were annelid worms (over 95% of all prey items) but also included an ant, beetle larva, a mite, and shed skin. Other salamanders have not been reported from the diet of cave-dwelling *G. porphyriticus* to our knowledge.

Here we report on an adult *G. porphyriticus* feeding on an adult *Euryea lucifuga* (Cave Salamander) from a cave in the Appalachian karst region of northeastern Tennessee. Both *G. porphyriticus* and *E. lucifuga* are common inhabitants and considered top predators of the terrestrial cave communities throughout their respective ranges (Osbourn 2005, *op. cit.*; Niemiller and Miller 2009, *op. cit.*). On 11 May 2019, a metamorphosed *G. porphyriticus* ca. 15 cm total length was observed feeding on an adult *E. lucifuga* ca. 12.5 cm total length at the margin of a pool of a small stream within the dark zone of a cave located in Union County, Tennessee (Fig. 1). When first encountered, the *G. porphyriticus* already had grasped the *E. lucifuga* at the posterior margin of the tail and was violently shaking it from side to side. This continued for a couple of minutes until the *E. lucifuga* was incapacitated. The predation event was witnessed and photographed for several minutes as the *E. lucifuga* was slowly ingested tail first. *Eurycea lucifuga* is reported to practice tail autotomy to evade predation (Wake and Dresner 1967. J. Morphol. 122:265–306), but it is unknown why this particular individual did not autotomize its tail to escape predation. Given the propensity of *G. porphyriticus* to prey on salamanders in surface habitats, it seems likely that consumption of salamanders, including conspecifics, in subterranean habitats is a more widespread phenomenon than currently reported.

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PLETHODON CINEREUS **(Eastern Red-backed Salamander). HYPOMELANISM.** *Plethodon cinereus* is one of the most abundant vertebrate species in the North American forests in which it occurs (Burton and Likens 1975. Copeia 1975:541–546). Across its range, *P. cinereus* is known to exist in a variety of color morphs, the most well-known of which are the red-backed, lead-backed, and erythristic forms (Mitchel and Mazur 1998. Northeast. Nat. 5:367–369). In addition to the more frequently observed phenotypes, iridistic, albino, leucistic, amelanistic, and melanistic variants of *P. cinereus* have also been reported (Moore and Ouellet 2014. Can. Field-Nat. 128:250–259). This account describes the occurrence of a ninth, hypomelanistic color morph of *P. cinereus* in Rhode Island, USA.

At 2147 h on 1 May 2020, a single hypomelanistic *P. cinereus* was observed thrashing at the surface of a vernal pool in Kingston, Rhode Island, USA (41.47279°N, 71.52674°W; WGS 84; 60 m elev.), likely after falling into the pool from a nearby natural embankment. It was subsequently removed from the water, photographed (Fig. 1), and released on land. Numerous conspecifics displaying both red-backed and lead-backed coloration were moving about in the open that evening due to warm and rainy conditions and were thus included in the photographs for reference.

Fig. 1. Hypomelanistic *Plethodon cinereus* from Rhode Island, USA displaying uniform, partial reduction of skin pigmentation (top right), as compared to red-backed (top left) and lead-backed (bottom) conspecifics.

It is important to note that hypomelanism is an umbrella term referring to any reduction of the skin pigment melanin and can include the extreme cases of albinism and leucism, which differ from the partial reduction of pigment observed here (Grant 2017. Que. Nat. 55:22). This uniform but incomplete loss of melanin has been previously reported in the closely related *P. serratus* (Drake and O'Donnell 2014. Am. Midl. Nat. 171:172–177), but to the best of my knowledge has not been formally described in *P. cinereus.*

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PLETHODON CINEREUS **(Eastern Red-backed Salamander). LEUCISM.** *Plethodon cinereus* is abundant and widely distributed across eastern North America. The species has variable color phenotypes, including three common color morphs: red-backed, lead-backed, and erythristic, and five rare anomalous color phenotypes: iridistic, albino, leucistic, amelanistic, and melanistic. The main characteristics of these eight color phenotypes and their distributions across North America is reviewed by Moore and Ouellet (2014. Can. Field-Nat. 128:250–259). On 29 April 2020, an anomalously colored *P. cinereus* was found in Barn Island Wildlife Management Area, Wequetequock, Connecticut, USA (41.3404°N, 71.8649°W; WGS 84) with darkly pigmented irises and a translucent head and body. This is the first leucistic or partially leucistic *P. cinereus* reported from Connecticut. The head and body coloration was mostly translucent light pink with fine dark purple speckling (Fig. 1). An orange/red pigmented patch was present

Fig. 1. Leucistic adult *Plethodon cinereus* from Wequetequock, Connecticut, USA.

between costal grooves 1–5 and a dark purple pigmented patch between costal grooves 6–9. This individual was found under a *Quercus rubra* log, less than a meter from a well-travelled foot path. The immediate area is a deciduous forest (*Q. rubra*, *Q. alba*, *Acer rubrum*) with deep leaf litter and abundant woody debris. Approximately 60 additional red-backed or lead-backed morphs of *P. cinereus* were found in the park between 20 March and 3 May 2020; no other salamander species were found.

I thank David Wake and Elizabeth Jockusch for helpful comments.

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***URSPELERPES BRUCEI* (Patch-nosed Salamander). REPRODUCTION.** *Urspelerpes brucei* is a plethodontid salamander found in seeps and small streams in the foothills of the Blue Ridge Mountains in Georgia and South Carolina, USA (Camp et al. 2018. Herpetol. Conserv. Biol. 13:609–616). The species is remarkable for its small size, sexual color dimorphism, and miniscule known geographic range. *Urspelerpes brucei* was first found in 2007 and described in 2009 (Camp et al. 2009. J. Zool. 279:86–94); there is much to learn about this secretive species, particularly regarding its breeding habits.

Here, we report the first documented observation of *U. brucei* eggs in the wild. On 20 March 2020, we uncovered a female and two recently deposited eggs along a steep-walled, gravel-bottomed first-order stream in a mesic forest in Habersham County, Georgia, USA (exact location withheld due to conservation concerns). We discovered the female and eggs at the foot of a steep slope, in a location where water seeps out of the ground and into the stream. We uncovered the female by sifting through ca. 5 cm of leaf litter and simultaneously noticed the two eggs, which were barely submerged in the shallow water and individually affixed to a single piece of mica-schist gravel beside the female (Fig. 1). It is not clear whether these two eggs represented the entire clutch, but examination of three gravid females for the original description of the species revealed apparent clutch sizes from 6–14 (Camp et al. 2009, *op. cit.*); we made no effort to uncover more eggs or examine the female for unlaid eggs for fear of disturbing the situation. Although no nests have previously been observed in the field, the timing of our observation is consistent with the date of observation of the smallest larva documented by Camp et al. (2018, *op. cit.*).

PHOTO BY ANANTH MILLER-MURTHY

Fig. 1. Female *Urspelerpes brucei* with eggs as found in Georgia, USA.

Our observation was similar to the single record of *U. brucei* eggs from captivity. On 25 July 2019, one of us (TAH) observed five eggs scattered and attached individually to submerged gravel in a dark "cave" chamber attached to an enclosure housing nine adult *U. brucei* collected from a different first-order stream in Habersham County, Georgia, USA in October 2014. In addition to these eggs, we simultaneously observed fifteen young larvae with fully absorbed yolk reserves (with one measuring 13.3 mm total length) in both chambers of the enclosure. The size and developmental stage of the captive larvae suggest they may have hatched from eggs laid in March–April 2019, corroborating the oviposition season we observed on 20 March 2020. It remains unclear whether the variability in captive oviposition dates reflects variation that may exist naturally or is an artifact of the > 4.5 years spent in captivity by the females. Furthermore, we did not observe any adult in attendance of these eggs in captivity, and it is also unclear whether our new observation in the field is suggestive of true parental care behavior, the presence of which is variable among other spelerpine plethodontid salamanders.

We thank Tyler L. Brock for providing background information and guidance in writing this note.

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ANURA — FROGS

***ANAXYRUS AMERICANUS* (American Toad). AUTUMN AMPLEXUS.** *Anaxyrus americanus* begin to breed soon after emerging from overwintering sites (Green 2005. *In* Lannoo [ed.] Amphibian Declines, pp. 386–390. University of California Press, Berkeley, California.), which in Tennessee, USA occurs from January to April, depending on elevation and weather patterns during any given year (Niemiller and Reynolds 2011. The Amphibians of Tennessee. The University of Tennessee Press, Knoxville, Tennessee. 369 pp.).

Fig. 1. *Anaxyrus americanus* in amplexus at 0500 h on 29 September 2019 in southern Cannon County, Tennessee, USA.

Fig. 2. Female *Anaxyrus americanus* found alone in southern Cannon County, Tennessee at 1853 h on 6 October 2019. We used the dorsolateral spotting pattern to verify that this individual is the same female that had been engaged in amplexus for at least 6 d.

We found a pair of *A. americanus* in one of our gardens in southern Cannon County, Tennessee, that engaged in amplexus (Fig. 1) for at least 6 d during early Autumn 2019. We first discovered the pair at 0500 h on 29 September 2019, and then again at 0541 h, 1654 h, and 1816 h on 3 October 2019, 0426 h and 1924 h on 4 October 2019, and 0913 h on 5 October 2019. We found the female alone at 1853 h on 6 October 2019 (Fig. 2), indicating that the pair had ceased amplexus sometime between the late morning of 5 October 2019 and early evening of 6 October 2019. Although we did not see the toads continually or even daily during this time period, we assume that they were in amplexus continually during the 6 d based on our repeated discovery of the pair and their behaviors. For example, we watched the pair for several minutes the morning of 29 September 2019, during which time the female made no attempt to dislodge the male, but she did hop away from us with the male in tow while we photographed them. When we found the pair at 0630 h on 3 October 2019, the female again hopped away, eventually nestling in amongst fallen leaves of a cultivated *Rhododendron* sp. (Fig. 3), where the pair remained until nightfall (1830 h) when the female crawled out from the leaves and began to walk around the garden, with the male still engaged in amplexus.

Fig. 3. Amplexed pair of *Anaxyrus americanus* nestled in amongst dried leaves of a cultivated *Rhododendron* sp. on 3 October 2019 in southern Cannon County, Tennessee, USA. They remained in this position for ca. 12 h.

We were surprised to find the toads in amplexus during early autumn. The occurrence is particularly perplexing because an unusual weather pattern that had settled over middle Tennessee during late summer and early fall created environmental conditions unlike those that *A. americanus* would encounter during their breeding season. Middle Tennessee was experiencing a moderate drought and had not received any appreciable rain since mid-August, and nearby Nashville, Tennessee received only 0.51 mm of rainfall during September (normal rainfall for this month is 86.6 mm), making it the driest September recorded for the region. Furthermore, middle Tennessee was in the midst of a heat wave that produced many daily record high temperatures from mid-September through early October when the heat wave officially ended. Small artificial ponds in the gardens near where we found the pair are used annually as breeding sites by *A. americanus* (pers. obs.) but were either dry or their water temperatures exceeded 27°C during early October. Thus, the time of year, air temperature, water temperature, and dearth of rainfall created environmental conditions not associated with breeding activities of *A. americanus.*

Reproductive behavior in anurans outside the breeding season is limited primarily to rain calls (reviewed by Toledo et al. 2015. Acta Ethol. 18:87–89), but such activities have not been reported for *A. americanus*. However, in some populations male toads intercept females approaching a breeding pond and engage in amplexus (Forester and Thompson 1998. Behaviour 135:99–119). Perhaps the male was unseasonally active and simply grasped a female encountered in our garden.

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ANAXYRUS HOUSTONENSIS **(Houston Toad). PREDATION.** *Anaxyrus houstonensis* is a federally endangered amphibian species endemic to east-central Texas. These amphibians have a restricted range documented to only fourteen Texas counties and extirpated from at least four of those counties. One of the

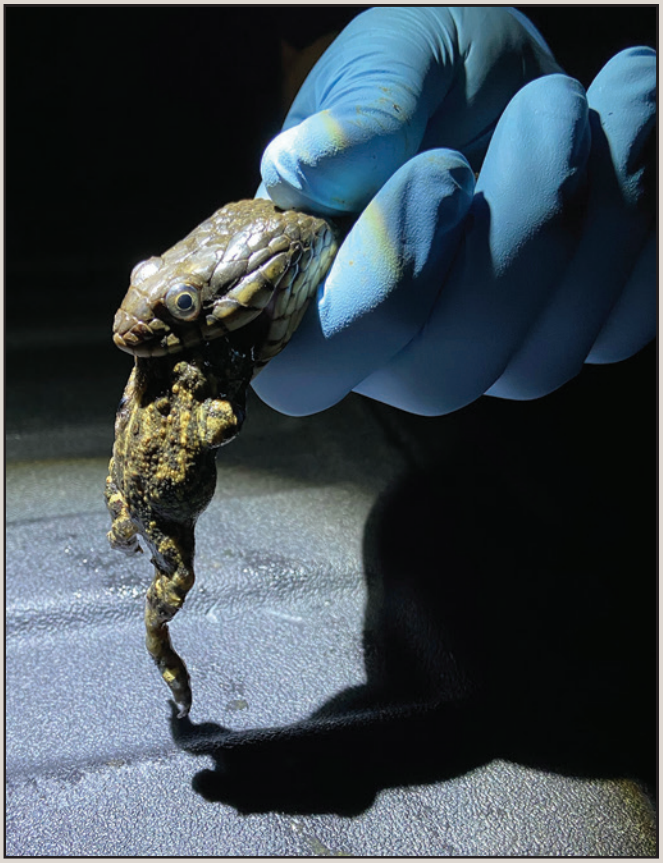

Fig. 1. An adult *Nerodia erythrogaster* in the process of regurgitating an adult *Anaxyrus houstonensis* at the Griffith League Ranch in Bastrop County, Texas, USA.

largest known populations of *A. houstonensis* remains in the Lost Pines ecoregion of Bastrop County, Texas, USA (Duarte et al. 2014. J. Wildlife Manage. 5:363–371). *Anaxyrus houstonensis* has an aggregative breeding strategy with male chorusing typically occurring in two to three-day pulses intermittently from January through June, with females attending larger male choruses (Gaston et al. 2010. PLoS ONE 5:1–6). Natricine snakes such as *Nerodia erythrogaster* (Plain-bellied Watersnake) may negatively impact breeding success in *A. houstonensis*, based on a previous unpublished observation of a *N. erythrogaster* containing two adult *A. houstonensis* while ingesting another (https://esadocs.defenders-cci.org/ESAdocs/recovery_plan/840917.pdf, accessed 11 March 2020). We provide direct evidence of *N. erythrogaster* predating *A. houstonensis* with the potential to impact breeding success.

At 2048 h on 3 March 2020, we observed an adult *N. erythrogaster* (80 cm SVL, 21.2 cm tail length, 390 g; Amphibian and Reptile Diversity Research Center, University of Texas at Arlington [UTADC] 9543; photo voucher) on the margins of a pond (30.20917°N, 97.24278°W; WGS 84) within close proximity to two male *A. houstonensis*. We captured the snake by hand and the snake regurgitated an adult male *A. houstonensis* (5.13 cm SVL, 1.537 cm head width, 18.3 g; UTADC 9544; photo voucher; Fig. 1). The male *A. houstonensis* was nearly intact indicating it was ingested recently.

All work was authorized by a U.S. Fish and Wildlife Service Permit (TE039544-0) and Scientific Permit for Research (SPR-0102-191) issued to MRJF.

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***BOANA BOANS* (Giant Gladiator Treefrog). PREDATION.** Anurans are commonly preyed upon by a wide variety of vertebrates, including reptiles, birds, and mammals, with snakes being common predators (Toledo et al. 2007. J. Zool. 271:170–177). *Boana boans* is an arboreal and nocturnal hylid found throughout the tropical forests of the Amazon basin and cis-Andean northern South America (Lima et al. 2006. Guide to the Frogs of Adolpho Ducke Reserve, Central Amazonia. Áttema Design Editorial, Manaus, Brazil. 168 pp.). *Bothrops atrox* is a generalist snake widely distributed in the Amazonian biome (Fraga et al. 2013. Guia de Cobras da Região de Manaus–Amazônia Central. Editora INPA, Manaus, Brazil. 303 pp). Here, we report on a predation event of a male *Boana boans* by an adult *Bothrops atrox* from anecdotal field observations.

At 0842 h on 26 September 2019, we observed an adult *Bothrops atrox* (ca. 120 cm SVL), consuming a *Boana boans*, on the left bank of the Igarapé Agua Fria, at Reserva Extrativista Beija-Flor-Brilho-de-Fogo (0.8044°N, 52.2126°W; WGS 84; 98.4 m elev.), Municipality of Pedra Branca do Amapari, Amapá, Brazil. The *Bothrops atrox* captured the frog and ingested it headfirst (Fig. 1). During the predation event, distress calls were not emitted by the *Boana boans*. The predation event occurred in the dry season in the leaf litter, in a site where male *Boana boans* build nest basins for oviposition by females and *Bothrops atrox* had been observed actively foraging. Predation of anurans by *Bothrops atrox* has been reported recently for the families Craugastoridae, Hylidae, and Leptodactylidae (Bisneto and Kaefer 2019. Acta Amazon. 49:105–113). To the best of our knowledge this is the first recorded observation of *Bothrops atrox* preying on *Boana boans* and expands the reported diet of *Bothrops atrox*.

Fig. 1. Predation of an adult male *Boana boans* by an adult *Bothrops atrox* in Reserva Extrativista Beija-Flor-Brilho-de-Fogo, Municipality of Pedra Branca do Amapari, Amapá, Brazil.

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BOKERMANNOHYLA GOUVEAI **(Itatiaia Treefrog). PARENTAL CARE.** Parental care in amphibians may include behaviors such as nest construction, egg attendance, eggs and larvae transportation, and larvae feeding (Vági et al. 2019. Proc. R. Soc. B. 286:20182737). Although it evolved independently many times among major clades of anurans (Vági et al. 2019, *op. cit.*), parental care is relatively uncommon, occurring in 6–15% of frogs and toads (Balshine 2012. *In* Royle et al. [eds.], The Evolution of Parental Care, pp. 62–80. Oxford University Press, Oxford, United Kingdom). The most common and phylogenetically widespread parental care behavior is egg attendance, which consists of a parent remaining with the egg mass, usually at the oviposition site (Crump 1996. Adv. Stud. Behav. 25:109–144; Lehtinen and Nussbaum 2003. *In* Jamieson [ed.], Reproductive Biology and Phylogeny of Anura, pp. 343–386. Science Publishers Inc., Enfield, New Hampshire).

The genus *Bokermannohyla* currently comprises 30 species of treefrogs and belongs to the hylid tribe Cophomantini (Lyra et al. 2020. Zool. J. Linn. Soc. 190:1235–1255). The genus is divided into three species groups: the *B. circumdata*, *B. martinsi*, and *B. pseudopseudis* groups (Lyra et al. 2020, *op. cit.*). The *B. circumdata* group is the most speciose, with 19 species (Carvalho et al. 2012. Zootaxa 3321:37–55), including *B. gouveai* (Peixoto and Cruz 1992. Mem. Inst. Oswaldo Cruz. 87:197–200), a species endemic to Brejo da Lapa, Itatiaia National Park, Municipality of Itamontes, Minas Gerais, Brazil (type locality: 22.3508°S, 44.6669°W; WGS 84; 2100 m elev.).

The present record occurred on 1 December 2013, at the species type locality, Brejo da Lapa, a temporarily flooded area. Males of *B. gouveai* were found calling on the floating vegetation composed of *Eriocaulon* sp. (Eriocaulaceae). We observed semicircular cavities formed by the flattening of the *Eriocaulon* vegetation, presumably made by *B. gouveai*, although we did not see the process of nest construction. Inside each one of the three cavities was an egg mass with one male (identified by the presence of enlarged spines in each prepollex) attending the eggs, positioned at the edge of the egg mass (Fig. 1A). We observed several males, some guarding their own nest and others calling from intact *Eriocaulon* leaves. On two occasions, males guarding eggs remained next to the nest even after our disturbance (Fig. 1B).

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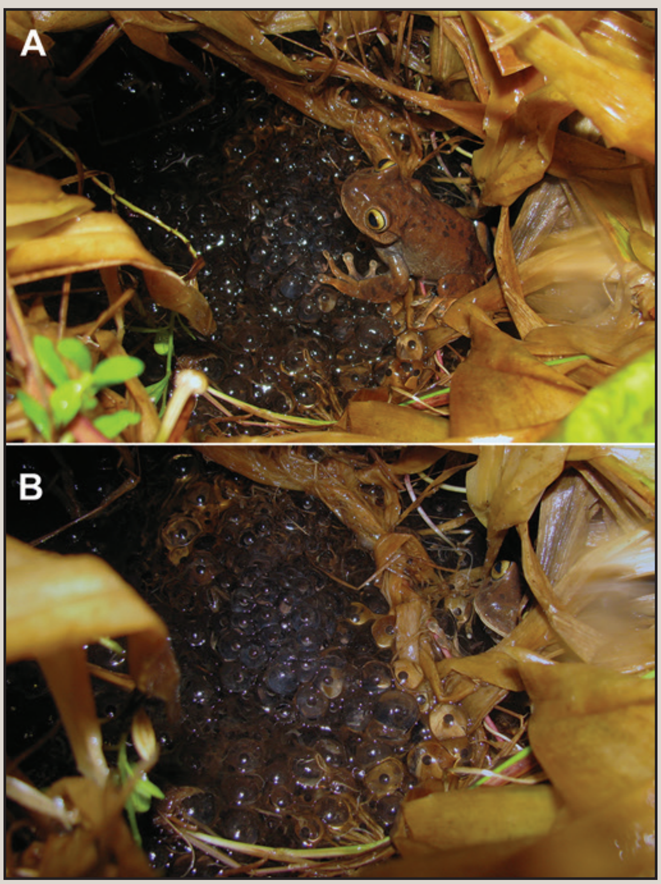

Fig. 1. A) Egg attendance by a male *Bokermannohyla gouveai*; B) male at the edge of the floating nest. After disturbance (our presence), the male hid but remained next to the nest.

Among the Cophomonatini, nest construction has been reported in several species of *Aplastodiscus* (see Berneck et al. 2016. Mol. Phylogenet. Evol. 97:213–223), *Boana* (see Caldwell 1992. *In* Hamlett [ed.], Reproductive Biology of South American Vertebrates, pp. 85–97. Springer-Verlag, New York, New York), and in two species of *Bokermannohyla*: *B. circumdata* (Pombal and Haddad 2007. *In* Nascimento and Oliveira [eds.], Herpetologia no Brasil II, pp. 101–116. Sociedade Brasileira de Herpetologia, Belo Horizonte, Brazil; Mongin and Carvalho-e-Silva 2013. Bol. Mus. Para. Emílio Goeldii. Cienc. Nat. 8:133–152) and *B.* aff. *circumdata* from Picinguaba, São Paulo (Hartmann et al. 2010. Iheringia, Sér. Zool. 100:207–215). Regarding egg attendance in the Cophomantini, the only reports are for *Boana faber* (Martin et al. 1998. Amphibia-Reptilia 19:65–73), *B. rosenbergi* (Kluge 1981. Misc. Publ. Mus. Zool. Univ. Michigan 160:1–170), and *Hyloscirtus platydactylus* (La Marca 1985. J. Herpetol. 19:227–237). Here, we report the first record of egg attendance in *B. gouveai* and the first report for the genus *Bokermannohyla*.

We observed two males guarding their nests (one per nest) and one unguarded nest during intensive calling activity. We do not have information about male behavior during periods of low calling activity. Martins et al. (1998. Amphibia-Reptilia 19:65–73) reported that males of *Boana faber* guard their nests when densities of calling males are high. The authors suggest that the main benefit of parental care in this species is to protect the eggs from being damaged by intruding males. We suggest that similar behavior occurs in *B. gouveai*, because males were persistent in their egg attendance during high calling activity.

We thank Paulo Sano (Departamento de Botânica, IB-USP) for the *Eriocaulon* identification and Julian Faivovich, Fernando A. Perini, and Tiago L. Pezzuti for suggestions on the first draft of this text. Itatiaia National Park and ICMBio-IBAMA (license # 38382-1) provided the collecting permit. Financial support was provided by Fundação de Amparo a Pesquisa do Estado de São Paulo (FAPESP #2012/22566-3, #2012/09401-5, #2013/14061-1) and the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001.

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***COLOSTETHUS PRATTI* (Pratt's Rocket Frog). PREDATION.** *Colostethus pratti* is a highly abundant leaf litter frog, found in humid lowland forests across Colombia and Panama. At 2130 h on 18 March 2020, during an amphibian survey we observed a *C. pratti* in the grip of a large amblypygid (whip spider; Ambylpygi), positioned facing downward on a tree trunk (Fig. 1). The individual was alive at the time and had suffered some wounds, but we did not witness the eventual outcome of the predation attempt. The observation was made within the Esteban Alphonso Lee Reserve, Sierra Llorona, Central Panama (9.35856°N, 79.7029°W; WGS 84; 499 m elev.).

Amblypygids mostly predate arthropods (Chapin and Hebets 2016. J. Arachnol. 44:1–14), but are known to consume small vertebrates, including frogs (Zuluaga-Isaza et al. 2020. Herpetol. Notes 13:231–233). At the site in Sierra Llorona, *C. pratti*, and amblypygids are extremely common and it is likely that this mode of predation occurs relatively frequently and may include other small species of frogs as well. This note provides the first record of this predatory interaction.

We thank Noel Rowe for the use of his research station facilities at Sierra Llorona, Panama.

PHOTO BY LUIS A. P. MARTINEZ

Fig. 1. An adult *Colostethus pratti* (ca. 20 mm SVL) held by a *Amblypygi* sp. in Sierra Llorona, Central Panama.

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***DUTTAPHRYNUS MELANOSTICTUS* (Common Asian Toad). DIET and FEEDING BEHAVIOR.** *Duttaphrynus melanostictus* is a common toad having rough skin with black tipped warts, paired parotid glands behind the eyes, and light or dark brown coloration. It is nocturnal and known to inhabit human habitations as well as forests (Ahmed et al. 2009. Amphibians and Reptiles of Northeast India. A Photographic Guide. Aaranyak, Guwahati, India. 169 pp.). Its distribution ranges from southeastern Iran, northwestern Saudi Arabia, west Yemen, northeastern Oman and adjacent United Arab Emirates east to northern Pakistan, Nepal, India, Sri Lanka and China (Frost 2020. Amphibian Species of the World: An Online Reference. Version 6.0. https:amphibiansoftheworld.amnh.org; 12 April 2020). This record also represents the southernmost population for the species.

Fig. 1. Female *Duttaphrynus melanostictus* preying on a venomous elapid snake, *Sinomicrurus macclellandi*, from Mizoram, India.

At 2040 h on 26 May 2017, in a residential area of Kawnpui Hmar Veng, Kolasib District, Mizoram, India (24.0255°N, 92.4025°E; WGS 84; 842 m elev.), a female *D. melanostictus* (148 mm SVL) was observed preying on a neurotoxic, venomous elapid, *Sinomicrurus macclellandi* (MacClelland's Coral Snake; ca. 315 mm total length). The *D. melanostictus* ambushed the moving *S. macclellandi*, bit it on the tail, and struggled with it for ca. 3 min, chewing and vigorously grabbing the snake with its forelimbs while grasping it in its mouth. The *S. macclellandi*, with ca. one quarter of its body swallowed by the *D. melanostictus*, tried to escape by wriggling and coiling around the anterior part of the *D. melanostictus* for several minutes. Slowly the *S. macclellandi* stopped resisting and the *D. melanostictus* quickly ingested the rest of the *S. macclellandi* (Fig. 1; Lee Kong Chian Natural History Museum, National University of Singapore [ZRC(IMG)] 1.192). The elapsed time from initial strike to complete ingestion was ca. 17 min.

The diet of *D. melanostictus* has been described as insects and worms (Ahmed et al. 2009, *op. cit.*). Other anuran species such as *Haplobatrachus tigerinus* are known to feed on reptiles such as the garden lizard, *Calotes* sp. and snakes such as *Boiga trigonata*, *Xenochrophis piscator* (which are mildly venomous and non-venomous, respectively) and *Typhlops* sp. (Anders 2002. *In* Schleich and Kästle [eds.], Amphibians and Reptiles of Nepal: Biology, Systematics, Field Guide, pp. 133–340. A.R.G. Gantner Verlag K.G., Rugell, Liechtenstein).

This work was conducted under the permission for herpetofaunal collection throughout Mizoram No. A.33011/2/99-CWLW/225 issued by the Chief Wildlife Warden, Environment, Forest and Climate Change Department, Govt. of Mizoram, India. Financial support was provided by the Department of Zoology, Mizoram University.

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***DRYOPHYTES JAPONICUS* (Japanese Treefrog). MELANISM.** *Dryophytes japonicus* (formerly *Hyla japonica*) generally has a green or brown dorsal coloration, a black lateral line from the tympanum to the groin, and a pale abdomen (Kim et al. 2017. J. Ecol. Environ. 41:42). On 23 May 2019 at 2220 h on Daecheongdo Island, South Korea (37.83427°N, 124.70105°E; WGS 84; 7 m elev.), we observed a melanistic male *D. japonicus*. This individual (38.7 mm SVL, 4.9 g) lacked any pattern and had a dark brown dorsal coloration. Moreover, the color of both pupils and irises was black (Fig. 1A). The abdominal color was dark yellow and there was no pigment medially making various organs, including the liver, intestine, and heart, visible through the transparent skin (Fig. 1B). This is the first recorded case of melanism in *D. japonicus*.

This work was supported by a grant from the National Institute of Biological Resources, funded by the Ministry of Environment, Republic of Korea (NIBR No. 202102102).

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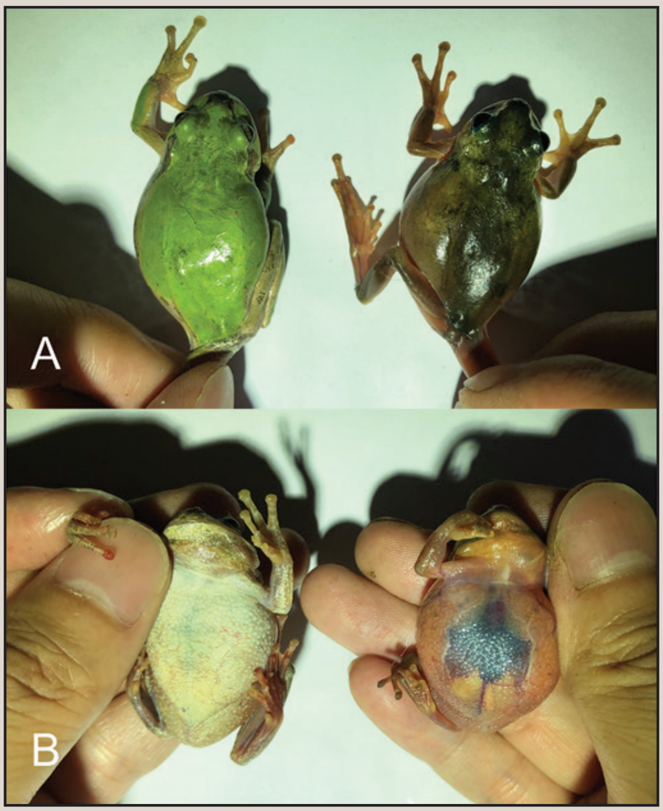

Fig. 1. A) Dorsal views and B) ventral views of a normal male (left) and a melanistic male (right) *Dryophytes japonicus* from Daecheongdo Island, South Korea.

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***DRYOPHYTES JAPONICUS* (Japanese Treefrog). MALFORMATION.** Parasitic infections and environmental pollution are causes of malformations in amphibians. Making matters worse, pesticides have been shown to increase the intensity of parasitism

PHOTO BY MIN SEOCK DO

Fig. 1. Juvenile *Dryophytes japonicus* with a malformation observed on Hansando Island, South Korea.

(Haas et al. 2018. Glob. Chang. Biol. 24:275–288). *Dryophytes japonicus* (formerly *Hyla japonica*) is a common species distributed throughout East Asia, including South Korea, often using rice fields as breeding sites (Lee et al. 2011. Ecological Guide Book of Herpetofauna in Korea. NIER Press, Incheon, South Carolina. 78 pp.). On 25 July 2019 at 1130 h we observed one malformed *D. japonicus* in a rice field (34.79193°N, 128.48030°E; WGS 84; 23 m elev.) on Hansando Island, South Korea. This individual (18.2 mm SVL, 1.1 g) was a juvenile which had just completed metamorphosis. It had a sac-like appendage attached to the left hind leg. The appearance of the sac was similar to the shape of a leg and the tip of the sac was in the shape of a toe (Fig. 1). Although *Ribeiroia* trematodes are known to cause malformations in frogs (Johnston and Lunde 2005. *In* Lannoo [ed.], Amphibian Declines, pp. 124–138. University of California Press, Berkeley, California), we were unable to determine the cause of this malformation.

This work was supported by a grant from the National Institute of Biological Resources, funded by the Ministry of Environment, Republic of Korea (NIBR No. 202102102).

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***FROSTIUS PERNAMBUCENSIS* (Frost's Toad). PREDATION.** *Frostius pernambucensis* is a bufonid endemic to the Atlantic Rainforest in northeastern Brazil, occurring in the states of Paraíba, Pernambuco, Alagoas, and Bahia (Frost 2020. Amphibian Species of the World: An Online Reference. Version 6.0; https:amphibiansoftheworld.amnh.org; accessed 15 April 2020). Its life cycle requires an association with phytotelma, either in bromeliads (Bromeliaceae) or tree trunks (Haddad and Prado 2005. BioScience 55:207–217; Dias et al. 2016 Herpetol. Rev. 47:277–278), and parental care has been reported for this species (Dias et al. 2016, *op. cit.*). *Scinax eurydice* (Maracas Snouted Treefrog) has a wide geographic distribution in the Atlantic Forest domain. It can be found on the banks of temporary and permanent pools in open areas and along forest edges (Pereira, et al. 2016. Rev. Iberoam. Cienc. Ambient. 7:70–83).

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Fig. 1. *Scinax eurydice* in a phytotelma, located in a shrub trunk depression surrounded by *Frostius pernambucensis* tadpoles, during the predatory event.

Herein, we report a case of *F. pernambucensis* tadpole predation by *S. eurydice* (Fig. 1). The event occurred during Biodiversity Research Program (PPBio) activities, at the Dois Irmãos State Park (8.0027°S, 34.9427°W; WGS 84), an Atlantic Rainforest fragment located in the metropolitan region of Recife, Pernambuco, northeastern Brazil. The *S. eurydice* was observed ingesting a tadpole at ca. 1730 h on 27 October 2017 in a phytotelma ca. 120 cm above ground in a shrub trunk measuring ca. 12.25 × 10.0 cm. The *S. eurydice* (5.3 cm SVL, 6.8 g) was collected and its stomach contents were analysed, confirming the presence of tadpoles. The *S. eurydice* and tadpoles were deposited in the Federal Rural University of Pernambuco Herpetological Collection (CHP-UFRPE 5272). The tadpoles of *F. pernambucensis* were about two weeks old and were no longer under adult care (Dias et al. 2016, *op. cit.*). Daily tadpole monitoring, which had occurred for two weeks after oviposition, indicated that 13 tadpoles out of 36 were predated.

During the observation, the *S. eurydice* remained within the phytotelma, the tadpoles remained stationary and distributed in small schools, keeping their distance. However, when the *S. eurydice* moved within the phytotelma or was too close to the small tadpole schools, they responded immediately with an escape behavior: shifting in a disordered movement and simultaneously swimming away from the predator. This aggregation behavior and "stalling", as well as the escape behavior, are considered secondary defensive behaviors, as they are performed only in response to direct or indirect predator contact (Gnaspini and Hara 2007. *In* Pinto-da-Rocha et al. [eds.] Harvestmen: The Biology of Opiliones, pp. 375–399. Harvard University Press, Cambridge, Massachusetts). This behavior of aggregation and escape benefits the tadpoles, confounding the predator and resulting in the dilution effect, a strategy that decreases the chance of attack (Wrona and Dixon 1991. Amer. Nat. 137:186–201; Uetz et al. 2002. Anim. Behav. 63:445–452). This aggregation behavior creates a geometric effect, in which the animals when positioned at the center of the group, decrease their risk of predation through protection provided by peripheral individuals (Uetz et al. 2002. Anim. Behav. 63: 445–452). Although predation of tadpoles in phytotelma has been reported for insect larvae (Odonata and belostomatid beetles; Toledo 2003. Phyllomedusa 2:105–108; Teixeira et al. 2006. Salamandra 42:155–163), in general, amphibians with reproductive cycles associated with phytotelma are at risk from a variety of predators that forage in these aquatic microenvironments (Dias et al. 2014. CES Revista 28:3–16), as in the case reported here.

We thank the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) for the sampling permit (No. 11218-1), Parque Estadual de Dois Irmãos and Programa de Pesquisa em Biodiversidade (PPBio- Mata Atlântica).

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***GASTROPHRYNE OLIVACEA* (Western Narrow-mouthed Toad). DIET.** *Gastrophryne olivacea* is a fairly small fossorial anuran that ranges from Nebraska, USA to Tamaulipas, Mexico. Species of *Gastrophryne* have a diet consisting largely of ants (Dodd 2013. Frogs of the United States and Canada. John Hopkins University Press, Baltimore, Maryland. 1032 pp.) but there has been documentation of their feces containing Coleoptera remains (Freiburg 1951. Trans. Kansas Acad. Sci. 54:374–386.). Here, we report the first instance of a *G. olivacea* feeding on a troglobitic millipede within a cave.

Our observation was made at a deep (ca. 40 m) cave in Bexar County, Texas, USA. The cave is known to be occupied by an endangered species of beetle, thus the specific location is withheld. The cave is a solution-formed feature that requires vertical gear to explore the depths. On 16 March 2020, while conducting endangered species presence/absence surveys within this cave, we observed an adult *G. olivacea* attempting to and subsequently consuming a *Speodesmus falcatus* (Sickled Cave Millipede) ca. 40 m within the cave (Fig. 1). The *G. olivacea* was positioned on a debris patch with ca. 10 *S. falcatus* roaming about. The *G. olivacea* was mostly unsuccessful trying to eat *S. falcatus* as they walked directly in front of the anuran. After four or five attempts the *G. olivacea* successfully ingested a *S. falcatus*. It is worth mentioning that the *G. olivacea* appeared to be malnourished, likely due to being trapped in a low nutrient, ant-lacking environment. This feeding behavior is likely not normal for *G. olivacea*; however, this is the first time *G. olivacea* has been documented feeding on *S. falcatus*, a troglobytic millipede.

PHOTO BY JACOB D. OWEN

Fig. 1. *Gastrophryne olivacea* attempting to predate a *Speodesmus falcatus* ca. 40 m within a cave in Bexar County, Texas, USA.

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LEPTODACTYLUS LABYRINTHICUS **(Pepper Frog). BATRACOPHAGY.** Information on predation events between frog species are important to elucidate the trophic relationships of species. *Leptodactylus labyrinthicus* belongs to the *Leptodactylus pentadactylus* species group which is widely distributed in Argentina, Brazil (including the Cerrado and Atlantic Forest), and Paraguay (de Sá et al. 2014. South Am. J. Herpetol. 9:1–100). This species is a generalist-opportunist predator of invertebrates such as beetles and ants, as well as spiders, crickets, grasshoppers, and insect larvae (França et al. 2004. Stud. Neotrop. Fauna. E. 39:243–248; Ganci et al. 2018. North-west J. Zool. 14:250–254) and vertebrates such as amphibians, lizards, and snakes (Cardoso and Sazima 1977. Ciência e Cultura. 29:1130–1132; Fonseca et al. 2012. Herpetol. Notes 5:167–168; Carvalho et al. 2014. Check List 9:849–850; Costa et al. 2015. Herpetol. Rev. 46:233). It has terrestrial habits, often living in open areas near lakes and ponds (França et al. 2004, *op. cit.*; Silva et al. 2005. J. Nat. Hist. 39:555–566; Carvalho et al. 2014, *op. cit.*). *Physalaemus cuvieri* (Cuvier's Foam Froglet) is a small frog (28–30 mm adult SVL) with nocturnal activity (Andrade and Barreto 1995. Amphibia-Reptilia 16:67–76). Little is known about the diet of these species, especially regarding batracophagy. Here, we describe a predation attempt by *L. labyrinthicus* on *P. cuvieri* at the Ecological Station Águas de Santa Bárbara, São Paulo, Brazil (22.81297°S, 49.23317°W; WGS 84; 590 m elev.).

On 17 February 2020 at 1000 h during a field trip, we observed a *L. labyrinthicus* (43.4 mm SVL; Fig. 1A) preying upon a *P. cuvieri* (25 mm SVL; Fig. 1B) in a pitfall trap. The event was observed for 4 min, at which time the *L. labyrinthicus* held the *P. cuvieri* by the head, until the *L. labyrinthicus* was disturbed by the observer, and released the *P. cuvieri*. Since the observation happened inside a trap, it is unclear whether *P. cuvieri* is part of the natural diet of *L. labyrinthicus*. However, due to the large size difference between the two species and the similar occupied habitats, we believe it is possible. We hope that our observation contributes to the knowledge of prey items for leptodactylid frogs.

We thank Fundação de Amparo à Pesquisa do Estado de São Paulo FAPESP (grant #2018/14091-1). We also thank Filipe C. Serrano for suggestions regarding this manuscript.

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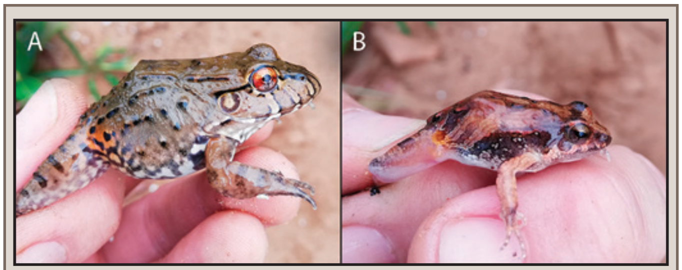

Fig. 1. Individuals found in the Ecological Station Àguas de Santa Bárbara: A) *L. labyrinthicus* (43.4 mm SVL); B) *Physalaemus cuvieri* (25 mm SVL).

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LITHOBATES PIPIENS **(Northern Leopard Frog). EGG PREDATION.** Many predators are known for *Lithobates pipiens*, a widely distributed species in North America, but relatively few species have been documented predating eggs of *L. pipiens* (Dodd 2013. Frogs of the United States and Canada, Volume 2. The John Hopkins University Press, Baltimore, Maryland. 982 pp.). In the laboratory, *Ambystoma opacum* (Marbled Salamander) consumed eggs of *L. pipiens* (Walters 1975. J. Herpetol. 9:267–279). In natural settings, eggs of *L. pipiens* are consumed by leeches, newts, and turtles, but no details were given on specific species of predators (Wright 1914. Carnegie Institution of Washington, Monograph Series 197:1–98; Harding 1997. Amphibians and Reptiles of the Great Lakes Region. University of Michigan Press, Ann Arbor, Michigan. 400 pp.).

On 13 May 2019, we observed a *Macrobdella decora* (North American Medicinal Leech) preying upon a submerged egg-mass of *L. pipiens* in a natural pond in the Sandhill Region of Cherry County, Nebraska, USA (42.48598°N, 101.88762°W; WGS 84; 1123 m elev.). The leech perforated through the egg-mass that was attached to a cattail shoot (*Typhus* spp.; Fig. 1). Vegetation in the immediate area included bulrush (*Scirpus* spp.) and cordgrass (*Spartina pectinata*). Air temperature was 26.7°C under partly cloudy skies.

Macrobdella decora has a northerly distribution in North America and occurs in both flowing and still water, but is particularly abundant in small, vegetated ponds (Sawyer 1972. North American Freshwater Leeches, Exclusive of the Piscicolidae, with a Key to All Species. University of Illinois Press, Urbana, Illinois. 155 pp.; Moser 1991. T. Nebraska Acad. Sci.18:87–91). These leeches are highly sanguinivorous, but also are voracious predators of many organisms, including insect larvae, other leeches, snails, and eggs of various species of amphibians (Savage 1961. The Ecology and Life History of the Common Frog. Sir Isaac Pitman & Sons, Ltd, London, England. 221 pp.; Sawyer 1972, *op. cit.*). Eggs of amphibians already known to be consumed by *M. decora* include *L. catesbeiana*, *Anaxyrus americanus*, and *Ambystoma maculatum*, with up to 80% egg mortality for *A. americanus* noted in a few cases (Sawyer 1972, *op. cit.*). This observation represents the first documentation of a known species of leech (*M. decora*) predating eggs of *L. pipiens*.

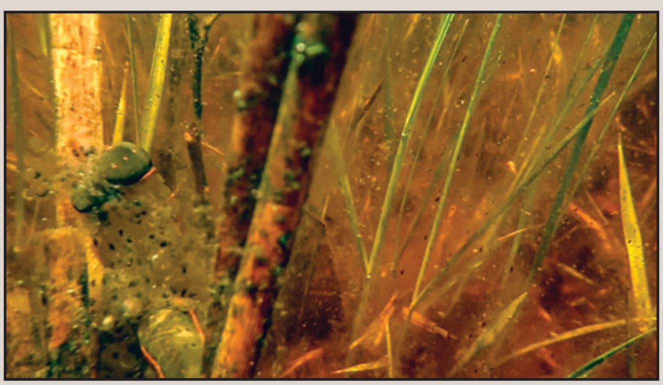

Fig. 1. *Macrobdella decora* preying on eggs of *Lithobates pipiens* in northwestern Nebraska, USA.

We thank Turner Enterprises, Inc. for providing funding, housing, and the opportunity to study turtles in the Nebraska Sandhills. Our opportunistic observation occurred while conducting research on *Emydoidea blandingii* (Blanding's Turtles) on Fawn Lake Ranch. We thank Emma Brinley Buckley for assistance with the photo.

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MEGOPHRYS BRACHYKOLOS **(Short-legged Toad). OVIPOSITION SITE.** *Megophrys brachykolos* is native to southern China, including Hubei, Guizhou, Henan, Guangxi, and Guangdong Provinces, and Hong Kong (Frost 2020. Amphibian Species of the World: an Online Reference. Version 6.0; https:amphibiansoftheworld.amnh.org; 19 Feb 2020). Little is known about the reproductive biology of this species (Chan et al. 2005. A Field Guide to the Amphibians of Hong Kong, Friends of the Country Parks and Cosmos Books, Hong Kong. 212 pp.). Here, we report the first observation of eggs and an oviposition site for *M. brachykolos*.

At 2100 h on 10 January 2020, we found an egg mass next to an adult *M. brachykolos* along a stream in Tai Tam Country Park, Hong Kong (22.25819°N, 114.20051°E; WGS 84; 274 m elev.). The egg mass was found on leaf litter in a pool (water depth = 1.9 cm), shaded by a rock with water dripping into the pool. There were eight cream-colored eggs, each was 3 mm in diameter (Fig. 1). We believe that the egg mass was laid by *M. brachykolos* because the size and color does not fit the eggs of all other sympatric frog species, including *Odorrana chloronata*, *Quasipaa exilispinosa* and *Liuixalus romeri*. Further, on 21 February 2020, we found 10 newly hatched tadpoles of *M. brachykolos* in the same pool which may confirm our identification.

Fig. 1. Egg mass of *Megophrys brachykolos* in Tai Tam Country Park, Hong Kong.

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PITHECOPUS HYPOCHONDRIALIS **(Orange-legged Leaf Frog). BEHAVIOR.** *Pithecopus hypochondrialis* is characterized as arboreal. They have opposable digits, which allow them to move freely above the ground (Caramaschi and Cruz 2002. Phyllomedusa 1:5–10). Despite having the capacity to jump, *P. hypochondrialis* are usually observed walking slowly on branches and leaves at heights not exceeding 2.5 m (Freitas et al. 2008. Biota Neotrop. 8:101–110). On 13 February 2020 at 2157 h we recorded a *P. hypochondrialis* (Fig. 1) in a tree, after a heavy rain, at a height of ca. 6 m near Benevides, Pará, Brazil (1.30791°S, 48.24017°W; WGS 84; 37 m elev.). The individual was vocalizing, along with other individuals close to the ground. Trees and shrubs are known vocalization sites for *P. hypochondrialis* (Rodrigues et al. 2007. J. Nat. Hist. 41:1841–1851), but previous records do not exceed 2.5 m in height (Freitas et al. 2008, *op. cit.*) as previously mentioned. This is the first record of *P. hypochondrialis* using and vocalizing from this height.

We thank the Coordination for Personal Improvement of Higher Education (CAPES) for scholarships. We also thank Natura Ecoparque for logistical support and the State Department of Environment of the state of Pará for collection authorization (#3905/2019).

Fig. 1. *Pithecopus hypochondrialis* vocalizing in a tree at a height of ca. 6 m in Pará, Brazil.

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PITHECOPUS NORDESTINUS **(Northeastern Brazilian Leaf Frog). DRY SEASON HABITAT USE.** Records of habitat use for anurans in the dry season or during non-reproductive periods in arid and semiarid environments are scarce (e.g., Sanchez et al. 2010. Folia Zool. 59:122–128). In these regions, many amphibians seek shelter and remain inactive during the dry season using inconspicuous microhabitats. *Pithecopus nordestinus* is endemic to northeastern Brazil and reproduces in temporary water bodies in the Caatinga and Atlantic Forest biomes (Caldas et al. 2016. North-west. J. Zool. 12:271–285; Faraulo et al. 2019. Salamandra 55:242–252). Microhabitat use for *P. nordestinus* is relatively well known during reproductive periods, but microhabitat use during

FIG. 1. Microhabitat use of an inactive *Pithecopus nordestinus* during the dry season in the Caatinga domain, northeastern Brazil: A) a juvenile (red arrow) under leaf litter in the Municipality of Russas, Ceará, Brazil; B) closeup of the juvenile with the leaf litter removed.

the dry season is poorly documented, with only a few reports of inactive individuals exposed on leaves (Navas et al. 2004. Int. Cong. Ser. 1275:298–305). Here, we provide four records of microhabitat use by inactive individuals of *P. nordestinus* during the dry season, in three different sites in the Caatinga domain.

The first two individuals were adults encountered on 21 December 2011 under the bark of a *Mimosa tenuiflora* (Juremapreta Tree) in the Municipality of Pentecoste, Ceará, Brazil (3.8117°S, 39.3366°W; WGS 84). Both were inactive (eyes closed and limbs close to their bodies) and ca. 170 cm above soil level. The third individual was observed at 2300 h on 21 July 2017 in the Municipality of Assú, Rio Grande do Norte, Brazil (5.5591°S, 37.0289°W; WGS 84). This individual was observed among the spines of a *Pilosocereus polygonus* (Greater Antillean Tree Cactus), ca. 20 cm above the ground. The fourth (Fig. 1) was a juvenile (28.3 mm SVL) and found inactive at 1602 h on 30 August 2019 in the leaf litter (7 cm deep) on the forest floor (Fig. 1A), below several *Aspidosperma piryfolium* (Pereiro-branco Trees), in the Municipality of Russas, Ceará, Brazil (5.0385°S, 38.0650°W; WGS 84). This individual was collected and deposited at the Coleção Herpetológica do Semiárido, Universidade Federal Rural do Semi-Árido (CHSA.A 1251). Usually, *P. nordestinus* has a green dorsal coloration, but all the inactive individuals reported here had a cream to brown dorsal coloration (Fig. 1B). Our observations document plasticity in resting microhabitat use for *P. nordestinus* in the dry season, using bark on tree trunks and the leaf litter on the forest floor. Our findings contribute to the knowledge of the biology of anurans from semiarid environments during the dry season.

The voucher specimen was collected under permit 35650-2 from the Instituto Chico Mendes de Conservação da Natureza – ICMBio.

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***PULCHRANA GRANDOCULA* (Big-eyed Frog). AMPLECTANT CALL and HABITAT USE.** *Pulchrana grandocula* is one of six Philippine endemic species in the genus *Pulchrana*. It is geographically distributed on the islands of Basilan, Biliran, Bohol, Camiguin Sur, Dinagat, Leyte, Mindanao, and Samar (Diesmos et al. 2015. Proc. California Acad. Sci. 62:457–539). It is a riparian inhabitant where males call in choruses during periods of low water levels. Occasionally, the species is also observed perched in low lying vegetation (Sanguila et al. 2016. ZooKeys 624:1–132). Other species of *Pulchrana* have been documented to inhabit subterranean rivers (Binaday et al. 2017. Philipp. J. Sci. 146:339–351).

The amplectant call is an audible reproductive call produced by anurans during amplexus, which has been hypothesized to stimulate egg laying (Toledo et al. 2014. Acta Ethol. 18:87–99). Most studies on anuran vocalizations are focused on advertisement calls, while only a few characterized species amplectant calls. Here, we characterize the amplectant call of *P. grandocula* and report on its cave habitat use.

On 9 March 2020 during exploration of a wet cave located in the Municipality of Naga, Province of Zamboanga Sibugay, Philippines (7.8825°N, 122.7578°E; WGS 84), a male and female *P. grandocula* were encountered exhibiting cephalic amplexus while vocalizing, alternately, on the edge of a cave pool (ca. 1 m depth) within the twilight zone (Fig. 1A). As the male vocalized, it slowly puffed up its pulsing throat, pressing on the back of the female (Fig. 1B). Audio and video recordings of this observation can be accessed through the Philippine Anuran Calls Online Database (https://philippineherps.wixsite.com/pinoyfrogcalls). Photo vouchers were deposited to Lee Kong Chian Natural History Museum, National University of Singapore (ZRC[IMG] 1.193a, 1.193b).

The audio recording of the amplectant call was digitized and analyzed using Audacity 2.3.3 software. The call duration, note duration, and inter-note interval duration were characterized from waveforms, while the dominant frequency was derived from the spectrogram (Fig. 2). The male's call duration was 6.19s with frequency ranging from 700Hz to 2500Hz. The call has 45 pulses with pulse duration getting longer, the pulse interval getting shorter, and the frequency getting gradually higher as the call progresses (Fig. 2A). This was immediately followed by the female's call which lasted for 7.39s with frequency ranging from 180Hz to 1900Hz. The call has 65 pulses, with the same characteristics as the male, wherein the pulse duration gets longer, the pulse interval gets shorter, and the frequency gets

Fig. 1. An amplectant pair of *Pulchrana grandocula* observed in a pool within the twilight zone of a cave in Zamboanga Sibugay, Philippines.

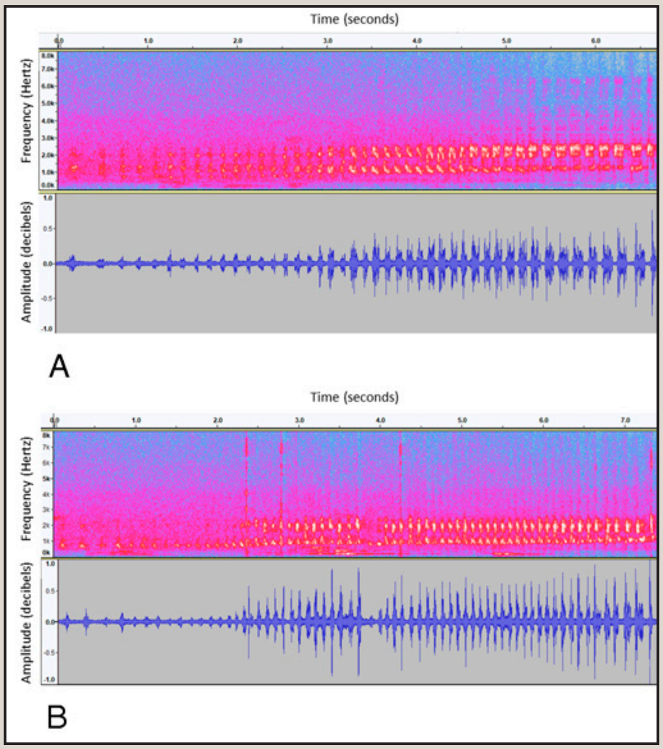

Fig. 2. Spectrograms and waveforms of the amplectant call of a male (A) and female (B) *Pulchrana grandocula* from Zamboanga Sibugay, Philippines.

gradually higher as the call progresses (Fig. 2B). This alternating of calls of the male and female was recorded twice, but plausibly lasted longer.

Following the review of Toledo et al. (2014, *op. cit.*) regarding anuran calls, we identified the call emitted by *P. grandocula* as an amplectant call following an amplexus event. Observations on other anuran species showed that the amplectant call stimulates the female for oviposition (Odendaal et al. 1983. Copeia 1983:534–537). A study on the cave inhabitant *Xenopus laevis laevis*, showed that the male's amplectant call was partnered with the pressing of its jaw for each call on the back of the female, together with muscular contractions phased from tightening of grip, arching of the back, and then the depression of the snout (Picker 1980. South African J. of Zoo. 15:150–158).

Furthermore, we observed four more individuals of *P. grandocula* ca. 4–5 m away from the amplectant pair. Only a few anuran species are known to be cave inhabitants. Inside these caves, they prefer the humid twilight zone with buffered temperature changes. In India, several species of ranids have been observed to inhabit subterranean caves (Biswas 2014. Amb. Sci. 1:17–25), while one species was observed to utilize caves as a refuge during the dry season (Chari 1962. J. Bombay Nat. Hist. Soc. 59:71–76). Further studies of the role subterranean habitats and similar environments play in the ecology and reproductive cycle of *P. grandocula* are warranted. To the best of our knowledge, this is the first characterization of the amplectant call of *P. grandocula* and the first documented record of the species' cave habitat use.

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***RANA AURORA* (Northern Red-legged Frog). PREDATION.** On 11 February 2020 at 1439 h, I observed a male *Circus hudsonius* (Northern Harrier) feeding on the ground adjacent to a small wet drainage ditch in short-grass pastureland of the Arcata Bottoms

Fig. 1. Adult *Rana aurora* in the grasp of *Circus hudsonius*, Arcata Bottoms, Humboldt County, California, USA. Note lengthy ranid legs, bright red features, and white-grey mottling along the body of the *Rana aurora*.

of Humboldt County, California, USA (40.86488°N, 124.12372°W; WGS 84; 3 m elev.). When approached it flew off, revealing an adult *Rana aurora* in its talons (Fig. 1). Raptor predators of other ranid species include *C. hudsonius* and *Buteo lineatus* (Red-shouldered Hawk) on *Rana clamitans* (Green Frog) in Michigan (Martof 1956. Am. Midl. Nat. 56:224–245) and *B. lineatus* on *R. draytonii* (California Red-legged Frog) in California (Rathbun and Murphey 1996. Herpetol. Rev. 27:187–189). Grazing may facilitate predation of this Priority 2 California Species of Special Concern (Thomson et al. 2016. California Amphibian and Reptile Species of Special Concern. University of California Press, Oakland, California. 408 pp.), especially by highly visual raptor ambush predators along waterways lacking riparian vegetation.

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***RANA SYLVATICA* (Wood Frog). LEUCISM.** *Rana sylvatica* exhibits sexual dichromatism, with males consistently more darkly pigmented, from tan to brown, whereas females generally are more reddish-brown (Banta 1914. Biol. Bull. 26:171–183). Reports of abnormal patterns of coloration, such as albinism and leucism, are important for determining the prevalence of these morphs throughout a species range. Leucism refers to reduced skin pigmentation, but the coloration of the eyes is normal (Dyrkacz 1981. SSAR Herptol. Circ. 11:1–31). A case of leucism has been reported for a tadpole of *R. sylvatica* which did not survive until metamorphosis (Smith 2014. Bull. Maryland Herpetol. Soc. 50:74–75). An instance of a leucistic individual of *R. sylvatica* from a population in British Columbia, Canada has also been reported, however, the diagnostic characters of *R. sylvatica* are not evident in the accompanying photograph (the specimen was not vouchered) possibly calling into question the correct species identity (Thompson and Rea 2013. Herpetol. Rev. 44:128–129). In the aforementioned report, the individual in the photograph apparently lacks dorsolateral folds and interdigital webbing of the hindfeet, among other diagnostic characteristics typical of this species. Also, the authors report that the leucistic individual's SVL was 2.8 mm (a presumed lapsus). Metamorphs of *R. sylvatica* range between 13–22 mm SVL, whereas adults range between 37–83 mm SVL (male and female ranges combined; Martof 1970. Cat. Amer. Amphib. Rept. 86:1–4). These inconsistencies open the possibility of a species misidentification (although alternative identifications are not immediately apparent) and equivocal assertion of the presence of leucistic *R. sylvatica* in British Columbia.

PHOTOS BY JOHANA GOYES VALLEJOS

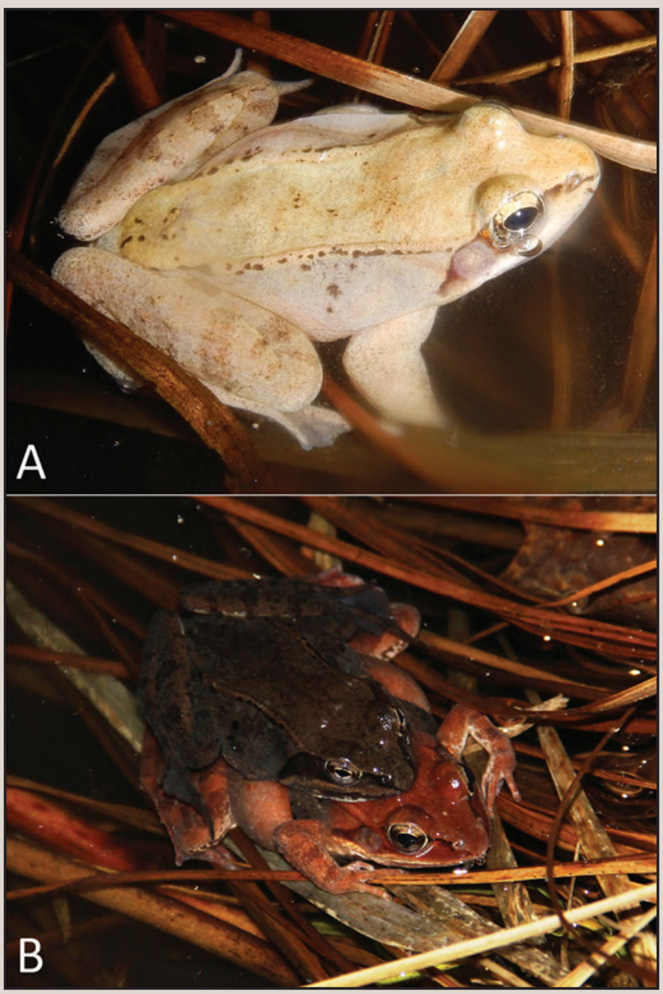

Fig. 1. A) Leucistic *Rana sylvatica* from Mansfield, Connecticut, USA; B) a pair of *R. sylvatica* in amplexus exhibiting normal coloration.

Here, I report a case of adult leucism in a population unambiguously identifiable as *R. sylvatica* from the northeastern United States. On the night of 13 April 2015, a leucistic adult male *R. sylvatica* was observed in a flood-plain wetland adjacent to the Fenton River, located within the UConn Forest, Mansfield, Connecticut, USA (41.824°N, 72.236°W; WGS 84). The individual was photographed without manipulation (Fig 1A). The individual exhibited a general lack of pigment throughout its body, although partially retaining the species' diagnostic "eye mask" and tympanic region pigmentation; reduced pigmentation was evident on its dorsolateral folds as well. For comparative purposes, a photograph of an amplectant pair taken on the night of 10 April 2014 from the same population at the same location is shown (Fig 1B), with the male (top) considerably darker brown than the female (bottom).

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***SCINAX FUSCOVARIUS* (Snouted Treefrog) and *LEPTODACTYLUS PODICIPINUS* (Pointed-belly Frog). MALFORMATIONS.** Morphological anomalies decrease the survival of anurans in relation to normal conspecifics (Goodman and Johnson 2011. PLoS ONE 6:e20193) and, when frequent, may indicate a decrease in environmental quality (Bacon et al. 2013. J. Exp. Zool. B. Mol. Dev. Evol. 320:218–37). The occurrence of morphological anomalies in amphibians may be related to environmental and genetic factors. Among the possible causes are UVB radiation, predators, parasites, and chemical contaminants, which can act synergistically (Lannoo 2008. The Collapse of Aquatic Ecosystems: Malformed Frogs. University of California Press, Berkeley, California. 288 pp.). Here, we report the second records of malformations for *Scinax fuscovarius*, previously reported in southern Paraguay (Pett et al. 2019. Cuad. Herpetol. 33:79–82), and additional examples for *Leptodactylus podicipinus*, previously reported in northern Brazil (Sousa and Costa-Campos 2016. Herpetol. Rev. 47:112–113).

The present records were found in the Municipality of Palotina, Paraná, southern Brazil (24.34778°S, 53.74694°W; WGS 84; 318 m elev.), during a nocturnal survey. On 16 October 2018, we found a *S. fuscovarius* (26 mm SVL) with syndactyly in the right hind limb (Fig. 1), which is characterized by the partial or complete fusion of digits (Henle et al. 2017. Mertensiella 25:9–48). This individual

Fig. 1. *Scinax fuscovarius* with syndactyly in the right hind limb and missing an adhesive disc in left forelimb from Paraná, Brazil.

Fig. 2. *Leptodactylus podicipinus* with ectromelia of the humerus in the left forelimb from Paraná, Brazil.

was also missing the adhesive disc on one of its digits on the left forelimb (Fig. 1). On 29 November 2018, we found a *L. podicipinus* (36 mm SVL) with ectromelia of the humerus in the left forelimb (Fig. 2), which is characterized by the absence of bony structures of the limbs (Meteyer 2000. Field Guide to Malformations of Frogs and Toads. Biological Science Report USGS/BRD/BSR–2000–0005; Henle et al. 2017, *op. cit.*). The specimens were collected (ICMBio License no. 48465-3) and deposited in the herpetological collection of the Museum of Natural History of Capão da Imbuia (MHNCI-11019, 11020, respectively).

Some causes have been attributed to certain types of anomalies, such as parasitic infection in cases of syndactyly, and predation and agricultural contaminants in individuals affected by ectromelia (Lannoo 2008, *op. cit.*). However, the natural history of the species also could influence the type of anomaly due to differences in sensitivity (Agostini et al. 2013. Dis. Aquat. Org. 104:163–171). The wetlands of this study are located in a landscape subject to agricultural activities, which could contribute to higher rates of morphological anomalies in the limbs (Taylor et al. 2005. Environ. Health Perspect. 113:1497–1501). We suggest monitoring malformation rates over time due to the variability of environmental factors and sampling different life stages, such as tadpoles and metamorphs.

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***SCINAX RUBER* (Red-snouted Treefrog). DIET.** The eggs of leptodactylid frogs are preyed upon by invertebrates (Carvalho et al. 2012. Herpetol. Notes 5:319–322) and vertebrates (Azarak and Farias 2017. Bol. Mus. Int. de Roraima 11:45–48). Herein, we report predation on *Leptodactylus macrosternum* (Leptodactylidae) eggs and tadpoles by *Scinax ruber* (Hylidae).

On 21 November 2015 in the River Curiaú Environmental Protection Area, Municipality of Macapá, Amapá, Brazil (0.15019°N, 51.0384°W; WGS 84) we observed an adult male *S. ruber* (35.4 mm SVL) preying on the eggs and tadpoles of *L. macrosternum* (87.2 mm SVL). The event was observed for 5 min at a temporary pond associated with a floodplain where *L. macrosternum* had laid eggs in a foam nest (Fig. 1). To verify if the treefrog was predating the eggs, we collected the foraging treefrog and nest. We found eggs and tadpoles of *L. macrosternum* inside the stomach of the foraging treefrog, confirming the nest was predated. Specimens are housed in the Herpetological Collection of Universidade Federal do Amapá (CECC 2784 – *Scinax ruber*; CECC 2785 – *Leptodactylus macrosternum*, collection permits from ICMBio #41486). Our

Fig. 1. Adult male *Scinax ruber* feeding on the eggs and tadpoles in a foam nest of *Leptodactylus macrosternum* in Amapá, Brazil.

results show the opportunistic and generalist feeding behavior of *S. ruber* on eggs and tadpoles.

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***SPHAENORHYNCHUS LACTEUS* (Orinoco Lime Treefrog) and *DENDROPSOPHUS HARALDSCHULTZI* (Harald's Treefrog). MICROHABITAT USE.** *Sphaenorhynchus lacteus* is a small frog widely distributed in the Orinoco basin of Venezuela and the Amazon basin of Brazil. This species can be found in flooded plains, floating meadows, ponds, and large lagoons with floating vegetation, in forest clearings, at forest edges, and in savannahs (Rodriguez and Duellman 1994. Guide to the Frogs of the Iquitos Region, Amazonian Peru. Natural History Museum, University of Kansas, Lawrence, Kansas. 80 pp.). *Dendropsophus haraldschultzi* is a small hylid that occurs in the Amazonian states of Amapá and Pará in Brazil, and throughout Amazonian Peru and Colombia, and is sympatric with *S. lacteus* throughout eastern Amazonia (Missassi et al. 2017. Herpetol. Notes 10:703–707). Herein, we report a novel observation of habitat use by *S. lacteus* and *D. haraldschultzi*.

FIG. 1. *Sphaenorhynchus lacteus* (A) and *Dendropsophus haraldschultzi* (B) associated with the developing leaves of *Phenakospermum guyannense* in Amapá, Brazil.

In the afternoon of 16 September 2016 during the dry season in the Abacate da Pedreira District, Municipality of Macapá, Amapá, Brazil (0.27308°N, 50.89787°W; WGS 84), we recorded two anurans (*S. lacteus* and *D. haraldschultzi*) associated with the Amazonian plant *Phenakospermum guyannense* (Fig. 1). During the final stage of maturation, *P. guyannense* accumulates water in its developing leaves, providing a suitable microhabitat for anurans. To our knowledge, this is the first report of anurans using the developing leaves of *P. guyannense* as microhabitat. This vegetation may provide a similar microhabitat to that found in bromeliads, which *S. lacteus* is known to use (Corrêa et al. 2017. Herpetol. Rev. 48:172).

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***TRIPRION PETASATUS* (Yucatecan Casque-headed Treefrog). DEFENSIVE BEHAVIOR.** Anurans display a wide range of defensive strategies that are used to manage threats from predators (Toledo et al. 2011. Ethol. Ecol. Evol. 23:1–25). Several species of casque-headed frogs, that have a co-ossified skull and dermis, have been observed using phragmosis. During this behavior, the frog enters backwards into a hole and uses its head to block the opening. It has been suggested that this behavior protects the frog against desiccation or predators (Jared et al. 2005. J. Zool. 265:1–8). The production of skin secretions is another defensive strategy that is often exhibited synergistically with phragmosis (Toledo et al. 2011, *op. cit.*). *Triprion petasatus* is a species of casque-headed frog endemic to the Yucatan Peninsula, that has previously been observed using phragmosis in tree holes (Stuart 1935. Misc. Publ. Mus. Zool. Univ. Michigan 29:1–56), though there are no known records of secretion production.

At 2206 h on 23 July 2019, we encountered an adult *T. petasatus* (61.0 mm SVL, 5 g) during a herpetological transect in the Calakmul Biosphere Reserve, Campeche, Mexico (17.95097°N, 89.37290°W; WGS 84; 293 m elev.). While we were handling the frog to take measurements, it produced a sticky secretion from its entire body. Upon inspection of this secretion, we noticed that the odor highly resembled that of capsaicin, a component found in chili peppers, the fruits of plants in the genus *Capsicum*. Due to the secretion being produced in response to our interaction with the frog, we suggest that it is an antipredator behavior.

Toledo et al. (2011, *op. cit.*) propose that there are four types of anuran secretions: odoriferous, adhesive, noxious, and slippery. Our observation indicates that the secretion of *T. petasatus* is odoriferous and adhesive; further research is needed to determine whether it is also noxious. These secretions can cause harm, act as a repellent or deterrent, or distract potential predators. The odor of the secretion of *T. petasatus* may act as chemical aposematism, to warn potential predators that it is unpalatable (Williams et al. 2004. Appl. Herpetol. 2:47–82). Since capsaicin functions as an irritant to prevent animals from eating *Capsicum* fruits, it is possible that *T. petasatus* has evolved this odor as a form of chemical mimicry. The odors of many treefrog secretions resemble plants, while other species are noted to have earthy or musky odors. This may be chemical camouflage, enabling them to be indistinguishable from their immediate environment or to mislead predators that are highly reliant on smell (Williams et al. 2004, *op. cit.*).

In some species of casque-headed frogs, including *Corythomantis greeningi*, *Aparasphenodon brunoi* and *Argenteohyla siemersi*, phragmosis co-occurs with the production of a secretion. These species not only produce secretions from over the entire body when threatened, they also use bony spines on the skull to pierce the skin in areas highly concentrated with granular glands, in order to deliver lethal secretions to potential predators. The potency of the toxins varies between species but can be several times greater than those of pitvipers in the genus *Bothrops* (Jared et al. 2015. Curr. Biol. 25:2166–2170; Cajade et al. 2017. J. Zool. 302:94–107).

The odoriferous secretions of anurans are an understudied area of research. Further studies are required on *T. petasatus* to explore the characteristics of its secretions, its toxicity, and the potential for it to possess similar venom delivery mechanisms to other casque-headed frogs.

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TESTUDINES — TURTLES

***ACTINEMYS MARMORATA* (Northern Pond Turtle). NESTING AFTER INJURY.** A recent taxonomic split in the Western Pond Turtle (*Actinemys marmorata*) has created two recognized species (*A. marmorata* and *A. pallida*), both of which are species of special concern in California (Spinks et al. 2014. Mol. Ecol. 23:2228–2241; Thomson et al. 2016. California Amphibian and Reptile Species of Concern. University of California Press, Berkeley, California. xv + 390 pp.). Bury et al. (2012. Northwest Fauna 7:1–128), and Thomson et al. (2016, *op. cit.*) have attributed population declines in both species to aspects of the nesting ecology, including destruction or loss of nesting habitat, absence of protections for nesting sites, and a putative lack of information on nesting ecology. Aspects of nesting ecology have been reported recently, including a review (Bury et al. 2012, *op. cit.*), predation potential for nest sites (Alvarez et al. 2014. Herpetol. Rev. 45:307–308), atypical nesting behavior (Alvarez and Davidson 2018. Herpetol. Rev 49:101–103), and nest site selection (Riensche et al. 2019. Northwest. Nat. 100:90–101; Davidson and Alvarez 2020. West. Wildl. 7:42–49), all of which have increased our understanding of the nesting ecology of this species. Herein, I report on the successful nesting by a female *A. marmorata* with a rear limb amputation.

As part of a long-term turtle-nesting ecology study that was conducted between 2013 and 2019 at Moorhen Marsh, Martinez, California, USA, a group of biologists followed female *A. marmorata* and co-occurring *A. pallida* from aquatic refuge sites to presumed nesting locations. When nesting females were located, data on these nesting locations was collected, a protective cage was placed over the nest, and the nest was monitored until hatching (Davidson and Alvarez 2020, *op. cit.*). On 14 June 2017, at ca. 1600 h, I followed an adult female *A. marmorata* to its selected nesting location and sat 50 m away to observe its behavior. The turtle appeared to be excavating a nest and laying eggs, and subsequently began to leave the site ca. 2.5 h after beginning the presumed nesting process. At this point the turtle was collected. The goal of the collection was to determine if it had a marginal scute marking, and to collect morphometric data following egg deposition. The unmarked turtle was marked (as #81) on its marginal scutes, measured, and inspected for anomalous characteristics (i.e., scars, injuries, etc.). The left rear limb showed a healed injury that included the amputation of all metatarsals and likely the tarsals as well (determined through palpation). The turtle was released, and a protective cage was installed over the nest. Notes on the caged nest included the suggestion that the nest was likely not viable due to the leg injury.

The nest was monitored every two weeks from June through February. No emergence was noted in February, at a time when other nest emergence was observed, nor in March. On 1 April 2018 the nest was excavated. Five dead neonates were uncovered in various states of decay. Veterinary examination concluded that the neonates had been predated while in the underground nest, likely by a rodent (unknown species), and had been dead for at least 2 mo. Based on Alvarez and Davidson (2018, *op. cit.*), the nest was declared to be an "obscured predated nest". The presence of neonates in the nest chamber, within a nest that was completely covered by metal mesh since the date of construction, strongly suggests that the female (#81) was capable of constructing a nest with an amputated foot and laying viable eggs that, if not predated, could have emerged as neonates.

This observation suggests a high level of behavioral and anatomical resilience for *A. marmorata*. For a long-lived species like *A. marmorata*, recovery from injuries is evolutionarily advantageous. We have noted other seriously injured turtles at Moorhen Marsh, which also recovered and continue as part of the population at that site (Alvarez et al. 2017. West. Wildl. 4:81–85). Turtles found with older injuries, that otherwise appear healthy, should be allowed to maintain a role in the population.

I am grateful to the Mt. View Sanitary District Board of Directors for support of turtle studies at Moorhen Marsh. I would also like to thank Kelly Davidson, Karen Kames, and Sarah Foster for assisting with nesting surveys. Work herein was conducted under a Lake and Streambank Alteration Agreement (1600-2016-0347-R3).

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***CARETTA CARETTA* (Loggerhead Sea Turtle). REPRODUCTIVE LONGEVITY.** Age estimates from skeletochronology suggest that female *C. caretta* nesting in the Northwest Atlantic may be capable of reproduction for up to 46 years following the onset of sexual maturity (Avens et al. 2015. Mar. Biol. 162:1749–1767). The combination of high tag loss and fisheries mortality during early years of many saturation tagging projects around the world have constrained the ability to empirically confirm such long reproductive lifespans. Nevertheless, reproductive longevity of up to 32 years has been recorded in Brazil (Baretto et al. 2019. Mar. Turt. Newsl. 157:10–12), and a female with a 33-yr nesting history was documented in Greece (Margaritoulis et al. 2020. Chelon. Conserv. Biol. 19:133–136).

Herein, we present a 36-yr nesting history for a *C. caretta* on the Georgia, USA coast. At 0024 h on 25 June 2006, BMS encountered a female completing the nesting process on Jekyll Island, Georgia (31.01245°N, 81.43324°W) bearing flipper tag PPM976 and collected a tissue sample for genetic identification using 18 microsatellite loci (Shamblin et al. 2011. Mol. Ecol. Res. 11:110–115). This female was originally tagged on the north end of Cumberland Island, Georgia on 1 June 1980. PPM976 was encountered by tagging patrols on Little Cumberland Island, Jekyll Island, and the northern end of Cumberland Island during eight nesting seasons between 1980 and 2000. Tagging on Cumberland Island ended in 1989, so some nesting years were possibly missed. Genetic tagging commenced statewide in 2008, and PPM976 laid at least 18 clutches on the same three islands between 2008 and 2016 (2008: N = 4; 2011: N = 5; 2013: N = 5; 2016: N = 4). She was last detected via genetic tagging of an egg sample from nest 632 laid on Cumberland Island, Georgia (30.92583°N, 81.40412°W) on 1 July 2016, giving her a minimum reproductive longevity of 36 years. As far as we are aware, this is the longest nesting history thus far documented for *C. caretta* anywhere in the world. PPM976's capture history would have been incomplete based solely on traditional tagging or genetic tagging, demonstrating the synergy of the combined datasets.

We thank the numerous volunteers that contributed to these tagging projects over the decades and the late Thelma Richardson for compiling and maintaining these tagging records. We thank the Little Cumberland Sea Turtle Project, Student Conservation Association interns on Cumberland Island, and the AmeriCorps Members at the Georgia Sea Turtle Center for collecting samples for the genetic tagging project. We also thank the many undergraduate students in the Nairn lab that extracted DNA for the genetic tagging study, and several lab managers and technicians that produced the genotypes.

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***CARETTA CARETTA* (Loggerhead Sea Turtle). NESTING DISPERSAL.** Despite the capacity for extensive migrations, female *Caretta caretta* are considered to display strong nest site fidelity, with individuals often recorded nesting within 5 km of previous nesting sites (Schroeder et al. 2003. *In* Bolten and Witherington [eds.], The Loggerhead Sea Turtle, pp. 114–124. Smithsonian Books, Washington, D.C.). Nonetheless, long-distance nesting dispersal events of several hundred kilometers have been documented for nesting females in Florida (LeBuff 1974. Herpetologica 30:29–31; Ehrhart et al. 2014. Chelon. Conserv. Biol. 13:173–181). In 1979, a female initially tagged at Cape Lookout, North Carolina, USA was recaptured at Cape Canaveral, Florida, USA 19 d later (Stoneburner and Ehrhart 1981. Herpetol. Rev. 12:66). At the time, this nesting dispersal of at least 725 km was the largest known within-season record for *C. caretta* in the Atlantic Ocean.

Here, we report a minimum dispersal of 1370 km among three within-season nest sites by a *C. caretta*. These internesting movements were detected as part of a subpopulation-scale genetic tagging project based on egg sampling from nests (Shamblin et al. 2017. Mar. Biol. 164:138). The 16 microsatellite loci used have strong discriminatory power (non-exclusion probability of identity of ca. 1.9×10^{-30}; Shamblin et al. 2009. Conserv. Genet. 10:577–580), providing a means of assigning clutches to individual females. Female CC011280 was initially detected nesting at Guana Tolomato Matanzas National Estuarine Research Reserve, Florida, USA (30.07894°N, 81.33557°W) on 17 June 2018. She was next identified nesting at Cape Lookout National Seashore, North Carolina, USA (34.78506°N, 76.38858°W) on 8 July 2018, indicating travel of ca. 700 km over a 21-d period. Her last detected clutch was deposited on Atlantic Beach, Florida (30.34021°N, 81.39605°W) on 30 July 2018, indicating a minimum dispersal of ca. 670 km over a 22-d period. Therefore, female CC011280 traveled at least 1370 km over her recorded 43-d nesting history in 2018.

Telemetry studies in Florida have demonstrated that *C. caretta* nest site fidelity estimated via tagging patrols is positively biased because most off-site nesting events are never documented (Tucker 2010. J. Exp. Mar. Biol. 383:48–55; Hart et al. 2013. PLoS ONE 8:e66921). These studies documented a nesting spread of 100 km or more within seasons by some females. This weak nest site fidelity behavior is apparently rare, with only 10% of the Northern Recovery Unit females laying their detected clutches over 100 km or more (Shamblin et al. 2017, *op. cit.*). However, detections of females laying only a single clutch were nearly twice as common in North Carolina than in South Carolina or Georgia, suggesting that females may be dispersing even further south in Florida, beyond the study area boundary (Shamblin et al. 2017, *op. cit.*). Although it is not clear what would drive inter-nesting movements of this scale given their energetic costs, females displaying this behavior may ultimately be the key to long-term species persistence via colonization of novel nesting habitats.

We thank the numerous technicians and volunteers that contributed to the genetic tagging project over the previous decade, particularly those representing the authors' institutions and organizations that sampled these nests. We also thank the many undergraduate students in the Nairn Lab who extracted DNA for the genetic tagging study.

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***CHELYDRA SERPENTINA* (Snapping Turtle). HATCHLING OVERWINTERING MORTALITY.** Gibbons and Nelson (1978. Evolution 32:297–303) reviewed the evolutionary significance of delayed emergence by hatchling turtles and concluded that where uncertainty in habitat or reproductive patterns predominate, delayed emergence will be favored, whereas in less variable circumstances it will not. Across its wide North American range, only rarely has *C. serpentina* been documented to overwinter in the nest (Finkler and Kolbe 2008. *In* Steyermark et al. [eds], Biology of the Snapping Turtle [*Chelydra serpentina*], pp. 158–167. John Hopkins University Press, Baltimore, Maryland). Ernst (1966. Phila. Herpetol. Soc. Bull. 14:8–9) attributed a rare case of *C. serpentina* over-wintering in Pennsylvania to dry weather and hard-packed soil followed by spring rains. However, Bleakney (1963. Can. Field-Nat 77:67–76) reported that in Nova Scotia, no hatchlings of *C. serpentina* had been observed in autumn, implying over-wintering in the nest, and reported hatchlings emerging in April, May, or later. Ewert (2008. *In* Steyermark et al. [eds.], Biology of the Snapping Turtle [*Chelydra serpentina*], pp. 100–110. John Hopkins University Press, Baltimore, Maryland) reports that there is an inverse relationship between latitude and incubation period in *C. serpentina*, citing northern incubation periods of 63–78 d. Only a single emergence date for New Brunswick, Canada, *C. serpentina* is available (New Brunswick Museum [NBM] files 1984-4)—5 September—which implies a nesting date of 20 June–5 July. This is in agreement with laying dates of 8 June–2 July (N = 11) in the NBM files, suggesting that emergence in August–September of the year of laying may be typical. Nonetheless, there is a paucity of data on emergence dates and overwintering behavior for *C. serpentina* in Maritime Canada, where this species approaches its northern range limit.

Here we document a possible case of attempted overwintering in the nest for *C. serpentina* in New Brunswick. On 29 March 2019, one of us (JR) discovered a *C. serpentina* nest partially excavated by a predator, most likely a Raccoon (*Procyon lotor*), a species common in the area. The eggs had been laid in coarse beach sand at Woodman's Point, Kings County (45.3683°N, 66.2288°W; WGS 84; 4 m elev.), about 5 m above normal high water along the Saint John River shoreline, and near the mouth of the Nerepis Marsh, a tributary. Ice was still apparent in the river with average daily temperatures that month of -3.6°C and an extreme low of -27.5°C (on 8 March; Daily data report for March 2019; https://climate.weather.gc.ca/climate_data/daily_data_e.html?StationID=50310&timeframe=2&StartYear=1840&EndYear=2020&Day=6&Year=2019&Month=3). Exposed eggs, both with broken (predated or hatched) and unbroken shells, were reburied at the site, but further predator disturbance and rising river levels (the lower Saint John River is tidal, and due to melting snow and heavy spring rainfall, subject to frequent spring flooding) prompted us to excavate the nest and collect all remaining eggs on 2 April (NBM 12380). Eggs retrieved included those with both broken and intact shells; all hatchlings recovered were full term but were dead and had likely frozen. Total hatchlings + unhatched or broken eggs = 24. Hatchlings ranged from 24.35–32.26 mm (mean = 27.48, SE = 0.43) straight-line carapace length, within the range for hatchlings reported by Finkler and Kobe (2008, *op. cit.*). This observation suggests that, at least on occasion, *C. serpentina* hatchlings (or unhatched full-term near-hatchlings) may attempt to overwinter in the nest in New Brunswick. We suspect these attempts are rarely successful.

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***GLYPTEMYS INSCULPTA* (Wood Turtle). RAILROAD MORTALITY.** Railroads threaten wildlife indirectly by genetically isolating populations, and directly through mortality resulting from collisions with trains and lethal entrapment between rails (Heske 2015. Urban Nat. 4:1–13; Popp and Boyle 2017. Basic Appl. Ecol. 19:84–93). Turtles, especially small to medium-sized species appear particularly vulnerable to the latter (Kornilev et al. 2006. Herpetol. Rev. 37:145–148; Platt et al. 2009. Herpetol. Rev. 40:434–435). While recognized as a potential threat (Kornilev et al. 2006, *op. cit.*), railroad mortality of turtles and other small vertebrates is probably under-reported because researchers typically spend little time actively searching railroads (Platt et al. 2018. Herpetol. Rev. 49:320). We here report a case of lethal entrapment of *G. insculpta* on a railroad in Dutchess County, New York, USA. To our knowledge, this is the first instance of railroad mortality yet reported for *G. insculpta*. *Glyptemys insculpta* is considered globally Endangered by the IUCN (Rhodin et al. 2018. Chelon. Conserv. Biol. 17:135–161), and most populations are thought to be slowly declining as a result of habitat destruction, degradation, and fragmentation, illegal collecting for the pet trade, fatal encounters with farm machinery, and road mortality (van Dijk and Harding 2011. *Glyptemys insculpta*. IUCN Red List of Threatened Species 2011:eT4965A97416259).

Our observation was made during an on-going, long-term study of Snapping Turtle (*Chelydra serpentina*) mortality along the Metro-North Railroad in the Great Swamp of New York. The Great Swamp encompasses 30,000 ha of floodplains, swamp forest, marsh, and fen in Putnam and Dutchess counties, and as such, constitutes the largest freshwater wetland in the state (see Holt et al. [2006. Northeast. Nat. 13:353–374] and references therein for detailed description of the area). While searching the railroad tracks on 20 August 2020, we found the desiccated carcass of an adult female *G. insculpta* (175 mm straight-line carapace length; 160 mm plastron length [from base of anal notch]; at least 12 plastron annuli, but indistinct) on the rock ballast between the rails (Fig. 1). The head/neck of the turtle was missing, but the tail and elements of all four limbs remained attached to the shell. The left posterior-most costal scute and four vertebral scutes were missing, presumably lost due to weathering (e.g., Dodd 1995. Amer. Midl. Nat. 134:378–387). Twelve intact, dried eggs were found within the shell, a clutch size within the range reported in other studies of *G. insculpta* (Walde et al. 2007. Herpetol. Conserv. Biol. 2:49–60; Walde and Saumure 2008. Herpetol. Rev. 39:82). Given that *G. insculpta* deposit eggs in late May and June (Walde et al. 2007, *op. cit.*), the turtle most likely perished 2–3 months before we chanced upon the dried carcass. Because the rails (210 mm height) would seem an insurmountable barrier to even the largest *G. insculpta*, we concluded the turtle most likely entered the tracks at a road-crossing ca. 643 m from where we found the carcass (specific locality omitted at the request of New York Department of Environmental Conservation). Several ballast ramps designed to facilitate the escape of turtles trapped between the rails were present in the area where we found the carcass, but obviously went unused by the turtle (Fig. 2). The habitat adjacent to the north-south railroad was shrub swamp and dense *Phragmites* (west) and upland forest (east). The shell and eggs were later deposited in the American Museum of Natural History.

This is the first instance of railroad mortality of *G. insculpta* we have documented during 12 seasons (beginning 2008 with a hiatus in 2011) of fieldwork along the Metro-North Railroad in the Great Swamp. Our results probably reflect both the rarity of *G. insculpta* in the Great Swamp and the minimal number of road crossings where turtles can access the rails (see Kornilev et al. 2006, *op. cit.*). Except for large *C. serpentina*, turtles cannot

Fig. 1. Female *Glyptemys insculpta* that perished after becoming entrapped on the Metro-North Railroad in Dutchess County, New York, USA. One of twelve shelled eggs recovered from the dried carcass can be seen just above the pen.

Fig. 2. Ballast ramps constructed along the Metro-North Railroad to facilitate the escape of turtles that become trapped between the rails. White arrows denote ballast ramps (note additional ramps in the distance).

climb over the rails, and once trapped, rapidly overheat and then succumb to lethally high body temperatures (Kornilev et al. 2006, *op. cit.*; Engeman et al. 2007. Herpetol. Rev. 38:331–332). Although our experience suggests railroad mortality of *G. insculpta* is rare, infrequent mortality events can nonetheless have significant negative demographic consequences for small populations. This is particularly true for long-lived species with delayed sexual maturity and limited reproductive output such as *G. insculpta* (Walde et al. 2007, *op. cit.*), which are sensitive to any increase in background mortality rates (Congdon et al. 1995. Amer. Zool. 34:397–408).

Our observation and a previous report of Bog Turtle (*Glyptemys muhlenbergii*) mortality (Platt et al. 2009. Herpetol. Rev. 40:434–435) together with dead Painted Turtles (*Chrysemys picta*) found in the same area (Platt et al., unpubl. data), calls into question the effectiveness of ballast ramps installed between the rails to provide a means for turtles to escape entrapment. To our knowledge, the efficacy of these ramps has not been tested, and the presence of dead turtles between the rails suggests that at least some turtles are either unable or fail to use them. Given the occurrence of two species of endangered chelonians (*G. insculpta* and *G. muhlenbergii*) in the Great Swamp, we urge state conservation authorities to consider other approaches that will reduce the likelihood of lethal entrapment of turtles on the Metro-North Railroad. To this end, we recommend installing a simple barrier crosswise between the rails on either side of road crossings that would block turtles from continuing down the tracks and eliminate a potential source of mortality in these imperiled populations.

We thank Michael Klemens and David Kizirian for assistance with depositing this specimen at the American Museum of Natural History, Cassandra Paul for providing literature, and Lewis Medlock for many years of field assistance. Support for SGP was provided by Wildlife Conservation Society. This paper represents technical contribution number 6933 of the Clemson University Experimental Station.

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***GLYPTEMYS MUHLENBERGII* (Bog Turtle). LONGEVITY.** The northern population of *Glyptemys muhlenbergii* was listed as a threatened species by the U.S. Fish and Wildlife Service on 4 November 1997. There was limited research conducted on this species prior to this date, despite its listing as endangered in Pennsylvania on 1 March 1974. This note presents data on longevity of *G. muhlenbergii* from a long-term study in Pennsylvania and updates a previous report (Gress 2009. Herpetol. Rev. 40:334–335).

Between May 1969 and June 1982, William Kimmich conducted the first known mark-recapture surveys of *G. muhlenbergii* at a site in southeastern Pennsylvania, USA, marking ca. 100 individuals with small drill holes exclusively in the marginal scutes. The Nature Conservancy (TNC) protected this site in 1989 and has continued the mark-recapture studies to the present date. This constitutes what is possibly the longest running study of *G. muhlenbergii* in their northern range. Kimmich worked independently on his study but provided his data and volunteer services to TNC after it acquired the property. Carl Ernst conducted research on *G. muhlenbergii* at this site between May 1982 and May 1989 and contributed data to TNC for this analysis.

At each capture, turtles were sexed, and measurements of the carapace straight-line length and width, plastron straight-line length and width, and shell height were recorded using the same techniques. Shell wear and injuries were also noted at subsequent captures. These characteristics, as well as the configuration of markings on the marginal scutes, were used for the data comparison.

The average annual growth rate of *G. muhlenbergii* is rapid during the first years after hatching, and gradually decreases as the turtle ages. Ernst (1977. Herpetologica 33:241–246) documented annual growth rates of 34.6% at hatchling with a gradual decline to 5.2% at age twelve, indicating that *G. muhlenbergii* reach their maximum size at some time after age 12. Comparison of Kimmich's data and that collected by TNC reveals an average size variation of 0.56 mm between initial and subsequent captures, indicating that these turtles were fully grown adults when first captured, and were presumed to be at least 13-yrs old at first capture. Counting the number of scute annuli appears to be a reasonable method of determining approximate ages of *G. muhlenbergii* up to about ten years, after which time growth slows and their burrowing habit begins to wear away the annuli. While young *G. muhlenbergii* have distinct annuli, the shells of older turtles have been worn completely smooth.

Data collected at this site using the above criteria, reveals 31 *G. muhlenbergii* that are calculated to be over 25 years old. Kimmich's data did not note annuli count or wear and it is possible that several of these turtles are considerably older than the calculated ages. Shell wear may vary greatly between sites, based on abrasive particles in the soil, and an individual turtle's burrowing habits, among other factors. Turtle ages (in years) are calculated to be at least 25 (N = 2 turtles), 28, 30, 31 (N = 2), 32 (N = 2), 33 (N = 2), 35, 36 (N = 2), 37, 38 (N = 2), 39 (N = 3), 40 (N = 2), 42, 44 (N = 2), 46, 53 (N = 2), 54, 58, and at least 62 years old (N = 2). Four of these turtles are known to be deceased, but twelve of these have been recaptured since 2018, and three of the four oldest turtles were last captured in the 2019 and 2020 field seasons.

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GOPHERUS AGASSIZII **(Agassiz's Desert Tortoise). OVERWINTER MOVEMENT.** During the winter, *Gopherus agassizii* brumate in self-constructed shelters that provide thermal protection from seasonally low temperatures (Nussear et al. 2007. Copeia 2007:378–386; Mack et al. 2015. J. Herpetol. 49:405–414). The deeper the burrow, the more it will buffer a tortoise from cold environmental temperatures (Woodbury and Hardy 1948. Ecol. Monogr. 18:145–200). *Gopherus agassizii* typically use one shelter during the entire brumation period, only emerging from their shelter during extreme rainfall events (Medica et al. 1980. Herpetologica 36:301–304), when they are physically disturbed (e.g., by predators, shelter collapse, human interactions), or on particularly warm days to bask (Woodbury and Hardy 1948. Ecol. Monogr. 18:145–200; Rautenstrauch et al. 1998. J. Wildlife Manage. 62:98–104). We studied the burrowing habits of a population of federally threatened *G. agassizii* in the Sonoran Desert of California, USA, on the northern slope of the Orocopia Mountains, ca. 2 km south of the southernmost border of Joshua Tree National Park (Cummings et al. 2020. Herpetol. J. 30:177–188). Tortoises were monitored monthly during the winter of 2017–2018 using radiotelemetry. This time overlapped with the normal duration of one brumation season, defined from the date tortoise surface activity levels decreased, through the time tortoises typically remained in one shelter at the end of the fall activity season until they first emerged the following spring activity season. The brumation period at our study site typically ranges from October/November to February/March. A total of five male and three female tortoises at this site each remained in one burrow for the extent of the brumation season, but one female was noted using two burrows.

This female tortoise entered brumation sometime between 20 October 2017 and 15 November 2017, using a deep soil burrow that was at least 140 cm in length. The burrow was next to a dead Creosote Bush (*Larrea tridentata*; Fig. 1). She was located in the same shelter on 18 December 2017 but was later found in a different shelter on 16 January 2018, almost 2 km away from the first shelter. The second shelter was a pallet (a shallow depression in the soil that does not form a burrow, often under the canopy of a shrub where a tortoise is concealed) under a White Rhatany Bush

PHOTO BY JEFFREY E. LOVICH

Fig. 1. *Gopherus agassizii* soil shelter used during brumation by a female from November 2017–January 2018.

(*Krameria bicolor*), ca. 8 m from an old, lightly trafficked highway (Fig. 2A). She created a tunnel through the dense branches, 26 cm into the center of the bush but did not burrow into the ground (Fig. 2B). This tortoise was located in this shelter three more times, until she moved to a different shelter on 9 April 2018.

Not only did this female use two shelters (one next to a roadway) during a brumation period, but she also lost the additional thermal protection that the soil burrow would have provided. Mack et al. (2015, *op. cit.*) suggested that pallet shelters are poor insulators from the environmental extremes of the desert. However, our study site is near the southern limit of the range of *G. agassizii* so winter temperatures are milder than northern locations in the Mojave Desert. Bailey et al. (1995. J. Herpetol. 29:361–369) found that females of the closely related Morafka's Desert Tortoises (*G. morafkai*) brumated in shelters that were closer to ambient temperatures with larger 24-hour temperature swings.

Almost no precipitation (rain) fell on the study site during the winter of 2017–2018, resulting in drought conditions the following spring season, and no germination of winter annual food plants (Cummings et al. 2020, *op. cit.*). A very small rainfall event occurred in December 2017, producing 0.15 cm of rain in the adjacent Joshua Tree National Park. This rainfall event may have affected the behavior of this female tortoise, causing her to emerge from her shelter in search of pooled water in the shallow asphalt depressions of the old highway (Medica et al. 1980, *op. cit.*) or to move closer to the road to take advantage of the enhanced productivity of the winter annuals from the "edge effect" created by the road (Lovich and Daniels 2000. Chelon. Conserv. Biol. 3:714–721) during a period of drought. However, no other tortoise at the site exhibited this behavior. Rautenstrauch et al. (1998, *op. cit.*) noted that tortoises disturbed by human handling during brumation may relocate to a new shelter, however, this tortoise was not handled during her brumation period. Changing burrows during brumation is not well documented in the literature for this species.

PHOTOS BY SHELLIE R. PUFFER

Fig. 2. A) *Gopherus agassizii* pallet shelter under a White Rhatany Bush (*Krameria bicolor*) used by a female from January–April 2018: A) this pallet shelter (entrance = black arrow) is located ca. 8 m from Highway 60 (an unmaintained, lightly trafficked highway; red arrow); B) the tortoise remained above ground and did not burrow into the soil.

We thank Jenna Norris and Erin Cox for assisting with this project, as well as Al Muth and Chris Tracy at Boyd Deep Canyon Desert Research Center (doi:10.21973/N3V66D) for providing housing. Research was supported by the Coachella Valley Conservation Commission. Research was conducted under permits from the U.S. Fish and Wildlife Service, the Bureau of Land Management, and the California Department of Fish and Wildlife. We are grateful to the Institutional Animal Care and Use Committee of Northern Arizona University for reviewing and approving our research procedures with tortoises. Any use of trade, product or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

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***GOPHERUS POLYPHEMUS* (Gopher Tortoise). BURROW ASSOCIATES.** *Gopherus polyphemus* occurs in the southeastern United States, typically in open canopy pine (*Pinus* spp.) forests and is considered a keystone species due in part to its habit of creating expansive burrows often shared by other organisms (Catano and Stout 2015. Biodivers. Conserv. 24:1957–1974). Jackson and Milstrey (1989. *In* Diemer et al. [eds.], Proceedings of the Gopher Tortoise Relocation Symposium, pp. 86–98. Florida Game and Fresh Water Fish Commission, Nongame Wildlife Program Technical Report No. 5, Tallahassee, Florida) summarized reports of 302 invertebrate and 60 vertebrate species documented within or otherwise using *G. polyphemus* burrows. Recent studies have increased the number of vertebrates associated with *G. polyphemus* burrows (Dziadzio and Smith 2016. Southeast. Nat. 15:586–594; White and Tuberville 2017. Wilson J. Ornithol. 129:792–803). Vertebrate species use *G. polyphemus* burrows for a variety of reasons and are generally separated into two groups: obligates, which spend a significant portion of their life within burrows or require burrows for reproduction (e.g., nesting), and associates that use burrows for refugia (from predators, temperature extremes, fire, etc.), foraging, basking, and/or display behavior (Dziadzio and Smith 2016, *op. cit.*; White and Tuberville 2017, *op. cit.*).

During burrow surveys in 2017–2020 within planted *P. taeda* (Loblolly Pine) and *P. palustris* (Longleaf Pine) stands located on a privately-owned, working forest in Washington Parish, Louisiana, USA, we occasionally observed *G. polyphemus* burrow associates while surveying with a burrow camera system (Environmental Management Services, Canton, Georgia). We observed amphibians and mammals including *Eurycea guttolineata* (Three-lined Salamander), *Incilius nebulifer* (Gulf Coast Toad), *Didelphis virginiana* (Virginia Opossum), *Sylvilagus floridanus* (Eastern Cottontail), and *Peromyscus* spp. (deer mice).

To our knowledge, our observations of *E. guttolineata* and *I. nebulifer* are the first reports of these species within *G. polyphemus* burrows. We detected one *E. guttolineata* on 27 June 2017 at 1040 h within an inactive burrow ca. 1 m from the entrance. The burrow was partially flooded (i.e., only flooded at the end of the burrow) after recent rain. After observing the salamander for ca. 3 min, it moved away from the camera and entered a small, branching tunnel within the side of the burrow. This burrow was ca. 180 m from a streamside management zone (SMZ), which is a buffer of mature forest along a stream to help maintain water quality. We detected one *I. nebulifer* on 14 July 2017 at 1650 h at the end of an inactive tortoise burrow ca. 1 m from the entrance. This burrow was ca. 200 m from the nearest SMZ.

While various species of anurans have been documented using *G. polyphemus* burrows, reports of salamanders observed within tortoise burrow systems are uncommon. To our knowledge, four salamander species have been previously documented within *G. polyphemus* burrows: *Ambystoma talpoideum* (Mole Salamander; Heupel et al. 2009. Herpetol. Rev. 40:66; Jensen et al. 2019. Herpetol. Rev. 50:334), *A. tigrinum* (Eastern Tiger Salamander; Jensen et al. 2019, *op. cit.*), *E. cirrigera* (Southern Two-lined Salamander; Goodman et al. 2020. Effects of habitat type on the use of gopher tortoise [*Gopherus polyphemus*] burrows by burrow associates on a large military installation in Florida. Final report to Department of Defense), and *Notophthalmus viridescens* (Eastern Newt; Jackson and Milstrey 1989, *op. cit.*; Kent and Snell 1994. Florida Field Nat. 22:8–10). While some previous studies have reported salamanders within burrows as accidental, our observation provide evidence that salamander species may use *G. polyphemus* burrows at least as temporary refugia and/or inhabit burrows when they are available. At our study site, burrows can remain flooded for multiple weeks after heavy rains due, in part, to the sandy loam soils with low drainage conductivity. Therefore, these burrows may provide favorable moisture conditions for prolonged periods compared to elsewhere in the *G. polyphemus* range where sandy, well-drained soils are more prevalent.

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***PODOCNEMIS UNIFILIS* (Tracajá). OMPHALOCELE.** The omphalocele is a defect in the abdominal wall of neonate turtles (and other vertebrate groups) and occurs because of a deformity in the closure of the abdominal wall at the level of the umbilical ring and the non-reintegration of the primitive umbilical loop, leading to variable herniation of the abdominal viscera (Hidaka et al. 2009. Obst. Gynaec. Res. 35:40–47). This anomaly has apparently not been reported in turtles of the family Podocnemididae. *Podocnemis unifilis* is a podocnemid with a wide distribution in northern South America, occurring in all Brazilian states within the Amazon basin (Ferrara et al. 2017. Quelônios Amazônicos: Guia de Identificação e Distribuição, Manaus, Brazil. 180 pp.). This species nests on sand beaches or clay banks of rivers and lakes, deposits 11–49 eggs per clutch, and may nest twice per reproductive season; the incubation period varies from 45–70 d (Vogt 2008. Tartarugas da Amazônia. Instituto Nacional de Pesquisas da Amazônia, AMAZON Conservation Association, Manaus, Brazil. 104 pp.). Here, we describe cases of omphalocele occurring during the embryonic development of *P. unifilis* incubated at a constant temperature.

Between October and December 2018, 100 eggs (from five different nests) of *P. unifilis* were collected and incubated in an incubator (BOD - 342L®) at 32°C, for the incubation period of 60 d (SISBIO nº 39472-9; CEUA/INPA nº 050/2018). A total of 93 embryos showed normal development; however, two embryos from the same nest presented with omphalocele defects. A 33-day-old embryo was smaller and had a more rounded body compared to other individuals of the same age, indicating that this individual had developmental delay in addition to having an omphalocele, characterized by the exposure of part of the liver, intestine, and heart (Fig. 1). A second embryo, at 34 d of incubation, also presented with an omphalocele resulting from a wide opening in the plastron, with almost total exposure of the liver and intestine; this malformation was associated with central elevation in the cranial portion of the carapace, a right hind limb with three malformed claws and a left hind limb with no formation of the digital plate and claws (Fig. 2A–C).

The origin of omphaloceles is not well defined; one classification describes as large or giant omphaloceles those that present with the liver inside the hernial sac, due to a defect in the development of the lateral discs of the embryonic mesoderm and resulting in failure to close the abdominal wall (Patel et al. 2009. Ped. Surg. Int. 25:413–416). Bárcenas-Ibarra et al. (2017. Vet. Pathol. 54:171–177) described an Olive Ridley (*Lepidochelys olivacea*) hatchling with a malformation similar to an omphalocele; the embryo presented with cervical curvature and had an opening in the abdominal region leaving the viscera almost completely exposed (noted as *Schistosomus reflexus* syndrome). The embryos of *P. unfilis* noted above did not present with cervical curvature and had a lesser degree of deformity in the formation of the plastron, thus we classify our results as being simple omphalocele. It was curious that the omphalocele was found in two individuals in the same reproductive season and from the same nest, suggesting that the cause of these omphaloceles could be due to environmental or genetic factors.

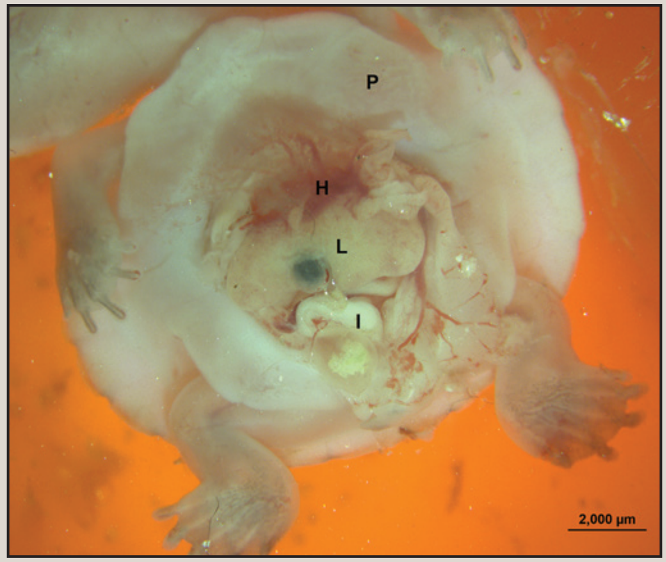

Fig. 1. Embryo of *Podocnemis unifilis* at 33 d of incubation. Ventral view of the embryo showing the plastron (P) with exposure of part of the liver (L), intestine (I), and heart (H).

Fig. 2. Embryo of *Podocnemis unifilis* at 34 d of incubation: A) dorsal view of the embryo with central elevation in the cranial portion of the carapace (C); B) ventral view of the embryo showing the plastron (P) with an almost total exposure of the liver (L) and intestine (I), and the left posterior limb without formation of the digital plate and claws (LL); C) Right posterior limb with three malformed claws (RL).

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***PSEUDEMYS CONCINNA FLORIDANA* (Coastal Plain Cooter). SIZE RECORD.** This subspecies is a large, herbivorous, freshwater turtle occurring in the southeastern coastal plain of the USA, from extreme southeastern Virginia southward through the panhandle of Florida and westward to the vicinity of Mobile Bay, Alabama. It occurs in high densities in some Florida spring runs. This turtle was formerly harvested for food and the aquarium trade but is now protected in some states in its range (Ward and Jackson 2008. *In* Rhodin et al. [eds.], Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, pp. 006.1–006.7. Chelon. Res. Monogr. 5). The number of species, and subsequent subspecies, in the genus *Pseudemys* have been frequently disputed. We follow the current SSAR Checklist in considering *P. c. floridana* a subspecies of *P. concinna*. However, Powell et al. (2016. Peterson Field Guide to Reptiles and Amphibians of Eastern and Central North America. Fourth edition. Houghton Mifflin Harcourt, Boston, Massachusetts. 494 pp.) recognize *P. concinna* and *P. floridana* as distinct species. Our interpretation, therefore, allows two record lengths, one for *P. c. floridana* and one for *P. concinna*.

On 1 February 1967, EHW live collected by hand 30 specimens by snorkeling at night in the lake and spring run of Yates Springs near Brinson, Decatur County, Georgia, USA (30.9421°N, 84.743°W; WGS 84; 27.4 m elev.). He had the permission of the owner of the property and the species was not then protected in Georgia. The largest two specimens were taken to Robert H. Mount (Auburn University Museum of Natural History [AUM]). The remaining 28 were released alive. Our specimens were deposited and identified as River Cooters (*Pseudemys concinna*) by Mount (AUMH 8725, 8726). We re-examined, measured, and photographed these specimens on 25 July 2018. We augmented the museum records with straight line (SCL) and curved (CCL) carapace lengths (AUM 8725: 34.4 cm SCL, 36.8 cm CCL; AUM 8726: 34.7 cm SCL, 36.7 cm CCL), as well as photographs, subspecies names, and more precise collection locality (verified by D. Laurencio).

At the time of deposition, our specimens were the largest *P. concinna* ever recorded (Mount, pers. comm.). Our specimens still represent some of the few deposited, specimen-confirmed lengths for *P. c. floridana*. According to SREL (2020. https://srelherp.uga.edu/turtles/psecon.htm, accessed 6 Aug 2020), the maximum measured carapace length for this species is 30.5 cm. In some other recent summaries, the maximum carapace length is 33 cm (e.g., www.herpsoftexas.org/content/river-cooter, 6 Aug 2020). Thus, our carapace length of 34.4 and 34.7 cm remain the verified records. Other authors have suggested greater maximum carapace lengths; however, these appear to be based on field observational estimates, not measurements, and in any case are not confirmed by vouchered depositions. Powell et al. (2016, *op. cit.*) recognized *P. concinna* and *P. floridana* as distinct species with maximum carapace lengths of 37.5 and 39.7 cm, respectively; however, the basis for these lengths was not presented.

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***STERNOTHERUS CARINATUS* (Razor-backed Musk Turtle) and *STERNOTHERUS PELTIFER* (Stripe-necked Musk Turtle). BIFID TAIL.** Tail regeneration capabilities have been documented, to some degree, in all extant orders of reptiles (Kuchling 2005. Chelon. Conserv. Biol. 4:935–937). Sometimes during tail regeneration, a bifurcation event occurs, and a regenerate tail will stem from an original tail or another regenerate tail (Kuchling 2005, *op. cit.*). Bifurcations usually stem from incomplete tail autotomies or ruptures in species with autotomous tails. Turtles, however, do not exhibit tail autotomy, but cases of tail bifurcation events through regeneration have been documented in Australian chelids (Kuchling 2005, *op. cit.*), South American chelids (Rodrigues and Silva 2013. Herpetol. Rev. 44:308–309), and Snapping Turtles (*Chelydra serpentina*: Rahman 2011. Herpetol. Rev. 42:265). Herein, I report the first documentation of bifid tails in Kinosternidae.

PHOTO BY GROVER BROWN

Fig. 1. Razor-backed Musk Turtle (*Sternotherus carinatus*) with a bifid tail from southern Mississippi, USA.

PHOTO BY GROVER BROWN

Fig. 2. Stripe-necked Musk Turtle (*Sternotherus peltifer*) with a bifid tail of a from southern Mississippi, USA.

On 25 September 2018, I captured an adult male *Sternotherus carinatus* (114.3 mm SCL, 215 g; Fig. 1) in George County, Mississippi, USA and on 26 May 2019, I captured a small male *S. peltifer* (73.3 mm SCL, 65 g; Fig. 2) from Lamar County, Mississippi. Both turtles exhibited some degree of tail bifurcation, with the *S. carinatus* exhibiting a more pronounced bifid tail than the *S. peltifer*.

In non-autotomous forms of lizards, Etheridge (1967. Copeia 1967:699–721) suggested that tail regeneration was stimulated by damage to vertebrae and not because of intervertebral separation (see also Kuchling 2005, *op. cit.*). The *S. carinatus* had damage to the posterior marginal scutes of the carapace in close proximity to the tail, and it is possible that the tail was injured at the same time. The *S. peltifer* did not have visible signs of damage to the posterior carapace, but other species of *Sternotherus* are known to exhibit male-male aggression (Jackson 1969. Herpetologica 25:53–54; Pignatelli et al., unpubl. data). Of the eight turtle species now reported with bifid tails (Kuchling 2005, *op. cit.*; Rahman 2011, *op. cit.*; Rodrigues and Silva 2013, *op. cit.*; this report), seven were males. This might suggest that male-male combat and/or aggression is a possible cause of tail bifurcation events, but this is conjecture, as many turtle species are also sexually dimorphic, with males having longer tails that could be more prone to injury.

Although not all tail bifurcations can be attributed to the regenerative process (e.g., Siamese twinning and axial bifurcations; Kuchling 2005, *op. cit.*), a radiograph would be necessary to determine the root cause. Neither of these turtles were radiographed, nor was there further study of their histology. Of the previously mentioned bifurcation events in turtles, only Kuchling (2005, *op. cit.*) radiographed the bifid tail, thus additional observations with radiographs of tail bifurcation events would be informative.

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***STERNOTHERUS MINOR* (Loggerhead Musk Turtle). MORTALITY.** Faunal surveys are necessary to understand the diversity, distribution, biology, and conservation of organisms. Numerous trapping methods have been developed and optimized for various groups of animals. Despite targeting particular taxa of interest, the capture of non-target organisms ("bycatch") is a common occurrence. One example is the bycatch of vertebrates resulting from invertebrate sampling methods. Vertebrate bycatch is most often seen in pitfall, ramp, or glue/sticky traps (Pearce et al. 2005. Can. Entomol. 137:233–250; Weary et al. 2019. Pan-Pac. Entomol. 95:21–32). Much less often does vertebrate bycatch occur in UV light pan traps. UV light pan traps consist of a shallow white pan filled with ethanol and a UV light attached to a power source and are used to monitor a wide array of insect taxa (Calor and Mariano 2012. EntomoBrasilis. 5:164–166). When such bycatch does occur, frogs appear to be the most frequent victims. Here, we report the first (to our knowledge) instance of turtle mortality due to a UV light pan trap.

The reported mortality event occurred during an ongoing aquatic invertebrate survey of the Upper St. Marks River Basin, Leon County, Florida, USA. The trap was deployed ca. 1 m from the margin of the St. Marks River near Horn Spring (30.31692°N, 84.13275°W; WGS 84) on 28 October 2020 at 0815 h and recovered at 2100 h. Upon recovery of the trap, an adult specimen of *Sternotherus minor* (sex undetermined) was encountered deceased in the 80% ethanol. The turtle was carapace-down on the margin of the pan, its head submerged in ethanol, and surrounded by many insects including large moths. The turtle was removed from the pan prior to the photograph in hopes that it was still alive.

We speculate that this individual of *S. minor* was attempting to predate upon the many insects attracted to the UV light, climbed over the lip of the pan to access the flying insects, and in doing so rolled onto its back. Given that this species exhibits bimodal respiration and obtains some of its oxygen cutaneously underwater (Gatten 1984. Herpetologica 40:1–7), the specimen likely succumbed to the ethanol.

The mortality incident here is certainly a notable instance of vertebrate bycatch. For example, one of the authors (AKR) has been UV light pan trapping for over 25 years (> 1000 sampling events) and has never witnessed a trap-related turtle mortality event. Although extremely rare, it is possible that this means of death could impact other kinosternids that also demonstrate bimodal respiration. To minimize vertebrate bycatch when using UV light pan traps to sample aquatic insects near waterbodies, frequent monitoring of the light trap, a physical barrier around the perimeter of the trap, and/or a wide-diameter mesh hardware cloth covering the pan might be effective while still allowing successful insect capture.

We thank Grover Brown for confirming our identification of the turtle.

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***TERRAPENE BAURI* (Florida Box Turtle). ATTEMPTED PLASTIC INGESTION.** The ingestion of plastic by wildlife has received increasing attention due to both the ubiquity of plastic waste in the environment and the mortality and morbidity associated with ingestion. Consumption and entanglement in anthropogenic litter, largely comprised of plastics, is a recognized threat to marine and estuarine reptiles (reviewed by Stafferi et al. 2019. Environ. Sci. Pollut. Res. 26:1238–1249), but few observations have been reported for terrestrial chelonians. Herein, I report the observation of attempted ingestion of plastic waste by a wild *Terrapene bauri*.

On 27 November 2020 at 1023 h, I investigated a noise alongside a path at the Carter Creek tract of the Lake Wales Ridge Wildlife and Environmental Area, Highlands County, Florida, USA (27.54911°N, 81.41324°W; WGS 84; 33 m elev.) which led me to an adult male *T. bauri* that was repeatedly biting at a partially melted plastic beverage container (Fig. 1A). The discarded polyethylene terephthalate (PET) bottle was likely burned during a prescribed fire that is commonly used to manage the xeric scrub habitat of this area. Strikes from the turtle were directed towards the melted portion of the bottle, but were unsuccessful in gripping the bottle, causing it to be pushed through the vegetation. The plastic was sufficiently hard making it unlikely that what remained could have been dislodged and consumed. The melted portion was disfigured and both black (charred) and white, with some soil and plant debris embedded (Fig. 1B). This may have resulted in the plastic superficially resembling a gastropod or fungi, both of which are known to be consumed by *T. bauri* (Krysko et al. 2019. Amphibians and Reptiles of Florida. University Press of Florida, Gainesville, Florida. 706 pp.).

Of the 8.3 million tons of plastics produced through 2015, 79% is estimated to be in landfills or the natural environment (Geyer et al. 2017. Sci. Adv. 3:e1700782). Ingestion of trash by terrestrial che-

Fig. 1. A) *Terrapene bauri* and plastic litter, as found; B) the turtle's bites were directed at the portion of the sports drink bottle that was partially melted, possibly resembling a food item.

lonians has only been infrequently reported, perhaps due to the rarity of observing what are primarily chance encounters (Walde et al. 2007. West. N. Am. Nat. 67:147–149). A Mohave Desert Tortoise (*Gopherus agassizii*) was found to have consumed 108 cm of a ribbon attached to a piece of balloon in California (Walde et al. 2007, *op. cit.*) and MacDonald and Mushinsky (1998. Hereptologica 44:345–353) reported a variety of "manufactured materials" in the scat of Gopher Tortoises (*G. polyphemus*). Although the negative impacts of the consumption of plastic by marine turtles is well known, the possibility that it may also be of conservation concern for terrestrial chelonians is worthy of further consideration.

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***TERRAPENE CAROLINA* (Eastern Box Turtle). SCAVENGING.** *Terrapene carolina* is an omnivorous terrestrial species found throughout eastern North America that is known to consume carrion (Dodd 2001. North American Box Turtles: A Natural History. University of Oklahoma Press, Norman, Oklahoma. 231 pp.). This note documents two observations of *T. carolina* scavenging on vertebrate carrion, including remains of *Thamnophis sauritus* (Eastern Ribbonsnake) and *Odocoileus virginianus* (White-tailed Deer).

Fig. 1. Adult female *Terrapene carolina* (Eastern Box Turtle) scavenging a *Thamnophis sauritus* (Eastern Ribbonsnake) on Jekyll Island, Georgia, USA.

Fig. 2. A radio-tracked adult female *Terrapene carolina* (Eastern Box Turtle) scavenging an *Odocoileus virginianus* (White-tailed Deer) on Jekyll Island, Georgia, USA.

On 29 November 2017 at 1007 h, a radio-tracked adult female *Terrapene carolina* was observed eating a freshly dead *Thamnophis sauritus* (Fig. 1) in maritime forest habitat on Jekyll Island, Georgia, USA (31.07361°N, 81.40836°W; WGS 84). When approached, the *Terrapene carolina* retreated into its shell. After a short period, the *T. carolina* emerged from its shell and hanging from its beak was a small piece of tissue from the deceased

Thamnophis sauritus. Portions of the snake's internal organs, connective tissue, and rib bones were exposed. *The T. sauritus* appeared to have died recently, as its carcass was neither completely desiccated nor stiff.

In a second observation made on 25 October 2020 at 1202 h, a different radio-tracked adult female *Terrapene carolina* was observed scavenging the dried carcass of an adult *O. virginianus* (Fig. 2), also in maritime forest habitat on Jekyll Island (31.06333°N, 81.41309°W; WGS 84). The *O. virginianus* carcass consisted of an intact skull, dried hide with fur, disarticulated ribs, vertebrae, and leg bones with pieces of fleshy connective tissue. When found, the *T. carolina* did not retreat into its shell but was actively crawling around the carcass with a piece of leg connective tissue in its mouth. To our knowledge, these are the first recorded observations of *T. carolina* scavenging on *T. sauritus* or *O. virginianus*. These observations illustrate the opportunistic scavenging behavior characteristic of *Terrapene carolina*.

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TERRAPENE CAROLINA CAROLINA **(Eastern Box Turtle). DOUBLE CLUTCHING.** Double clutching has been occasionally reported in free-roaming *Terrapene c. carolina* as far north as 39.7°N in Newark, Delaware, USA (Kipp 2003. M.S. Thesis, University of Delaware, Newark, Deleware. 78 pp.). In contrast, studies of *T. c. carolina* farther north in the subspecies range reported no instances of multiple clutching 42.3°N in the Connecticut River Valley of Massachusetts, USA (Willey 2010. Ph.D. Dissertation, University of Massachusetts Amherst, Amherst, Massachusetts. 200 pp.) or at 40.5°N in Long Island, New York, USA (Burke and Capitano 2011. Am. Midl. Nat. 165:137–142.).

Here, we report two instances of double clutching in Massachusetts, at a site near the northeastern extreme of the range of *T. c. carolina*. In 2017 and 2019, we documented double clutching by two different *T. c. carolina* in Middlesex County, Massachusetts, less than 4 km from the New Hampshire border (42.7°N, 71.5°W). On 19 May 2017 we observed a radio-tagged female (F#2) dig and complete a nest; she was observed nesting again on 17 June 2017. A different radio-tagged female (F#3) was documented nesting on 31 May 2019 and again on 19 June 2019. The four nests were screened to protect eggs from predation, and the eggs were removed from the nest cavity after 60 d for continued incubation indoors. None of the eggs in the first clutches of both females hatched nor showed evidence of developed embryos (N = 5 and 6 eggs respectively). Also, in both cases, we recovered live hatchlings from the second clutches (two of three eggs in the second 2017 clutch and six of seven eggs in the 2019 second clutch). Over three years of radiotracking ten adult female *T. c. carolina* we observed 17 instances of females nesting in a given year at this Massachusetts site; in 15 cases (88%) we only observed females depositing a single clutch in one nesting season, though it is possible that we missed a small number of double clutching events. In both observed instances of double clutching among *T. c. carolina* at our site, only one of the two clutches had viable eggs, thus we have yet to observe successful double clutching in *T. c. carolina* in Massachusetts.

Work on this project was permitted by the Massachusetts Division of Fisheries and Wildlife and funding to support our work with *T. c. carolina* was provided by the Massachusetts Natural Heritage and Endangered Species Program and the William P. Wharton Trust.

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TERRAPENE CAROLINA CAROLINA **(Eastern Box Turtle). MYIASIS.** Myiasis is a term used to describe the presence of maggots in the tissue and organs of a live animal. Cases of small mammal myiasis are found extensively within the literature; reports in reptiles are somewhat scarcer but are well documented in *Terrapene carolina carolina* (Peters 1948. Am. Midl. Nat. 40:472–474; Gould and Georgi 1991. J. Am. Vet. Med. Assoc. 199:1067–1068).

On 8 October 2020 at 1015 h, an adult male *T. c. carolina* found in rural North Carolina, USA was presented to a wildlife clinic with a suspected aural ("ear") abscess. On initial examination, this turtle was alert, and responsive, with enophthalmos (posterior displacement) of the left eye. There was only one open nare present, with slightly overgrown tomia. The turtle was euhydrated and had a 1.5 × 1.5 cm cutaneous abscess at the base of the left aural cavity. There was caseous, necrotic debris present at the cranial extent of the abscess. The top differential diagnosis was aural abscessation that would require surgical debridement. Aural abscesses are the second highest cause of morbidity and mortality in *T. c. carolina*, resulting in the accumulation of caseous debris in the middle ear cavity and occasional bone remodeling (Brown et al. 2004. J. Wildl. Dis. 39:918–921). Aural abscesses in *T. c. carolina* have been linked to hypovitaminosis A resulting from organochlorine compounds in the environment (Holladay et al. 2001. Ecotoxicol. Environ. Saf. 48:99–106; Brown et al. 2004. J. Wildl. Dis. 40:704–712; Sleeman et al. 2008. J. Wildl. Dis. 44:922–929).

Following the initial examination, sedation was achieved with a combination of dexmedetomidine (Dexdomitor®; 150 mcg/kg), ketamine (Ketaset; 5 mg/kg), and morphine (1.5 mg/kg) administered intravenously. After preparing the area with povidone iodine scrub and 0.9% sterile saline, an incision was made along the ventral aspect of the abscess with a #15 scalpel blade. The abscess was irrigated with sterile saline and caseous material removed. Five fly larvae were visualized in the wound (Fig. 1). The larvae were manually removed with forceps and the site was debrided and flushed copiously with sterile saline, dilute povidone iodine, and nitenpyram solution (Capstar®, Elanco, Greenfield, Indiana, USA). The larvae were placed into a sterile vial for analysis by a clinical parasitologist (Fig. 2). The dorsal aspect of the defect was closed by suturing the edges of the skin using 3-0 polyglactin 910 (Vicryl®, Ethicon, Johnson & Johnson) in a horizontal mattress pattern. The ventral aspect was left open to allow for adequate drainage. The turtle was administered subcutaneous fluids (2% bodyweight lactated ringer's solution), an intramuscular anti-inflammatory injection (ketorolac, 0.25 mg/kg), and an intramuscular sedation reversal agent (atipamezole, Antisedan®, Orion Pharmaceuticals).

Based on spiracular morphology, the maggots were identified as members of the family Sarcophagidae and are likely *Cistudinomyia* (*Sarcophaga*) *cistudinis.* The larvae laid on the host are not able to penetrate the skin's surface and require significant breaks in the skin in order to infiltrate the underlying tissue; therefore, it is likely that this is a case of wound myiasis secondary to the rupture of an aural abscess (Jacobson 2004. J. Zoo Wildl. Med. 25:2–17). The open wound in this case would present

PHOTO BY CHRISTIAN M. CAPOBIANCO

Fig. 1. Sarcophagid larvae in the aural cavity of an adult male *Terrapene carolina* from North Carolina, USA, following surgical incision and debridement of the abscess.

PHOTO BY DANIEL MEJIA

Fig. 2. Sarcophagid larva following removal from the aural cavity.

a perfect opportunity for the adult fly to deposit the larvae. This *T. c. carolina* recovered without incident and has been released where it was originally found.

We thank the members of North Carolina State University Turtle Rescue Team for their help during this case. We are particularly grateful for the assistance provided by Daniel Mejia and Sabrina L. Kapp.

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CROCODYLIA — CROCODILIANS

***CAIMAN LATIROSTRIS* (Broad-snouted Caiman). REPRODUCTION IN SOUTHERN BRAZIL.** *Caiman latirostris* is a widely distributed species found in both natural and urbanized environments, although studies have indicated that urban expansion is one of its major threats in Brazil (Coutinho et al. 2013. Biodivers. Bras. 3:1320). The species' nests are mounds of vegetation located in forests, savannas, or on floating mats (Mourão and Campos 1995a. Biol. Conserv. 73:2731; Montini et al. 2006. Phyllomedusa 5:9196) and the nesting period extends from December to March, with hatching been reported in early March (Campos and Mourão 1995b. Herpetol. Rev. 26:203204).

On the nights of 21 and 22 March 2015, during nocturnal spotlight count surveys of *C. latirostris* in a set of lagoons of the Tramandaí River Basin on the Coastal Plain of Rio Grande do Sul, Brazil, we captured, measured, and marked the two groups of hatchlings on a carpet of dense floating vegetation in the freshwater Fazenda Ipê Lagoon. The Fazenda Ipê is 23.87 ha^2, and is one of the 41 lagoons of the Tramandaí River Basin. The lagoon is 4 and 7 km, respectively, from the urban centers of Osório and Tramandaí municipalities, and is surrounded by native vegetation and non-native *Eucalyptus* plantations. The 21 March group consisted of 15 neonates (mean SVL = 13.37 cm ± 0.26 SD, mean total length = 27.37 cm ± 0.49 SD, mean mass = 3.42 g ± 0.29 SD) found along the northern edge of the lagoon (29.9195°S, 50.1959°W; WGS 84; 1 m elev.; Fig. 1), and the 22 March group consisted of 27 neonates (mean SVL = 12.46 cm ± 0.27 SD; mean total length 26.01 cm ± 0.54 SD; mean mass = 2.63 g ± 0.21 SD) found along the southern edge of the lagoon (29.9235°S, 50.1993°W; WGS 84; 1 m elev.; Fig. 1).

During a survey on 20 February 2015 in the lagoon, we detected juveniles, sub-adults and adult individuals, but no neonates; and according to the known reproductive period of the species, we believe the young we saw in March hatched within this interval (Campos and Mourão 1995b, *op. cit.*). Because neonates remain together close to the nest in sibling groups

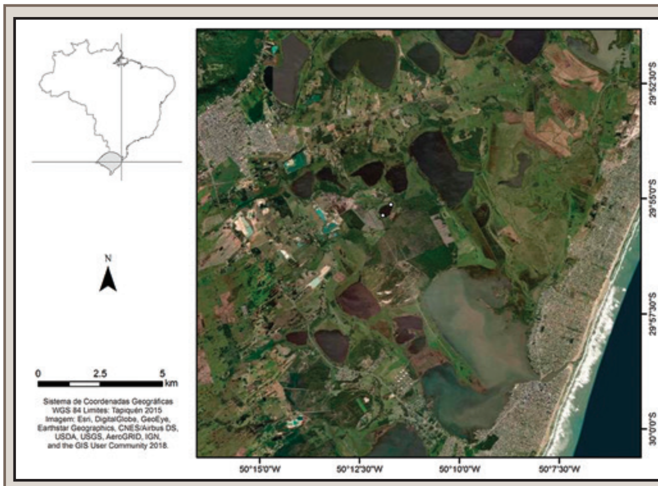

Fig. 1. Location of the two groups of *Caiman latirostris* hatchlings found (white circles) at the Lagoon Fazenda Ipê of the Tramandaí River Basin, Rio Grande do Sul, southern Brazil.

after hatching, their occurrence in the Fazenda Ipê Lagoon is evidence that at least two females nested in the vicinity of the lagoon (Borteiro et al. 2006. Phyllomedusa 5:97108; Eversole et al. 2018. J. Urb. Ecol. 2018:19).

This report is significant because it is the first observation of *C. latirostris* reproduction in the Tramandaí River Basin, a region under increasing urbanization. The sensitivity of this species to urbanization is an unknown threat, and continued monitoring is needed, especially in places that may harbor nests but remain unknown. This population is not under legal protection, unlike the closest known population (Melo 2002. *In* Verdade and Larriera [eds.], La Conservación y el Manejo de Caimanes e Cocodrilos de América Latina, pp. 119–125. CN Editora, Piracicaba, São Paulo, Brazil), which is being studied and inhabits a legally protected area on the south of the Rio Grande do Sul Coastal Plain, the Taim Ecological Station (Federal Law 9.985/2000).

All procedures described were registered in the National System of Biodiversity Information–SISBIO (ICMBio) with the authorization number 44234–1, and in Ethics Committee on the use of Animals–CEUA (UFRGS) with the number 27317. We thank Bruna Arbo Meneses for the map.

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CROCODYLUS ACUTUS **(American Crocodile). HOMING.** Crocodilians have well-developed homing abilities that include using the Earth's magnetic field (Rodda 1984. J. Comp. Physiol. A 154:649–658). This allows them to detect their position and orientation from displaced points outside area of familiarity, e.g., translocated juvenile crocodilians may be homeward oriented when released (Rodda 1984. Behav. Ecol. Sociobiol. 40:444–451). American Crocodile adults disperse through oceanic water as their sublingual salt glands are fully developed and functional (Mazzotti et al. 1989. Amer. Zool. 29:903–920), differently from juveniles who experience a physiological boundary for oceanic migration (Ellis 1981. J. Herpetol. 15:187–192). Young individuals exhibit smaller home ranges and move short distances. For example, 22-month-old radio-tagged *C. acutus* remained 700 m from the nest (Rodda 1984. Herpetologica. 40:444–451); a 3.5-year-old recaptured individual showed movements of 1.6 km from the nest; furthermore, homing behavior for translocated individuals is only known for adults and has not yet been reported for juveniles (Cupul-Magaña 2012. Bol. Invest. Mar. Cost. 41:479–483).

On 1 May 2019 a juvenile *C. acutus* (41.0 cm SVL, 37.2 cm tail length) was accidentally captured by fishermen in the Medihuaca River Delta, Departamento del Magdalena, Colombia (11.2754°N, 3.8599°W; WGS 84; 4 m elev.) and was turned over to the local environmental authority CORPAMAG. The animal was tagged with a microchip implanted under the nuchal rosette (#[900]113000077183), had its crest scales clipped with a unique identifier, and had a plastic tag (M1) attached. Later in the day, this individual was relocated at the wetland formed by Quebrada Valencia and Quebrada del Tigre (11.2544°N, 73.7907°W; WGS 84; 8 m elev.), 7.92 km from the capture site. Seven months later, on 1 December 2019, this individual was recaptured (49.5 cm SVL, 43.9 cm tail length, 2254 g) at its initial capture site in the Mendihuaca River Delta, having travelled at least 7.92 km from the relocation site.

To our knowledge this record is the longest homing movement reported for a juvenile *C. acutus*. Surrounding flood plains may have facilitated homing after translocation, during the wet season, freshwater paths are formed between the capture and release sites, allowing the tagged individual to navigate back home.

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PALEOSUCHUS PALPEBROSUS **(Cuvier's Dwarf Caiman). NEONATE VOCALIZATION.** Adult crocodilians reserve acoustic interactions for courtship and territorial protection events (Garrick et al. 1982. Bull. Amer. Mus. Nat. Hist. 160:53–192). In small caimans, these vocalizations are structurally basic and display few variations (Marler 1961. J. Theor. Biol. 1:295–317; Campbell 1973. Zoologica 58:1–11; Herzog and Burghardt 1977. Zeitschrift für Tierpsychologie 44:294–304). In neonate caimans, vocalizations are present even before egg hatching and are used to establish communication with both parents and siblings (Vergne and Mathevon 2008. Current Biol. 18:513–514). Among their vocal repertoire, an incubation call issued in association with an egg-hatching context and an agonistic call, of paramount importance in parental care, aiming at predator avoidance and other threats (Vergne et al. 2009. Biol. Rev. 84:391–411; Roberto and Botero-Arias 2013. Zootaxa 3647:593–596), have been reported.

Paleosuchus palpebrosus is a small South American crocodilian that exhibits parental care, where after nesting the young are usually accompanied by their mother and begin leaving the group at approximately twelve months of age (Campos et al. 2012. J. Nat. Hist. 46:2979–2984). Due the species' cryptic behavior there is a general lack of behavioral information (Campos et al. 2013. J. Therm. Biol. 38:20–23), especially for hatchlings. For example, hatchlings of some crocodilians have pre- and post-hatching calls that provide cues to the mother or siblings from a nest (Vergne et al. 2009. Biol. Rev. 84:391–411), but to our knowledge such vocalizations have not been reported in *P. palpebrosus*. Herein we report the first vocalizations in post-hatching *P. palpebrosus* from northeastern Brazil and compare their acoustic parameters with other crocodilians.

Data collection took place at the Dois Irmãos Reservoir located in the Dois Irmãos State Park (PEDI), in an Atlantic Rainforest fragment in the city of Recife, Pernambuco, Northeastern Brazil (8.0143°S, 34.9467°W; WGS 84; 10 m elev.). On 29 March 2015 we located a *P. palpebrosus* nest, constructed with leaves and branches, with 14 eggs near the water line along the shore of the reservoir. We monitored the nest until the 14 eggs successfully hatched on 8 May 2015 at ca. 1700 h (Correia et al. 2019. Herpetol. Rev. 50:778–779) and at this time heard the hatchlings emit vocalizations. We recorded eight different vocalizations from two hatchlings (measured with a digital pachymeter 0.1 mm; individual A: 21.3 cm total length, 33 g; individual B: 20.5 cm total length, 37 g) with a Marantz PMD 620 recorder coupled to a unidirectional Sennheiser ME 66 microphone configured at 44 KHz in 16 bits. At the time of recording relative humidity was 53% and air temperature was 30°C.

The acoustic data were analyzed using the Raven Pro 1.5 software (settings: DFT = 256, type = Hann; brightness and contrast = 50, standard values; Cornell Lab of Ornithology, USA).

Table 1. Mean and standard deviation of the assessed spectral and temporal acoustic parameters during agonistic singing of two *Paleosuchus palpebrosus* neonates recorded at the Dois Irmãos State Park, Recife, Pernambuco, Brazil. The relative humidity of the air at the time of recording was 53%, at a temperature of 30°C.

Parameters	Neonate 1	Neonate 2	Mean
Call duration (s)	0.21±0.04	0.19±0.03	0.2±0.034
Maximum frequency	1937.3±471.5	2549.8±1081.9	2320.1±912.6
Harmonics (Downsweep)	6.66±1.52	7.6±2.5	7.25±2.12
Minimum frequency	455.5±185.2	487.5±102.6	475.5±126.9
Amplitude	15735.0±5215.6	24833.4±4784.1	21421.5±6559.3
Interval between calls	1.6±0.53	1.15±0.51	1.34±0.61
Dominant frequency	875.0±216.5	975.0±156.8	937.5±173.5
Length (cm)	10.5	10.8	–
Weight (g)	33	37	–

Table 2. Comparison between the analyzed acoustic parameters during agonistic singing of *Paleosuchus palpebrosus* neonates from the Dois Irmãos State Park, Pernambuco, Brazil in relation to other Alligatoridae and Crocodylidae species presenting available data in the literature. M = means; SD = standard deviation; N = number of individuals; (s) = seconds; (Hz) = Hertz; (dB) = decibels.
Species codes: PAPA = *Paleosuchus palpebrosus*; CACR = *Caiman crocodilus*; MENI = *Melanosuchus niger*; CAYA = *Caiman yacare*; CRNI = *Crocodylus niloticus*; CRAC = *Crocodylus acutus*.

Family	Species	Reference	Call	Interval	Max.	Min.	Amplitude	Dominant	No. of	Modulation
Alligatoridae	PAPA	Present study	M = 0.2; DP = 0.03; N= 8	M = 1.34; DP = 0.61	M = 2320.1; DP = 912.6	M = 475.5; DP = 126.9	M = 21421.5; DP = 6559.3	M = 937.5; DP = 173.5	M = 7.25; DP = 2.12	Downsweep
	CACR	Roberto & Botero-Arias 2013. Zootaxa 3647:593–596	M = 0.21; DP = 0.03; N = 20	M = 1.70; DP = 1.58; N = 19	M = 14395; DP = 1197; N = 20	M = 137.3; DP = 148.2; N = 20	–	M = 1231.7; DP = 220.2; N = 20	–	Downsweep
	MENI	Vergne et al. 2011. Zoology 114:313–320	M = 0.1; DP = 0.02; N = 100	–	M = 418; DP = 88	–	–	–	M = 8	Downsweep
	CAYA	Sicuro et al. 2013. Rev. Biol. Trop. 61:1401–1413	M = 0.14; DP = 0.04; N = 196	–	M = 620.60	M = 137.95	–	M = 1456.01; DP = 279.04; N = 196	M = 12	Downsweep/ circumflex
Crocodylidae	CRNI	Vergne et al. 2006. Naturwissenschaften 94(1):49	M = 0.21; DP = 0.04; N = 10	–	M = 763; DP = 175; N = 10	–	–	M = 497; DP = 80; N = 10	M = 20	Downsweep/ circumflex
	CRAC	Mandujano-Camacho et al. 2011. Quehacer Científico en Chiapas 1(11):12–18	M = 0.35	–	M = 9934.1	M= 93.4	M=1469.4	M=1481.4	M = 13	Downsweep

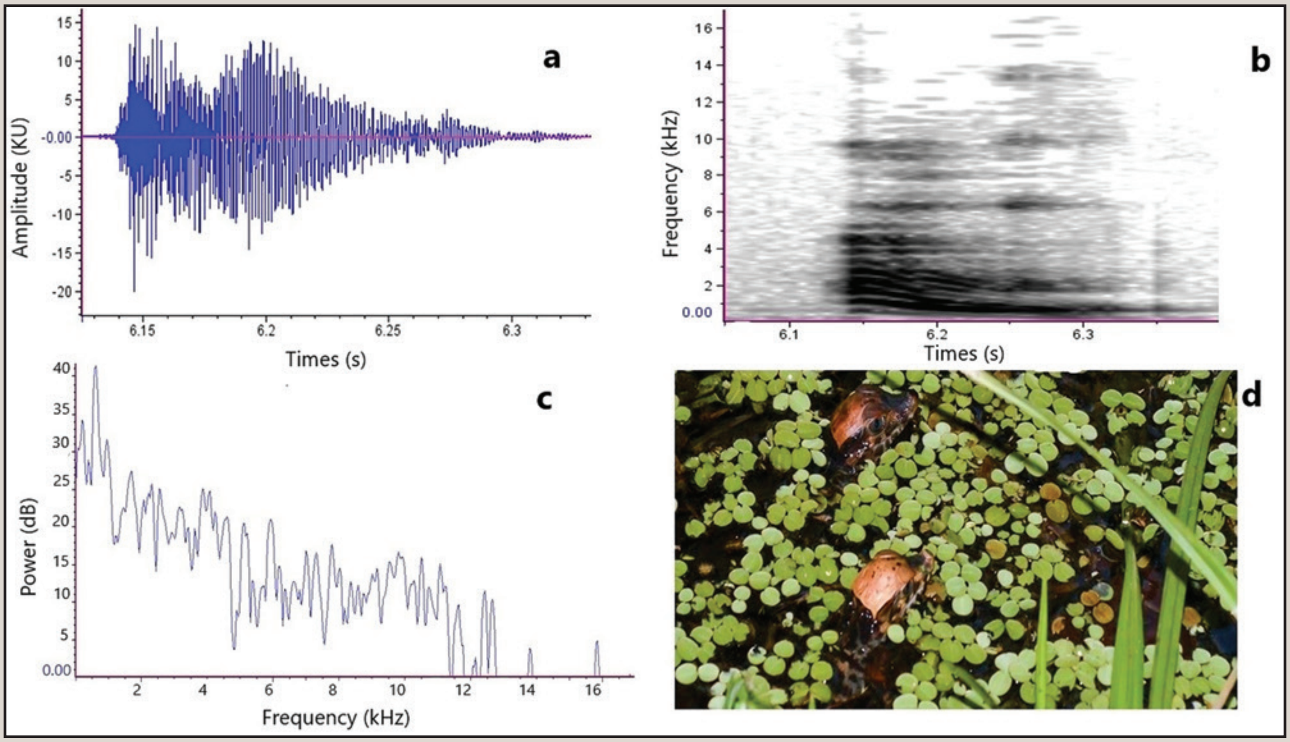

Fig. 1. Agonistic singing analyses of two neonatal *Paleosuchus palpebrosus* specimens from the Dois Irmãos State Park (PEDI), Northeastern Brazil: A) oscillogram; B) spectrogram (kHz); C) call power spectrum (dB); D) neonates targeted for PEDI recordings.

The physical characteristics of each analyzed call comprised call duration, (in seconds = s), interval between calls (s), number of harmonics, initial frequency (Hz), final frequency (Hz), dominant frequency (Hz) and mean amplitude (dB). The recorded vocalizations were classified as "groans", as the sound emission was made while the neonates maintained their palatal valve closed, according to Herzog and Burghardt (1977, *op. cit.*). Although the recordings were made a few hours after egg hatching, and may be associated with the "incubation call" context (Vergne et al. 2009, *op. cit.*), the vocalizations were determined and classified as an "agonistic call." The recorded agonistic singing in *P. palpebrosus* neonates comprised a single fine-harmonic note (mean = 7.25, SD = 2.12), with an average duration of 0.2 seconds (SD = 0.03) and intervals between songs ranging between 0.7 and 1.9 seconds; the mean dominant frequency was 937.5 (SD = 173.5) and mean minimum frequency was 475.5 (SD = 126.9), with a mean maximum frequency of 2320.1 (SD = 912.6), and a mean amplitude of 21421.5 (SD = 6559.3) (Fig. 1; Table 1).

During *P. palpebrosus* call modulation, which varied between six and nine harmonics, an energetic departure was followed by a frequency decay resulted in a "downsweep" pattern only (Fig. 1B), which occurs in other crocodilian neonates, such as *Melanosuchus niger*, *Caiman crocodilus*, and *C. yacare* (Vergne et al. 2011. Zool. 114:313–320; Roberto and Botero-Arias 2013, *op. cit.*; Sicuro et al. 2013, *op. cit.*); in addition, spectral note conformation can also present a circumflex modulation in observed in *C. yacare* (Sicuro et al. 2013, *op. cit.*). Although both neonate caimans and crocodiles share the same agonistic call characteristic of a single note composed of multi-harmonics, *P. palpebrosus*, as well as other species, present less harmonics than crocodiles, ranging from 7–12 (Vergne et al. 2011, *op. cit.*; Roberto and Botero-Arias 2013, *op. cit.*; Sicuro et al. 2013, *op. cit.*), while average Crocodilydae values contain between 13 and 20 harmonics (Vergne et al. 2006. Naturwissenschaften 94:49; Mandujano-Camacho et al. 2011. Quehacer Cient. Chis 1:12–18; Table 2). Call durations and the dominant frequency varies among *P. palpebrosus* and other Alligatoridae species, and the minimum *P. palpebrosus* call frequency was higher than that observed in other Alligatoridae, namely *C. crocodilus*, *Melanosuchus niger*, and *Caiman yacare*, and higher than the two Crocodilydae species where neonate agonistic singing has been described, namely *C. niloticus* and *C. acutus* (Table 2). The maximum frequency was similar, except when compared to the crocodylid *C. acutus*, which displayed a maximum frequency higher than that observed for *P. palpebrosus* (Table 2).

We thank Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) for the sampling permit (n° 11218-1), Parque Estadual de Dois Irmãos, Programa de Pesquisa em Biodiversidade (PPBio- Mata Atlântica), Foundation for the Support of Science and Technology of the State of Pernambuco for financial support and biologists Olga Camila da Silva and José Ricardo de Oliveira Santos, for their assistance in data interpretation.

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SQUAMATA — LIZARDS

***ARISTELLIGER PRAESIGNIS* (Jamaican Croaking Lizard). AQUATIC FORAGING BEHAVIOR.** *Aristelliger praesignis* is a nocturnal, semiarboreal gecko native to Jamaica, Caymans

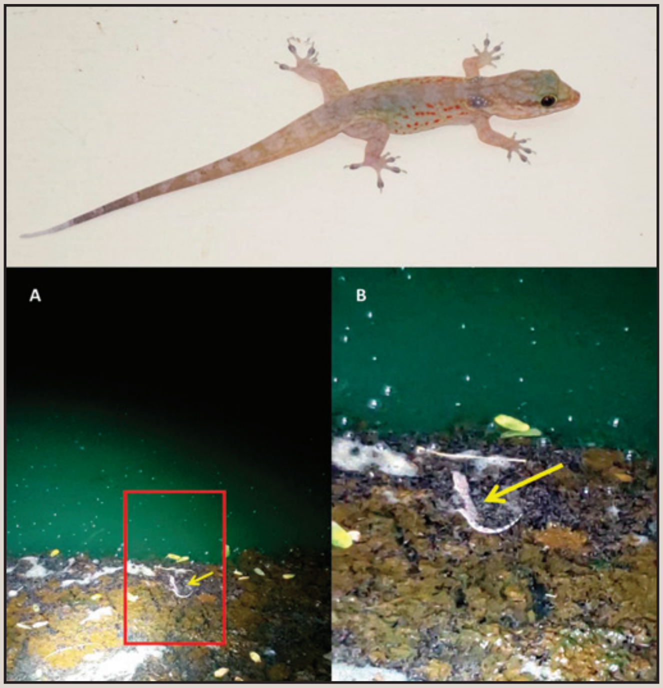

Fig. 1. Novel foraging behavior on floating aquatic debris of *Aristelliger praesignis*, observed at the Hellshire Sewage Ponds, St. Catherine's Parish, Jamaica.

Islands, and Swan Islands (Schwartz and Henderson 1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. University of Florida Press, Gainesville, Florida. 714 pp.). It is a moderate-sized lizard (maximum SVL = 100.7 mm) found in forests, on buildings, rotten trees, stone piles, and terrestrial bromeliads (Schwartz and Henderson 1991, *op. cit.*; Griffing et al. 2017. Herpetol. Rev. 48:184–185.), but they are not known reported from aquatic habitats (Hecht 1952. Evol. 6:112–24). Here, we report observations of novel aquatic foraging behavior of *A. praesignis*.

On 20 May 2020, during a nocturnal survey for *Crocodylus acutus* at the Hellshire Sewage Ponds, Hellshire, St. Catherine Parish, Jamaica (17.899°N, 76.907°W; WGS 84; ca. 1 m elev.), we observed a number of *A. pragesignis* foraging in the water floating among aquatic debris in one of the ponds. We first observed an individual *A. praesignis* at 1931 h, continuously swimming in a circle, ca. 1 m from the sewage ponds edge, for ca. 1 minute before it paused and floated in the water. Because of the non-directed swimming behavior, we assumed that the animal had accidentally fallen into the water. However, after further searching, we found six more *A. praesignis* performing similar behaviors in the same pond, including resting on aquatic debris (Fig. 1). We observed the lizards for over 15 min and watched them perform darting swimming movements in the water and appeared to feed on small, unidentifiable aquatic organisms. We returned to the pond on 21 May 2020, during daylight hours, to explore the diurnal activity behaviors of *A. praesignis*. During the day, ca. 1100 h, we observed 8 *A. praesignis* hiding behind the bark of large trees overhanging the sewage treatment pond, which is more typical for this species. Our observation represents the first published report of *Aristelliger* foraging in an aquatic environment. Our observation of multiple individual *A. praesignis* in the aquatic environment at night suggests that this is a deliberate foraging strategy and warrants further ecological and behavioral research.

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***ASPIDOSCELIS FLAGELLICAUDUS* (Gila Spotted Whiptail), *ASPIDOSCELIS UNIPARENS* (Desert Grassland Whiptail), and *ASPIDOSCELIS VELOX* (Plateau Striped Whiptail). INTERSPECIFIC PSEUDOCOPULATION IN NATURE.** Pseudocopulation in unisexual (all-female) whiptail lizards of the genus *Aspidoscelis* (formerly *Cnemidophorus*), which reproduce by parthenogenesis, involves stereotypical courtship and mating behaviors similar to those observed in bisexual species, and was first reported in captive *A. uniparens*, *A. velox*, and *A. tesselatus* (= *A. neotesselatus*; Crews and Fitzgerald 1980. Proc. Natl. Acad. Sci. 77:499–502). Subsequently, pseudocopulation has been reported in free-ranging *A. flagellicaudus* (= *A. sonorae* of Taylor et al. 2018. Herpetol. Rev. 49:636–653; Bezy and Enderson 2002. Sonoran Herpetol. 15:90), *A. laredoensis* (Paulissen 1995. Herpetol. Nat. Hist. 3:165–170), *A. neotesselatus* (Caracalas et al. 2020. Herpetol. Rev. 51:326), and *A. uniparens* (Crews and Young 1991. Anim. Behav. 42:512–514; Eifler 1993. Herpetol. Rev. 24:150). Although interspecific pseudocopulation (involving individuals of two different unisexual species) has been reported among whiptails in captivity (Cole and Townsend 1983. Anim. Behav. 31:724–728), it has not been reported from wild populations. Here we report the first documented observations of pseudocopulation between individuals of three different unisexual species of *Aspidoscelis* in wild populations.

On 7 June 2015, we observed a sequence of interspecific courtship and mating behaviors between *A. uniparens* and *A. velox* at a rural residence in Paulden, located in the Big Chino Valley, Yavapai County, Arizona, USA (34.9203°N, 112.5039°W; WGS 84; 1350 m elev.). This event involved the *A. uniparens* performing male-like mounting behavior with the submissive *A. velox* (Fig. 1A–B), which culminated in the so-called doughnut posture (Fig. 1C) where the male (in a bisexual species) grasps the female on her side with his jaws during intromission (Crews and Moore 1993. *In* Wright and Vitt [eds.], Biology of Whiptail Lizards [Genus *Cnemidophorus*], pp. 257–282. Oklahoma Museum of Natural History, Norman, Oklahoma). On 27 June 2020, at the same location, we observed another instance of interspecific mating behavior between *A. flagellicaudus* and *A. velox*. The *A. flagellicaudus* was in the doughnut posture mounting the *A. velox*.

Over the span of approximately a decade, involving hundreds of hours of casual observation of whiptails at this site, we have twice observed pseudocopulation involving two individuals of *A. uniparens*, as well as at least 10 pseudocopulation events between *A. uniparens* and *A. velox*. In all of these pseudocopulation instances *A. uniparens* performed the male-like mounting behaviors and *A. velox* had the female role.

While some studies have presented evidence that pseudocopulation enhances reproductive output in unisexual *Aspidoscelis* in the laboratory (e.g., Crews et al. 1986. Proc. Natl. Acad. Sci. 83:9547–9550), Cole and Townsend (1983, *op. cit.*) found no such effect, and it remains to be determined to what degree

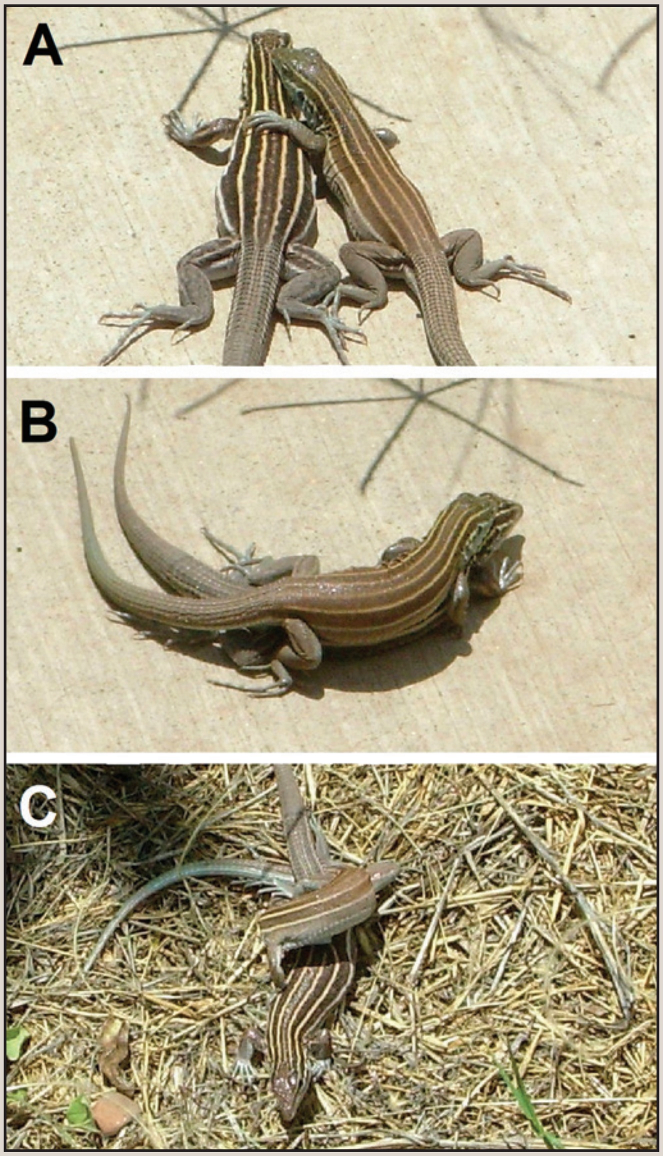

Fig. 1. Sequence of pseudocopulatory behaviors in *Aspidoscelis uniparens* and *A. velox* in Yavapai County, Arizona, USA, 7 June 2015: A) adult female *Aspidoscelis uniparens* (right) approaching adult female *A. velox*; B) *Aspidoscelis uniparens* (top) mounting *A. velox*; C) *Aspidoscelis uniparens* (top) in stereotypical copulatory doughnut posture.

such behaviors may affect reproduction in natural populations. Pseudocopulation in free-ranging parthenogenetic lizards was first reported by Werner (1980. Z. Tierpsychol. 54:144–150) for the gecko *Lepidodactylus lugubris* in Hawaii, and he suggested such behavior was most likely related to social dominance, not reproduction. Such could be the case here, especially given the likely increased abundance of invertebrate prey that lizards might compete over, resulting from the presence of watered trees and shrubs as well as artificial lights that may attract nocturnal insects (C. J. Cole, pers. comm.).

We thank C. J. Cole for providing literature and making valuable comments on the manuscript.

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***ASPRONEMA DORSIVITTATUM*. PREDATION**. *Aspronema dorsivittatum* is a moderate-sized (up to 195 mm total length) skink distributed throughout Argentina, Bolivia, Brazil, Paraguay, and Uruguay (Cei 1993. Museo Regionale di Scienze Naturali Monogr. 14. Turin:1–949; Cacciali et al. 2016. Spec. Publ. Mus. Southwest. Biol. 11:1–373), that inhabits humid grasslands, commonly near water (Carreira et al. 2005. Reptiles de Uruguay. Universidad de la República, Facultad de Ciencias, Montevideo. 639 pp.; Cabrera 2015. Reptiles del Centro de la Argentina. Editorial de la Universidad Nacional de Córdoba, Argentina. 297 pp.). Predators of *A. dorsivittatum* include foxes (Gallardo 1968. Rev. Mus. Arg. Cienc. Nats., Zool. 9:177–196), colubrid snakes (Lopez 2003. Herpetol. Rev. 34:71–72), anurans (Kokubum and Rodrigues 2004. Herpetol. Rev. 35:159–160), and at least two raptors, the American Kestrel (de Aguiar et al. 2019. Herpetol Notes 12:309–310) and White-tailed Hawk (Di Giacomo and Krapovickas 2005. Historia Natural y Paisaje de la Reserva El Bagual, Provincia de Formosa, Argentina. Monografia de Aves Argentinas No 4.). Here we report on new

Fig. 1. Adult male *Circus buffoni* gliding with a reptile just captured in Córdoba Province, Argentina.

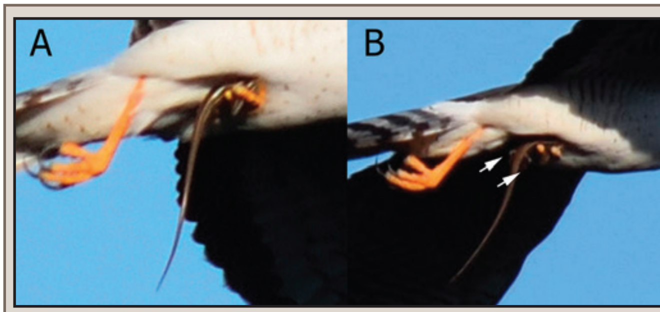

Fig. 2. Magnifications performed on two photographs that allow, despite poor sharpness, to appreciate details of pattern and shine (A), and hind legs (B, arrows) of the prey, *Aspronema dorsivittatum*.

raptor species, Long-winged Harrier (*Circus buffoni*) preying on a *A. dorsivittatum*.

At 1842 h on 15 November 2020, at a Pampean marshland near the city of Ucacha, Córdoba Province, Argentina (33.0129°S, 63.5487°W; WGS 84; 183 m elev.) we observed and photographed an adult male Long-winged Harrier in flight carrying a reptile in its left talon (Fig. 1). After reviewing our series of photographs, it became evident that the prey was an adult *A. dorsivittatum* (Fig. 2) which we determined the lizard's identity by body profile, pattern, skin shine, and short hind legs. The only other species that could be confused with *A. dorsivittatum* is the similar sized skink *Notomabuya frenata* but the latter species is an arboreal and forest species not found in pampas (Cei 1993, *op. cit.*).

Circus buffoni prey on small mammals, birds, frogs, and lizards (Ferguson-Lees and Christie 2001. Raptors of the World. Christopher Helm, London, United Kingdom. 993 pp.), and to our knowledge this is the first observation of this raptor preying on *A. dorsivittatum.* Although *C. buffoni* and *A. dorsivittatum* widely share ranges, habitats, and hours of activity, predation by the former on this or any other reptile species remains unrecorded (Bó et al. 1996, *op. cit.*; Beltzer et al. 2001. Revista FABICIB 5:159–161; Bó et al. 2007. Hornero 27:97–115). Neither the bird nor the skink was collected in this sighting, and the harrier flew away with its prey.

We thank J. D. Williams for confirming skink species, and to Secretaría de Ciencia y Tecnología de la Universidad Nacional de Córdoba, for funding field work.

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CHAMAELEO ZEYLANICUS **(Indian Chameleon). PREDATION.** Although reptiles are common prey for many animals, predation of cryptic arboreal species such as members of the Chameleonidae are difficult to observe. *Chamaeleo zeylanicus* is a wide-ranging diurnal lizard found throughout India, southeast Pakistan, and Sri Lanka (Glaw 2015. Vert. Zool. 56:167–242) and is well known for its camouflage and cryptic ability (Tolley and Herrel 2014. The Biology of Chameleons. University of California Press, Berkeley, California. 270 pp.), which are antipredator tactics (Stuart-Fox et al. 2006. Biol. J. Linn. Soc. 88:437–446). Known chameleon predators include snakes, birds, and mammals, but little is known about predation on *C. zeylanicus* (Tolley and Herrel 2013, *op. cit.*).

At 1636 h on 31 May 2019, near Bhat ecotourism campsite (22.4096°S, 73.6237°W; 134 m elev.), Janbughoda Wildlife Sanctuary, Gujarat, India, we observed a *Dendrocitta vagabunda* (Rufous Treepies) feeding on a *C. zeylanicus* (Fig. 1). We did not observe the capture event but made our observation after the bird was perched on a branch holding the lizard. It took the bird 22 min to devour the entire lizard. Rufous Treepies are omnivorous and opportunistic feeders, foraging among tree branches for prey, including reptiles (Grimmett et al. 2011. Birds of the Indian Subcontinent. Second edition. Oxford University Press & Christopher Helm, London. 528 pp.). To our knowledge this is the first record of avian predation on *C. zeylanicus.*

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PHOTO BY RAHUL BHATT

FIG. 1. *Chamaeleo zeylanicus* preyed upon by a Rufous Treepies (*Dendrocitta vagabunda*) at Janbughoda Wildlife Sanctuary, Gujarat, India.

GAMBELIA SILA **(Blunt-nosed Leopard Lizard). DEFENSIVE BEHAVIOR.** On 30 May 2020 at 1412 h on the Elkhorn Plain in the Carrizo Plain National Monument, California, USA (35.11770°S, 119.62792°W; WGS 84; 704 m elev.), an adult *Masticophis flagellum ruddocki* attempted to prey upon a radio-collared female *Gambelia sila*. *Masticophis f. ruddocki* frequently eat lizards (Jones and Whiteford 1989. Southwest. Nat. 34:460–467; Whiting et al. 1992. The Snake 24:157–160; Halstead et al. 2008. Copeia 2008:897–908), including *G. sila* (Montanucci 1965. Herpetologica 2:270–283). Snakes tend to ingest their prey head-first (Ashton 2002. J. Herpetol. 36:500–502) and often specifically search for the head before ingesting prey (Greene 1976. Zeitschrift für Tierpsychologie 41:113–120). Here we describe an observation of a novel defensive tactic of *G. sila* to a snake predator (https://youtu.be/LAdcCqzb3Xk).

We did not witness the snake attacking the lizard, but found the lizard hanging motionless from a small dead shrub, with her arms and legs limp and her mouth clamped onto a twig of the shrub. The snake held the lizard's head in its jaws and used a slight twisting motion to try and pry the lizard from the shrub. After less than a minute, we approached, and the snake let go of the lizard and went into a burrow. The lizard remained motionless, still grasping the branch with her mouth, bleeding from the bite wounds to her head. At this point the lizard was assumed dead and her radio-collar was removed, which took at least 45 sec as she hung on the branch. However, after the collar was removed, the lizard immediately revived, released her grip, and ran quickly to a shrub ca. 7 m away and climbed ca. 6 cm off the ground, and this was when the observation was terminated.

The first line of defense for *G. sila* if they have been spotted by a predator is to run into a rodent burrow or under the cover of a shrub, and in some cases, they may climb up into shrubs (Montanucci 1965, *op. cit.*; Warrick et al. 1998. J. Herpetol. 32:183–191). They also have very strong jaws (Jones and Lovich 2009. Lizards of the American Southwest: A Photographic Field Guide. Rio Nuevo Publishers, Tucson, Arizona. 567 pp.), which likely contributed to this lizard's ability to keep hold on the branch so effectively. Given that *G. sila* are frequently preyed upon by snakes and birds (Germano 2019. Southwest. Nat. 63:26–280), we suggest that a strong bite force may also be adaptive by preventing or discouraging predators from dislodging lizards that are biting onto vegetation.

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***LYGODACTYLUS KLUGEI* (Kluge's Dwarf Gecko). ECTOPARASITES.** *Lygodactylus klugei* is a small gekkonid lizard, found throughout the dry Caatinga and Cerrado in northeastern Brazil (Galdino et al. 2011. Herpetol. Rev. 42:275–276; Lanna et al. 2018. Mol. Phylog. Evol. 127:638–645). Studies on parasitism on this species are scarce and have focused on helminth endoparasites (Lima et al. 2018. Helminthologia 55:140–145; Anjos et al. 2011. Neotrop. Helmintol. 5:285–290; Araujo Filho et al. 2020. J. Helminthol. 94:121–121). Here, we report on the ectoparasites on *L. klugei* from northeastern Brazil.

During herpetofaunal monitoring on 16 September 2008 in the Caatinga of northeast Brazil, near the Municipality of Jati (7.6301°S, 39.0330°W; WGS 84; 507 m elev.) we collected two adult *L. klugei* (only one was measured: 26.6 mm SVL, 29.8 mm tail length) ectoparasitic larval mites. We identified these as *Eutrombicula alfreddugesi* (Acari: Trombiculidae), a common ectoparasite on reptile hosts (Wharton and Fuller 1952. A Manual of the Chiggers. Mem. Entomol. Soc. Washington. 185 pp.). One lizard had a single mite attached to its central back and the second lizard had seven *E. alfreddugesi* larvae, five attached to the thigh close to the body in between fingers, and one on the shank near the knee.

Eutrombicula alfreddugesi is one of the most geographically widespread members of the genus and has been reported on numerous lizard hosts in northeastern Brazil including five species of *Tropidurus* (Rocha et al. 2008. Parasit. J. 15:131–136; Carvalho et al. 2015. Rev. Bras. Zool. 23:1010–1015), two species of *Mabuya* (Cunha-Barros et al 2003. Braz. J. Biol. 63:393–399), and two species of *Ameivula* Xavier et al. 2019. Herpetologica 75:315–322). Recently a new species of *Eutrombicula* was reported on *Kentropyx calcarata* from the Atlantic Forest in northeastern Brazil (Oliveira et al. 2019. Neotrop. Biol. Conserv.14:109–116). To our knowledge this is the first report of any mite on *L. klugei*, and also represents a new host species for *E. alfreddugesi.* We collected one of the lizards as a specimen and it is deposited in the Herpetology of the Universidade de Brasília collection (CHUNB-56575).

We thank the Universidade Federal do Cariri – UFCA, Fundação Cearense de Apoio ao Desenvolvimento Científico e Tecnológico-FUNCAP.

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***PSAMMOPHILUS* SP. (Rock Agama). PREDATION.** The genus *Psammophilus* has two species, *P. dorsalis* (Peninsular Rock Agama) and *P. blanfordanus* (Blanford's Rock Agama), and both are

Fig. 1. Predation of *Psammophilus* sp. by a female *Nephila pilipes* in Tadoba Andhari Tiger Reserve, Maharashtra.

endemic to the Indian Peninsula. They are agile, diurnal, rock-dwelling lizards found in rocky habitats, forests, and sometimes on trees (Saikrishna et al. 2017. Int. J. Innov. 4:388–394). The spider *Nephila pilipes* (Giant Wood Spider) is widely distributed in east Asia, southeast Asia, South Pacific islands, and North Australia (Su et al. 2011. Zool. Sci. 28:47–55) and feeds on small invertebrates but will occasionally feed on vertebrates such as bats and birds (Baliarsingh et al. 2015. Curr. Sci. 109:1245). Here, I report an instance of *N. pilipes* feeding on a juvenile *Psammophilis.*

On 2 November 2017, at ca. 0730 h, I observed an adult female *N. pilipes* feeding on a juvenile *Psammophilus* sp. in the forest of Tadoba Andhari Tiger Reserve, Chandrapur District, Maharashtra, India (20.13621°N, 79.31861°E; WGS 84; 226 m elev.). Because both *Psammophilus* species look similar and occur in this area, I was not able to identify the species. When first seen, the spider was holding the head of the lizard, which was still alive, with its chelicera at the edge of the spider web (Fig. 1). The web was ca. 1 m above the ground, spread between a tree and bush. After an hour, the spider had killed the lizard and then began to wrap it in silk, which took ca. 4–5 min. To my knowledge, this is the first record of *Psammophilus* predation by *N. pilipes.*

I thank Abhijit Das for his encouragement and guidance to publish this note.

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***SALVATOR MERIANAE* (Argentine Black and White Tegu, Teiu, Tejo). PREDATION ATTEMPT.** On 17 February 2019, at 1040 h, we observed an adult *Boa constrictor* attempting to eat an adult *Salvator merianae* in a forest fragment near the town of Camaragibe, Pernambuco, Brazil (7.9576°S, 34.9864°W; WGS 84; 110 m elev.). The *B. constrictor*, measuring ca. 2 m in length, was constricting an apparently immobilized *S. merianae* and biting the lizard's head (Fig. 1), but it is unclear if the snake was about to begin the process of ingestion the lizard. After watching this event for 10 min we approached within 2 m of the snake and at this time the snake released the lizard and began to move away. The *S. merianae* remained in a lifeless position on its back (Fig. 2), possibly feigning death or unconscious from being constricted. After 5 min we picked up the lizard which then moved suddenly and jumped out of our hand and fled into the vegetation. Although the *B. constrictor* released the tegu, the snake appeared to have complete

PHOTO BY FILIPE M. ALÉSSIO

Fig. 1. *Boa constrictor* and *Salvator merianae* during a predation attempt in Pernambuco, Brazil.

PHOTO BY FILIPE M. ALÉSSIO

Fig. 2. Stunned or possible death feigning behavior of the *Salvator merianae* after being released by a *Boa constrictor*.

control of the subdued lizard and it seems likely the snake would have consumed the lizard if not interrupted by us. *Boa constrictor* is a dietary generalist that feed on birds, mammals, and lizards (Pizzatto et al. 2009. Amphibia-Reptilia 30:533–544) and is known to prey on large lizards such as *Iguana iguana* (Sanches et al. 2018. Cuad. Herpetol. 32:129–132). To our knowledge this is the first record of predation, or attempted predation, of *S. merianae* by a *B. constrictor*.

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***SCELOPORUS OCCIDENTALIS* (Western Fence Lizard). DIET.** *Sceloporus occidentalis* is a small dietary generalist lizard that preys mainly on invertebrates and is abundant throughout much of western North America (Stebbins and McGinnis 2012. Field Guide to Amphibians and Reptiles of California. University of California Press, Berkeley, California. 538 pp.). There are reports of plant material, including florets and seeds, in the diet *S. occidentalis*, but this is considered incidental ingestion (Johnson 1965. Herpetologica 21:114–117; Clark 1973. Herpetologica 29:73–75). Herein, we report an observation of a *S. occidentalis* deliberately consuming a flower.

On 4 August 2020, at 1150 h, we observed an adult *S. occidentalis* (likely a male) at the UC Santa Cruz Arboretum, California, USA (36.98251°N, 122.06143°W; WGS 84; 133 m elev.) under a White Pitcher Sage (*Lepechinia calycina*) plant, native to the California coast ranges south to the Transverse Ranges. The lizard approached a fallen pinkish-colored flower under the plant and quickly grabbed and ate the flower before running off. Deliberate herbivory has been reported in at least two other *Sceloporus* species, *S. torquatus* (Burquez et al. 1986. J. Herpetol. 20:262–264) and *S. poinsettii* (Ballinger et al. 1977. Am. Midl. Nat. 97:482–484) but is not known to be widespread. As far as we know this is the first record of a *S. occidentalis* deliberately eating plant materials.

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***TROPIDURUS TORQUATUS* (Calango). PREDATION.** *Tropidurus torquatus* (Tropiduridae) is widely distributed throughout all southeastern, and parts of central-western, northeast, and northern Brazil (Costa and Bérnils 2018. Herpetol. Bras. 7:11–57). This is a diurnal, moderately sized lizard that inhabits open fields, dunes, restingas, as well as urban areas (Rand and Rand 1966. Smithson. Misc. Collect. 115:1–16; Silva-Soares et al. 2011. Checklist 7:290–298). Records of birds preying upon lizards are very common in the literature (e.g., Poulin et al. 2001. J. Trop. Ecol. 17:21–40); however, we could only find two reports of birds, a songbird and cuckoo, preying on *T. torquatus*: Tropical Mockingbird (*Mimus gilvus*; Zocca et al. 2019. Herpetol. Rev. 50:381), and Guira Cuckoo (*Guira guira*; Kiski and Merçon 2015. Herpetol. Notes. 8:35–37). Herein, we present the first record of predation upon *T. torquatus* by the terrestrial Red-legged Seriema (*Cariama cristata*), a tall-bodied predaceous bird of savannas and open woodlands.

At 1630 h, on 5 October 2019, in the Municipality of Domingos Martins, Espírito Santo, southeastern Brazil (20.4030°S, 41.0324°W; WGS 84; 1250 m elev.), we observed an adult Red-legged Seriema preying on an adult of *T. torquatus* (Fig. 1). The seriema was in a fenced pasture next to a public road and the lizard was already captured and in the bird's beak when we made our observation. Presumably the bird had just caught the lizard because there was no indication it had begun to swallow its prey. The seriena moved further into the pasture carrying the lizard when it noticed our presence and we did not see the bird swallow the lizard.

The previous observations of bird predation on *T. torquatus* involved smaller, aerial foraging species (Zocca et al. 2019, *op. cit.*; Kiski and Merçon 2015, *op. cit.*). In contrast, the Red-legged Seriema forages by walking the ground, often near cattle, for large invertebrates, small mammals, and reptiles (Redford and Peters 1986. J. Field Ornithol. 57:261–269). Although this bird is known to prey on lizards, to our knowledge this is the first record of it preying on *T. torquatus*.

PHOTO BY BRYAN DA CUNHA MARTINS

Fig. 1. Red-legged Seriema preying upon an adult *Tropidurus torquatus* in Espírito Santo, Brazil.

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SQUAMATA — SNAKES

***ACHALINUS FORMOSANUS CHIGIRAI* (Yaeyama Odd-scaled Snake). DEFENSIVE BEHAVIOR and DIET.** *Achalinus formosanus chigirai* is a rare and poorly understood subspecies endemic to Iriomote and Ishigaki Islands of the Yaeyama Group, Ryukyu Archipelago, Japan. It has been reported to feed on earthworms (Ota 2014. *In* Ministry of the Environment of Japan [eds.], Red Data Book 2014. Threatened Wildlife of Japan, Volume 3, Reptilia/Amphibia, pp. 58–59. GYOSEI Corporation, Tokyo) but this is the only diet information of this subspecies. Here, we report an observation of its defensive behavior and diet.

At 0215 h on 7 May 2017, following a heavy rain (air temp = 22.8), we found a female *A. f. chigirai* (287 mm SVL, 125 mm tail length; KUHE 61970) on a trail of subtropical laurel forest on Iriomote Island. The snake was motionless, and the body was loosely coiled. As we gently tapped its body with a finger, the snake displayed two different tail wagging responses simultaneously: 1) it moved the whole tail smoothly and slowly

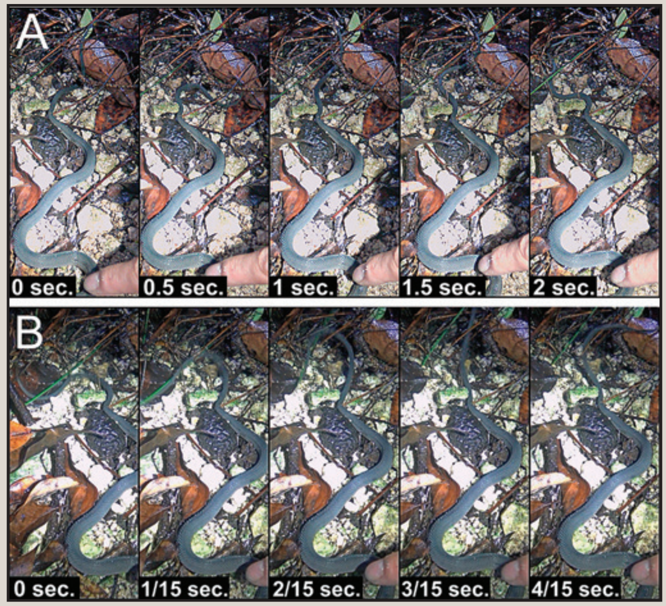

Fig. 1. Photographs showing a sequence of tail wagging behavior by *Achalinus formosanus chigirai* from Iriomote Island, Japan (A: 1/2 sec interval, B: 1/15 sec interval).

Fig. 2. Megascolecidae gen. sp. obtained as a stomach content of *Achalinus formosanus chigirai* from Iriomote Island, Japan.

(Fig. 1A) and 2) it shook the posterior part of the tail quickly (Fig. 1B). Immediately after we stopped tapping, the snake stopped moving its tail, but when we restarted tapping, it resumed tail wagging. During this reaction, the snake hardly moved its body except for the tail (see video at: https://youtu.be/9u0FIB6IIj0). The snake continued this behavior for ca. 2 min while we were tapping the body, and finally started to escape. We collected the snake to examine its stomach contents by forced regurgitation and obtained an earthworm (Megascolecidae gen. sp.; Fig. 2).

Tail displays in snakes are thought to misdirect the attack by predators, and it is common for a response to stimulus (Greene 1973. J. Herpetol. 7:143–161). In our observation, tail wagging was observed only when the snake was tapped. Little is known about the antipredator responses of *Achalinus*, and to our knowledge tail wagging behavior has not been reported for snakes in this genus.

We are grateful to A. Mori for valuable comments on the manuscripts, T. Saito for the assistance during the survey, and the Iriomote Station, Tropical Biosphere Research Center, the University of Ryukyus for providing facilities and accommodations.

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AGKISTRODON CONTORTRIX LATICINCTUS **(Broad-banded Copperhead). DIET.** The diets of snakes in the *Agkistrodon contortrix* complex vary seasonally and are similar across their wide geographic range (Greenbaum 2004. Behav. Ecol. 15:345–350). *Agkistrodon contortrix* are considered generalists, however, mammals and insects are most frequently consumed (Garton and Dimmick 1969. J. Tennessee Acad. Sci. 44:113–117). Although more infrequent, *A. contortrix* have been known to prey on small avian species (Ditmars 1936. The Reptiles of North America. Doubleday and Company Inc. New York, New York. 476 pp.). Davis (1938. Condor 40:183) documented *A. contortrix* holding onto and subduing a *Zonotrichia albicollis* (White-throated Sparrow). Additionally, captive *A. contortrix* in southeastern Texas were described as having the ability to feed "fairly well" on small birds (Guidry 1953. Herpetologica 9:49–56). Herein we describe what we presume is an instance of *A. contortrix laticinctus* consuming an adult *Colinus virginianus* (Northern Bobwhite).

In March 2020 we trapped, radiomarked, and translocated *C. virginianus* from west and south Texas to a 2200 ha private ranch in western Erath County, Texas, USA (34.04138°N, 78.01020°W; WGS 84) as part of an ongoing research project. The study site is located in the Cross Timbers ecoregion which is defined by a high density of trees and irregular plains and prairies. We marked *C. virginianus* that weighed >150 g with 6 g VHF radio transmitters and monitored them daily via telemetry post-release. On 18 July 2020, we located a transmitter inside an *A. c. laticinctus* (60.0 cm total length; Fig. 1). The transmitter was affixed to a female *C. virginianus* translocated from west Texas, weighing 160 g at time of tagging. We presume that the *A. c. laticinctus* consumed the radio-marked *C. virginianus*. Prior to the predation event, the radio-marked *C. virginianus* was located frequently in a fallow field comprised of *Sorghum halepense* (Johnsongrass) and the *A. c. laticinctus* was located in leaf litter nearby. It is possible *A. c. laticinctus* consumed the transmitter mistakenly as carrion after *C. virginianus* was already dead, however, we feel this is unlikely. *Agkistrodon contortrix* are considered sit-and-wait predators and it is unlikely that one would encounter a mortality site (Fitch 1960. Univ. Kansas Mus. Nat. Hist. Pub. 13:85–288). We monitored radio-marked *C. virginianus* daily, thus minimizing exposure time post-mortality. To our knowledge, this is the first record of *A. contortrix* predation on *C. virginianus*.

PHOTO BY ELIZABETH BROGAN

Fig. 1. Transmitter from radio-marked *Colinus virginianus* inside of an *Agkistrodon contortrix* from Texas, USA.

We thank Stephen and Joan Smith, Bass Pro Shops, Park Cities and Cross Timbers Chapters of Quail Coalition, Jim and Barbara Salter, East Foundation, Rolling Plains Quail Research Foundation, and Tarleton State WSES Department for facilitating this research project.

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AGKISTRODON PISCIVORUS **(Cottonmouth). DEFENSIVE BEHAVIOR.** Legitimate bites (when a snake bites someone who has unintentionally and unknowingly provoked it) by *Agkistrodon piscivorus* are uncommon as they seldom bite defensively unless handled or stepped on (Gibbons and Dorcas 2002. Copeia 2002:195–198). However, public perceptions of *A. piscivorus* being aggressive persist. Also, a question continues to be raised about whether they can bite under water, although the claim has been effectively disputed (Steen 2019. Secrets of Snakes: The Science beyond the Myths. Texas A&M University Press, College Station, Texas. 184 pp.). However, I am unaware of any published records of underwater bites. Here I report two instances of envenomation from legitimate bites by *A. piscivorus* underwater.

At 1733 h on 21 September 2019, I was bitten by a fully submerged *A. piscivorus* near Charleston, South Carolina, USA (32.874°N, 79.795°W; WGS 84; 6 m elev.). I had approached within 4 m to photograph the snake basking on the bank of a small pond before it fled into the water. After waiting ca. 30 min to see if it would resurface, I spotted a *Nerodia fasciata* (Banded Watersnake) on the other side of the pond and waded in to grab it. While walking in murky water about 40 cm deep, I planted my foot on the unseen *A. piscivorus*, which was lying on the bottom. The snake's defensive response resulted in a bite on my ankle. After leaving the water and walking toward our vehicle for ca. 3 min I felt a searing pain at the site of the bite, confirming that I had been envenomated. I was taken to the hospital within 30 min. During the evening, hospital staff measured swelling of the leg, which increased by ca. 5 cm in circumference, and administered four vials of CroFab®. After 3 d in the hospital and five more on crutches, I fully recovered.

In discussions with colleagues, I learned of an earlier legitimate bite to an individual through a wetsuit by a submerged *A. piscivorus* in a tannic stream in the Savannah River drainage near Evans, Georgia, USA, in 2006. Whether stepping on a venomous snake under water has a higher probability of provoking a bite than the 4.6% observed during a study of *A. piscivorus* on land (Gibbons and Dorcas 2002, *op. cit.*) is undetermined.

I thank B. Albanese, L. Faust, J. Jensen, A. Lawrence, D. Weiler, and J. Wisniewski for information on experiences regarding snakebites in aquatic situations. I thank M. McDonald for accompanying me in the field. J. W. Gibbons offered suggestions on the original draft of the manuscript.

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***AMEROTYPHLOPS RETICULATUS* (American Reticulate Blindsnake). DEFENSIVE BEHAVIOR and TRADITIONAL USE.** The typhlopid snake *Amerotyphlops reticulatus* is an oviparous species with fossorial habits, found in a wide array of habitats in Colombia, Venezuela, Guyana, Suriname, French Guyana, Brazil, Ecuador, Peru, and Bolivia (Wallach et al. 2014. Snakes of the World: A Catalogue of Living and Extinct Species. CRC Press, Boca Raton, Florida. 1227 pp.). The fossorial behavior in the snake makes it difficult to observe and its biology is not well known.

We observed two specimens of *A. reticulatus* in the rural area of La Guajira, Colombia. The first specimen was found at 2030 h on 17 May 2018 in tropical dry forest in the Municipality of Dibulla, La Guajira (11.24073°N, 73.31095°W; WGS 84; 5 m elev.), which is located in the foothills of the Sierra Nevada de Santa Marta. The individual was observed moving in the water in a temporary puddle located between floodplains, rice cultivation and palm cultivation. It was swimming rapidly, apparently as a defensive response to our presence. Once the snake was captured and manipulated, it showed a series of contortion movements with its body in order to escape from our hands but it never tried to bite us. We did not observe defensive cloacal secretions that have been reported by other authors (Martin and Oliveira 1998. Herpetol. Nat. Hist. 6:78–150).

The second specimen we observed was preserved in a bottle with artisan liquor in Buenos Aires Rancheria (small Wayuu communities), a rural area of the Municipality of Riohacha, Township of San Lorenzo de Camarones (11.45425°N, 73.00211°W; WGS 84; 23 m elev.). The specimen was in a sealed glass bottle, which contained "Chirrinchi or Churro," a traditional liqueur made from sugar cane (*Saccharum* sp.) or from brown sugar loaf. The specimen was captured in a nearby area, which is tropical dry forest. This species is commonly immersed in liquor by Indigenous people of the Wayüü ethnic group and used topically as alternative medicine for cases of dislocations and fractures.

We thank Wayuu people for sharing their knowledge as well as all the members of the research group of EBET of the Universidad de La Guajira. We are deeply grateful to El, Nicole, Julio and Paola for their time, and especially to Omeida Gonzales for sharing her traditional knowledge.

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***ATRETIUM SCHISTOSUM* (Olive Keelback Watersnake). COLOR POLYMORPHISM.** *Atretium schistosum* is a diurnal watersnake distributed in peninsular India, Sri Lanka, Nepal, and Bangladesh (Uetz et al. 2020. www.reptile-database.org; 16 May 2020). It typically exhibits a uniform olive-brown or greenish dorsum and is color-polymorphic (yellow, red, or white) on the ventral side (Whitaker and Captain 2004. Snakes of India, The Field Guide. Draco Books, Chennai, India. 218 pp.; Fig. 1). Despite being widespread and common, data on the geographic distribution of individuals with ventral color polymorphism is lacking. Here we report co-occurrence of yellowish and reddish ventral color variants of *A. schistosum*. Two individuals of the reddish variant were found crossing a road in Thanjavur District, Tamil Nadu, India (Thittai: 10.83452°N, 79.16377°E; WGS 84; Kandiyur: 10.84954°N, 79.11593°E; WGS 84) on 14 November 2011 and 19 October 2018 (Fig. 1B, C). One of the two individuals was gravid (Fig. 1C), and the sex of the other was not determined. Another individual with yellowish underside (Fig. 1A) was also found on the same road (Kandiyur: 10.84954°N, 79.11593°E; WGS 84) on 27 October 2012. Individuals of both color variants were docile when handled and did not show any behavioral differences. The function of discrete color polymorphism in this species remains to be understood.

PHOTO BY GOPAL MURALI

Fig. 1. Typical yellow morph (A) and reddish morph (B, C) of adult *Atretium schistosum* from Tamil Nadu, India.

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***BOA CONSTRICTOR* (Boa Constrictor). DIET.** *Boa constrictor* is known to feed on a variety of bird species (Quick et al. 2005. J. Herpetol. 39:304–307). Here, an additional avian prey species, the Ruddy Ground Dove (*Columbina talpacoti*), is reported for *B. constrictor*. *Columbina talpacoti* is widespread and considered abundant across Trinidad and Tobago, particularly in urban areas (Kenefick et al. 2020. Birds of Trinidad and Tobago: Third Edition. Helm Field Guides. London. 272 pp.). *Boa constrictor* is also widely distributed in the country and known to occur in urban and forest edge areas on Trinidad and its offshore islands (Murphy et al. 2018. A Field Guide to the Amphibians and Reptiles

Fig. 1. *Boa constrictor* preying on *Columbina talpacoti* on the ground on 18 June 2020 (A) and from a wire fence off the ground on 23 June 2020 (B).

of Trinidad and Tobago. Trinidad and Tobago Field Naturalists' Club. 336 pp.). On 18 June 2020, a *B. constrictor* was observed preying on a *C. talpacoti* on Gasparee Island off Trinidad, Trinidad and Tobago (10.6668°N, 61.6489°W; WGS 84; 45 m elev.). The boa was constricting the dove on the ground (Fig. 1A) around 1000 h and within an hour had swallowed the bird. The snake was not measured but appeared to be between 1 m and 2 m long and was left to feed without intrusion. At 1030 h on 23 June 2020, a second predation event on another *C. talpacoti* was observed ca. 25 m from the previous observation. The snake was on a wire fence about 5 m off the ground (Fig. 1B). This snake may have been the same individual as the first observation, as it was similar in size and location.

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***BOIGA OCHRACEA* (Tawny Cat Snake). DIET.** *Boiga ochracea* is a rear-fanged colubrid snake that is distributed across Nepal, northeastern India, Andaman Islands, Bhutan, and Myanmar (Uetz et al. [eds.] 2020. The Reptile Database: http://reptile-database.reptarium.cz; 25 August 2020). Species in the genus *Boiga* are known to feed on various lizard species, small snakes, birds, and small mammals (Smith 1943. The Fauna of British India, Including Ceylon and Burma. Reptilia and Amphibia. Vol III-Serpentes. Taylor and Francis, London, England. 526 pp.). However, there have been no reports of the diet specific to *B. ochracea*.

At 1615 h on 4 October 2016, we observed a *B. ochracea* feeding on a *Trachischium fuscum* (Black-belly Worm-eating Snake) in a human-dominated area in Takdah Cantonment, Darjeeling District, West Bengal, India (27.0369°N, 88.3541°E; WGS 84; 1584 m elev.). The *B. ochracea* bit the *T. fuscum* on the neck and dragged it into a nearby bush (Fig. 1). The *B. ochracea* engulfed the head of the *T. fuscum* and continued to drag it into the dense undergrowth, where it was almost impossible to observe or photograph. To our knowledge, this is the first report of *B. ochracea* feeding on *T. fuscum*.


PHOTO BY ADITYA PRADHAN

Fig. 1. *Boiga ochracea* feeding on *Trachischium fuscum* in Darjeeling, West Bengal, India.

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***BOIGA OCHRACEA* (Tawny Cat Snake). FORAGING BEHAVIOR.** *Boiga ochracea* is a mildly venomous nocturnal colubrid distributed throughout the eastern Himalayan Range, from Sikkim, Darjeeling to Myanmar (Smith 1943. The Fauna of British India, Including Ceylon and Burma. Reptilia and Amphibia. Vol III-Serpentes. Taylor and Francis, London, England. 526 pp.). During a visual encounter survey on 23 August 2017, we observed foraging behavior of *B. ochracea* at Mizoram University campus Aizawl District, Mizoram, India (23.44134°N, 92.39494°E; WGS 84; 798 m elev.). After dark, a *Calotes versicolor* was observed resting on the tip of narrow branches of a low bush, 1.5 m high off the ground, with closed eyes and head directed inwards. The sub-adult *B. ochracea* crawled very slowly towards a juvenile *C. versicolor* (Fig. 1), taking more than 30 min to cover a 1 m distance. After sensing the lizard, the *B. ochracea* flicked its tongue very frequently in different directions to locate the prey. The sleeping *C. versicolor* became alert as the snake crawled up the branch and made it sway and bend due to its weight. The lizard stayed on the branch until the snake actually touched it with its tongue, at which it jumped off the branch and escaped. Our observation sheds light on the foraging behaviour and diet of *B. ochracea*.

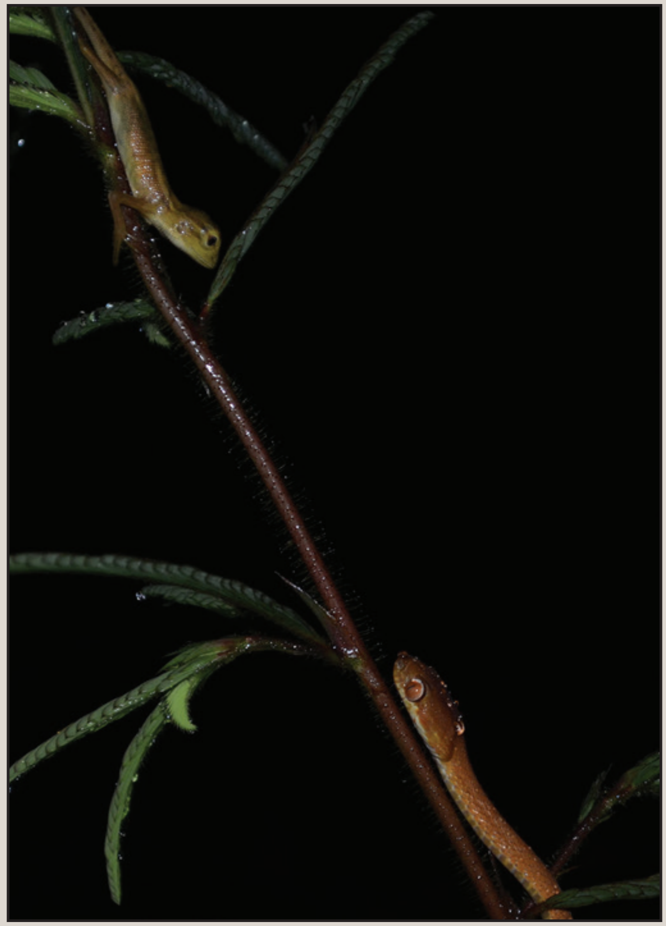

Fig. 1. *Boiga ochracea* stalking a sleeping *Calotes versicolor* in Mizoram, India.

We are thankful to the Chief Wildlife Warden, Department of Environment, Forests and Climate Change, Government of Mizoram for issuing permissions (No.A.33011/2/99-CWLW/225) for herpetofaunal study and collection within the State.

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University, Gwynedd, UK; **AJAY KARTIK**, Madras Crocodile Bank Trust – Centre for Herpetology, Mamallapuram, Tamil Nadu, India; **VISHAL SANTRA**, Simultala Conservationists, Foundation for Wildlife, Nalikul, Hooghly, West Bengal, 712407, India and Captive & Field Herpetology, Wales, UK.

***BOTHRIECHIS LATERALIS* (Green Palm Pitviper). DIET.** Anoles are preyed upon by various vertebrate species such as mammals, birds, other lizards, and snakes, which are considered anoles' main predators (Henderson 1984. Oecologia 62:234–239; Chadler and Tolson 1990. J. Herpetol. 24:151–157; Losos 2009. Lizards in an Evolutionary Tree: Ecology and Adaptive Radiation of Anoles. University of California Press, Berkeley and Los Angeles, California. 527 pp.). The arboreal snake *Bothriechis lateralis* and the lizard *Anolis woodi* coexist in the humid forests of the mountains of northern Costa Rica. Juvenile *B. lateralis* prey on invertebrates, anurans, and lizards (including anoles), while adults have been recorded to prey on rodents, bats, and small birds (Campbell and Lamar 2004. The Venomous Reptiles of the Western Hemisphere. Cornell University Press, Ithaca, New York. 870 pp.; Solorzano 2004. Serpientes de Costa Rica: Distribución, Taxonomía e Historia Natural. INBio, Santo Domingo de Heredia, Costa Rica. 791 pp.). Here, we report attempted predation on *A. woodi* by a juvenile *B. lateralis*.

On 12 May 2014, at 0930 h, park rangers from the Monteverde Cloud Forest Biological Reserve, Costa Rica, observed a snake and a lizard falling from the tree canopy onto the Cuecha tourist trail (10.3057°N, 84.7939°W; WGS 84; 1537 m elev.). We immediately collected them for identification. We identified them as a juvenile *B. lateralis* (270 mm SVL, 4 g), and a dying *A. woodi* female (69 mm SVL, 8.5 g) that had been envenomated by the snake (Fig. 1). The *A. woodi* showed evident necrosis on the nape, neck, chest and abdomen, with signs of having been bitten between the neck and chest; it died minutes after being captured. The biometric data demonstrate that juvenile *B. lateralis* hunt prey substantially larger in mass than themselves. Our record expands information on *B. lateralis* diet and in turn increases reports of predation on *A. woodi*.

We thank Tropical Science Center for authorization to *B. lateralis* research in the Monteverde Reserve (scientific passport No. 2573), and we thank to each of the people who make up the work teams in the Reserve, for their support.

Fig. 1. Female *Anolis woodi* envenomated by a juvenile *Bothriechis lateralis* in Costa Rica.

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***BOTHROPS ASPER* (Fer-de-lance). DIET.** *Bothrops asper* is a common venomous pit viper distributed throughout Central America into Colombia. *Bothrops asper* is considered a generalist, feeding regularly on small mammals, birds, reptiles, and even scavenging opportunistically (Logan and Montero 2009. Herpetol. Rev. 40:352).

At 2130 h on 19 July 2019, a dead adult *B. asper* was found on Barro Colorado Island, Panama, submerged in a stream near the laboratory clearing (9.1637°N, 79.8375°W; WGS 84). The snake had a large, partially consumed lizard in its mouth, with the tail and hind legs exposed. We were able to identify the lizard as *Basiliscus basiliscus* (Common Basilisk) by its large hind legs and long toes. The *Basiliscus basiliscus* was nearly half the length of the *Bothrops asper*, and likely struggled enough to bring the pair underwater where they both drowned. The absence of rigor mortis in both animals suggests the predation attempt likely happened recently and on live prey. Upon return to the site about 15 min later to preserve the pair in ethanol (Fig. 1), two small crabs had started scavenging the corpses of *Bothrops asper* and *Basiliscus basiliscus*. Although the habitats and ranges of *Bothrops asper* and *Basiliscus basiliscus* overlap considerably, to my knowledge there have been no documented cases of *Basiliscus basiliscus* predation by *Bothrops asper*.

I thank Alexander Vining and Pegah Negahdar for helping locate and preserve the specimens. I acknowledge the Smithsonian Tropical Research Institute for resources.

Fig. 1. Preserved *Bothrops asper* with a half-consumed *Basiliscus basiliscus* from Barro Colorado Island, Panama.

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***BOTHROPS ASPER* (Terciopelo). DIET.** *Bothrops asper* is an abundant venomous snake with a distribution extending from southern Mexico and much of Central America southward to Ecuador and including northern Colombia and northern Venezuela (Campbell and Lamar 2004. The Venomous Reptiles of the Western Hemisphere. Cornell University Press, Ithaca, New York. 870 pp.; Wallach et al. 2014. Snakes of the World: A Catalogue of Living and Extinct Species, CRC Press, Boca Raton, Florida. 1227 pp.). It is a generalist with a diverse diet that includes mostly small mammals, anurans, and lizards, and occasionally birds,

Fig. 1. *Bothrops asper* found feeding on *Gymnopis multiplicata* in Costa Rica.

other snakes, and various invertebrates, which are mostly consumed by juveniles (Solórzano 2004. Snakes of Costa Rica: Distribution, Taxonomy and Natural History, Editorial Instituto Nacional de Biodiversidad [INBio], Santo Domingo, Heredia, Costa Rica. 791 pp.); Sasa et al. 2009. Toxicon 54:904–922.).

On a night hike on 25 July 2019, at 2235 h in heavy rain, one of us (JML) found a juvenile female *B. asper* (ca. 550 mm total length) feeding on a *Gymnopis multiplicata* (Purple Caecilian) measuring ca. 325 mm total length, in a secondary forest at Finca Cinco Pochotes, Atenas Region, Alajuela Province, Costa Rica (9.93305°N, 84.45650°W; WGS 84; 448 m elev.). The snake was ingesting the caecilian head-first (Fig. 1). This observation is the first report of caecilians in the diet of *B. asper*.

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***BOTHROPS AYERBEI* (Equis Patiana). REPRODUCTION.** *Bothrops ayerbei* is distributed within the upper Patía river valley Departments of Cauca and Nariño, southwestern Colombia, in mid elevations from 400 to 1800 m (Folleco-Fernandez 2010. Rev. Noved. Colomb. 10:1–34; Wallach et al. 2014. Snakes of the World. A Catalogue of Living and Extinct Species. CRC Press, Boca Raton, Florida. 1237 pp.) and was recently described after reviewing the taxonomy of the *Bothrops asper* complex (Serpentes: Viperidae) in southwestern Colombia. *Bothrops ayerbei* was proposed as a new species on the basis of subtle morphological differences and venom composition (Mora-Obando et al. 2014. J. Proteomics 96:159–172). A recent phylogenomic study concluded that *B. ayerbei* was nested within several clades of *B. asper*; however, they did not propose any taxonomic changes (SalazarValenzuela et al. 2019. J. Biogeogr. 46:1826–1840). Given the current taxonomic status of the species and the short time since its description, the reproductive biology of *B. ayerbei* has not been well documented.

An adult female *B. ayerbei* was delivered to the serpentarium from the Centro de Investigaciones Biomédicas de La Universidad del Cauca (CIBUC), located in the Municipality of Popayán, Department of Cauca, Colombia (2.47036°N, 76.55066°W; WGS 84; 1745 m elev.). The individual came from the sector Las Yescas, Municipality Timbío, Department of Cauca, Colombia, and it was maintained in a terrarium in the laboratory. At 0830 h on 5 November 2012, eight months after entering the serpentarium, I observed the *B. ayerbei* giving birth to 27 young (16 male, 11 female); sexual dichromatism was evidenced by the presence of a yellow color in the tail of male neonates, verified by eversion of the hemipenes in some individuals. The tail coloration was maintained in captivity for at least 2 yr. The newborns averaged 332 mm (range = 325–336 mm) in total length. To my knowledge, these are the first reproductive data published for *B. ayerbei*.

I am grateful to Santiago Ayerbe and José Beltrán for the opportunity to work in the CIBUC serpentarium. I thank the biologists Roger Coral, Fabian Hurtado, Luis E. Vera Pérez, María Rivera for the long hours of work in the serpentarium and Mary Ospino and Jimmy A. Guerrero for allowing me access to the new serpentarium registry base.

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***BOTHROPS ERYTHROMELAS* (Jararaca). DIET.** *Bothrops erythromelas* is endemic to northeastern Brazil, occurring in arid and semi-arid environments surrounding tropical dry and deciduous forests, rocky areas, undergrowth vegetation of terrestrial bromeliads, and along riverbanks (Campbell and Lamar 2004. *In* Campbell and Lamar [eds.], The Venomous Reptiles of the Western Hemisphere, pp. 334–409. Cornell University Press, New York, New York). It is one of the smaller pitvipers with an average SVL of 555 mm (Nogueira et al. 2019. South Amer. J. Herpetol. 40:1–274). Pitvipers in the genus *Bothrops* are typically generalists that mainly feed on mammals and ectotherms such as lizards, frogs, and occasionally centipedes (França and Araújo 2007. Braz. J. Biol. 67:33–40). *Bothrops alcatraz*, *B. erythromelas* and *B. brazili* are considered exceptions because they feed on a considerable proportion of centipedes (66.7%, 23%, and 17.6% of their diet, respectively; Martins et al. 2002. *In* Schuett et al. [eds.], Biology of the Vipers, pp. 307–328. Eagle Mountain Publishing, Eagle Mountain, Utah).

On 15 July 2011, we captured an adult female *B. erythromelas* (49 cm SVL, 80 g) in the Municipality of Inajá (8.90167°S, 37.82389°W; WGS 84; 362 m elev.), Pernambuco, Brazil. The individual was kept at the Laboratory of Venomous Animals and Toxins at the Federal University of Pernambuco, and after three days it regurgitated a scorpion and fragments of centipedes. The telson, post-abdomen region, and legs of the scorpion were clearly identified in regurgitated material, but further identification was not possible. This is the first report of scorpions in the diet of *B. erythromelas*. Within Viperidae, feeding on scorpions is known only in *Echis* spp. (Richards et al. 2012. Toxicon. 59:110–116). Scorpions are common in Caatinga habitats of northeastern Brazil where *B. erythromelas* occurs, representing an available and abundant food item. Further studies should add information about invertebrates as part of the diet of *B. erythromelas*.

We thank the Universidade Federal do Cariri – UFCA, Fundação Cearense de Apoio ao Desenvolvimento Científico e Tecnológico.

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BOTHROPS LEUCURUS **(White-tailed Lancehead). DIET.** *Bothrops leucurus* is a terrestrial pit-viper distributed in Atlantic Rainforest biome regions along the northeastern coast of Brazil, including the states of Alagoas, Bahia, Ceará, Espírito Santo, Minas Gerais, Paraíba, Pernambuco, and Sergipe (Campbell and Lamar 2004. The Venomous Reptiles of the Western Hemisphere. Cornell University Press, Ithaca, New York. 870 pp.). *Bothrops leucurus* is a dietary generalist, feeding primarily on ectothermic prey such as lizards, anurans, and snakes as juveniles (Baptista et al. 2016. Herpetol. Rev. 47:474–475; Castro and Oliveira 2017. Herpetol. Rev. 48:445–446) and shifting to endothermic prey, mainly small mammals (Martins et al. 2002. *In* Schuett et al. [eds.], Biology of the Vipers, pp. 307–328. Eagle Mountain Publishing, Eagle Mountain, Utah; Lira-da-Silva 2009. Gaz. Méd. Bahia 79:56–65), as adults. Herein we report the first record of predation on the tropical frog *Leptodactylus macrosternum* by *B. leucurus*.

On 15 May 2020, at 0926 h, we collected a juvenile female *B. leucurus* (542 mm SVL, 78 mm tail length, 620 mm total length, 60 g) with enlarged belly in a passion fruit orchard along the Camaratuba River in the Municipality of Mamanguape, Paraíba, Brazil (6.39844°S, 35.8770°W; WGS 84; 42 m elev.). When the specimen was dissected we found an adult *L. macrosternum* (77.6 mm total length, 64 g; Fig. 1) in its stomach that had been ingested headfirst. *Leptodactylus macrosternum* is endemic to northeastern Brazil and occurs both in humid forests of the Atlantic Rainforest and in open environments of Caatinga, foraging on the ground near watercourses (Haddad et al. 2013. Guia do Anfíbios da Mata Atlântica: Diversidade e Biologia. Anolis Books, São Paulo, Brazil. 544 pp.). According to Lira-da-Silva (2009, *op. cit.*) juvenile *B. leucurus* often feed on hylid anurans; however, leptodacylid frogs are eaten by other *Bothrops* species (Bisneto and Kaefer 2019. Acta Amaz. 49:105–113).

ASS and EFS thank the PRAC/ and PRG/UFPB for undergraduate scholarships. JMSA and VNB thank CAPES for master's scholarships. FGRF thanks the financial support from the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq Universal grant 404671/2016-0). The *B. leucurus* and *L. macrosternum* specimens are housed in the herpetological collection of Universidade Federal da Paraíba Campus IV (NES 047) and were collected under ICMBio collect permit (SISBIO 22940-1).

Fig. 1. Juvenile *Bothrops leucurus* with consumed *Leptodactylus macrosternum* from Paraíba, Brazil.

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CHARINA BOTTAE **(Northern Rubber Boa). DEFENSIVE BEHAVIOR.** *Charina bottae* is an inconspicuous, crepuscular, and nocturnal boid with a small number of reported natural predators (Hoyer and Stewart 2000. J. Herpetol. 34:354–360; Van Heest and Hay 2000. Herpetol. Rev. 31:177). The behavioral ecology of nocturnal species and their interactions or relationships within communities can be difficult to observe and are largely unknown due to secretive habits (Thompson 2004. Sampling Rare or Elusive Species: Concepts, Designs, and Techniques for Estimating Population Parameters. Island Press, Washington, D.C. 429 pp.). However, one method of mitigating this is the use of remote triggered camera traps.

At 2349 h on 27 September 2019, TT captured recorded images of a Striped Skunk (*Mephitis mephitis*) with a *Charina bottae* tightly coiled around its neck (Fig. 1). The camera trap (Canon EOS Rebel T5 SLR, 18-55 Canon kit lens, with two remote flashes and remote sensor) was stationed within the Sierra Nevada at Bower's Mansion Regional Park (BMRP), Washoe County, Nevada, USA (ca. 1615 m elev.). It is unknown how the interspecific interaction concluded and also unclear how it began. However, it is likely that the interaction was

Fig. 1. Nocturnally active Striped Skunk (*Mephitis mephitis*) foraging on a rocky slope with an adult *Charina bottae* coiled around its neck from Nevada, USA. The images are depicted in sequence as they were recorded clockwise from top left.

initiated as a predation attempt by the skunk to consume the boa, as this skunk species is a known predator of snakes and other reptiles (Llewellyn and Uhler 1952. Amer. Mid. Nat. 48:193–203; Greenwood et al. 1999. Wild. Soc. Bull. 27:823–832). To our knowledge, this is the first report of what appears to be attempted predation on this snake species by *M. mephitis*.

We are aware of only two other reports of this antipredator defense employed by *C. bottae*. One involved captive feeding incidents between two conspecifics sharing an enclosure (Peabody et al. 1975. J. Herpetol. 9:237). The other was an observation of a *C. bottae* successfully killing a Red-tailed Hawk (*Buteo jamaicensis*), having continued its stranglehold around the neck of the avian predator post-decapitation (Van Heest and Hay 2000, *op. cit.*). It is of interest that this latter observation took place at Washoe Lake State Park in Washoe Valley, Washoe County, Nevada, USA, ca. 7.5 km from the observation reported here.

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***CONIOPHANES BIPUNCTATUS* (Two-spotted Snake). DIET.** *Coniophanes bipunctatus* is a nocturnal, medium-sized snake (ca. 870 mm total length [TL]) that occurs from the Atlantic versant of Mexico (San Luis Potosí, northern Puebla, northeastern Oaxaca, and Chiapas) to Panamá (Heimes 2016. Herpetofauna Mexicana Vol. I. Snakes of Mexico. Edition Chimaira, Frankfurt am Main. 572 pp.). In the Yucatán Peninsula, this species inhabits moist lowlands forests, swampy areas, and coastal areas in the northwest coast of the state of Yucatán (Lee 2000. A Field Guide to the Amphibians and Reptiles of the Mayan World. Cornell University Press, Ithaca, New York. 402 pp.). This snake species preys upon frogs, eels, and probably small lizards (Heimes 2016, *op. cit.*).

At 1945 h on 10 July 2019, a few meters away from Laguna Valeriana (18.91810°N, 89.27437°W; WGS 84; 126 m elev.), a semi-temporary lake located in the northern section of Calakmul Biosphere Reserve, Campeche, México, we heard loud frog distress calls coming from the adjacent evergreen forest. We investigated and found an adult (ca. 64 mm TL) leopard frog (*Lithobates brownorum*) on the ground, being pulled by its right leg towards as small burrow. We looked inside and observed that the predator was an adult (ca. 54 cm TL) *C. bipunctatus*. The frog kept trying to escape by distress calling and jumping around for ca. 1 min. The snake then released the frog (likely due to our presence), which escaped towards the waterbody. To our knowledge, this is the first record of *L. brownorum* predation by *C. bipunctatus*.

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***CONIOPHANES IMPERIALIS* (Regal Black-striped Snake). DIET.** *Coniophanes imperialis* ranges from south Texas, USA, through Mexico to Central America. It is diurnal and feeds primarily on frogs and lizards, but snakes and insects are also eaten (Heimes 2016. Herpetofauna Mexicana Vol. 1. Snakes of Mexico. Edition Chimaira, Frankfurt am Main. 572 pp.). At 1440 h on 19 May 2014, in the Instituto Tecnológico de Huejutla, Chalahuiyapa, Huejutla de Reyes, Hidalgo, México (21.15390°N, 98.36967°W; WGS 84; 144 m elev.), we observed a *C. imperialis* (288 mm SVL, 4 g) attempting to consume an *Incilius nebulifer* (Gulf Coast Toad; 33 mm SVL, 3 g). The toad was apparently too large to swallow and the snake eventually released it with some injuries (Fig. 1). Given the abundance of *I. nebulifer* over much of Mexico, small toads may be common in the diet of *C. imperialis*.


PHOTO BY RAÚL VALENCIA HERVERTH

Fig. 1. *Coniophanes imperialis* and the injured *Incilius nebulifer* prey, after being released by the snake.

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***CONIOPHANES MERIDANUS* (Peninsular Stripeless Snake). PREDATION and REPRODUCTION.** *Coniophanes meridanus* is a nocturnal and terrestrial small snake that is considered endemic to the Mexican portion of the Yucatan Peninsula, where it inhabits thorn forest, tropical deciduous forest, and semi-evergreen seasonal tropical forest (Lee 2000. A Field Guide to the Amphibians and Reptiles of the Mayan World. Cornell University Press, Ithaca, New York. 402 pp.; González-Sánchez et al. 2017. Mesoam. Herpetol. 4:263–380). Little or no information on the biology and ecology of this species is available. The only cause of mortality recorded for this species is roadkill (Köhler et al. 2016. Mesoam. Herpetol. 3:669–687). Regarding reproduction, *C. meridanus* is considered oviparous, like the other members of the genus. Dissection of five male specimens revealed the largest testis sizes in May, and one female collected in January in southern Quintana Roo had three oviductal eggs with an

PHOTO BY PEDRO E. NAHUAT-CERVERA

Fig. 1. Adult female *Coniophanes meridanus* killed by a cat, with oviducal eggs.

average length of 11.85 and a width of 2.85 (Köhler et al. 2017. Mesoam. Herpetol. 4:527–542). However, this snake is considered uncommon and its natural history and reproduction and is poorly known (Lee 2000, *op. cit.*).

On 1 July 2020, at 1445 h, I received a call to identify a snake that was killed by a cat (*Felis silvestris catus*) in the backyard of a house in the center of the city of Mérida, Yucatán, Mexico (20.94501°N, 89.62280°W; WGS 84; 13 m elev.). The snake was an adult female *C. meridanus* (24.11 cm SVL) with extensive wounds throughout the body. The individual presented a lump in the lower body, and when it was dissected, I found two oviducal eggs (Fig. 1) with lengths of 3.23 and 3.31 cm and widths of 0.66 and 0.71 cm, respectively. The female reported by Köhler et al. (2017, *op. cit.*) in Quintana Roo had considerably smaller oviducal eggs than the size reported in a female founded in January. To our knowledge, this report represents the first record of predation of *C. meridanus* by cats and provides important information of the reproduction on this endemic snake species.

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***CORONELLA AUSTRIACA* (Smoothsnake). CANNIBALISM and PREY SIZE.** *Coronella austriaca* is a medium-sized colubrine snake found throughout most of Europe and into central Asia (Speybroeck et al. 2016. Field Guide to the Amphibians & Reptiles of Britain and Europe. Bloomsbury, London. 432 pp.; Engelmann 1999. *In* Böhme [ed.], Handbuch der Reptilien und Amphibien Europas. Band 3/I: Schlangen [Serpentes]I. AULA-Verlag, Wiesbaden) that is abundant in the middle Saale Valley in Thuringia, Germany (Hiekel et al. 2004. Die Naturäume Thüringens. Thüringer Landesanstalt für Umwelt und Geologie Naturschutzreport 22). It feeds primarily on lizards and small mammals, and occasionally on other snakes, including conspecifics, although this is rare (Drobenkov 1995. Russian J. Ecol. 26:197–201; Luiselli et al. 1996. Oecologia 106:100–110; Jofré and Reading 2020. Herpetol. J. 30:168–172). Here, we report an observation of cannibalism in wild *C. austriaca*.

At 1004 h on 17 August 2020, one of us (HMR) found two live *C. austriaca* intertwined on a path on the south face of the Jenzig in Jena, Thuringia, Germany (50.93802°N, 11.6219°E; WGS 84). The smaller of the two was biting the larger on the head and was constricting the larger snake close to its heart using a posterior horizontal coil with an initial twist in the first loop (Greene and Burghardt 1978. Sci. 200:74–77; Fig. 1). The larger snake was ca. 1.2 times as long as the smaller, based on measurements made from photographs (Fig. 1).

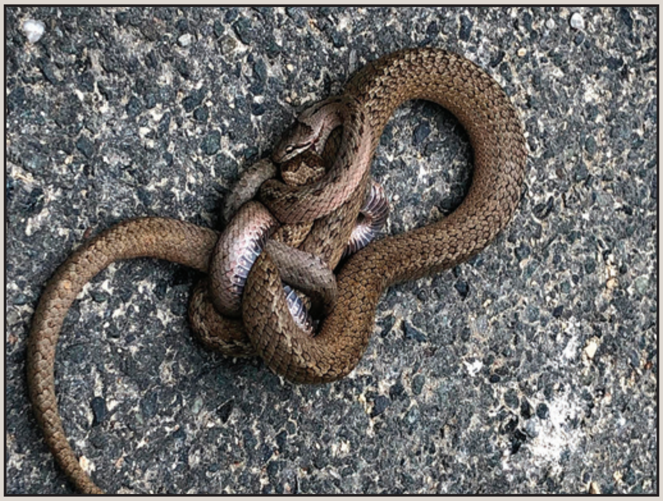

Fig. 1. Smaller *Coronella austriaca* constricting a larger conspecific in Thuringia, Germany (predator:prey size ratio ca. 1.2).

Previous records of cannibalism in *C. austriaca* report a predator:prey size ratio of 1.02 (Jofré and Reading 2020, *op. cit.*) and that all predators of conspecifics were >30 cm SVL (Luiselli et al. 1996, *op. cit.*). We show that *C. austriaca* will prey upon conspecifics even greater than their own body size. Some snakes are known to consume prey longer than their own bodies (Jackson et al. 2004. Zool. 107:191–200). We did not observe the final outcome of this attempt, although the larger individual had stopped moving by the time observations ceased. Body condition was not obviously poor for either snake, although detailed measurements were not taken.

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***CROTALUS ATROX* (Western Diamond-backed Rattlesnake). DIET and FEEDING BEHAVIOR.** *Crotalus atrox* is considered a dietary generalist that largely consume mammals (Nowak et al. 2008. Biol. Rev. 83: 601–620; Loughran et al. 2013. Southwest. Nat. 58:502–505). In addition to hunting live prey, it has been observed that *C. atrox* will opportunistically incorporate carrion into its diet (DeVault and Krochmal 2002. Herpetologica 58:429–436). However, field observations of rattlesnakes consuming carrion are relatively uncommon.

On 6 August 2020 we encountered an adult *C. atrox* consuming a road-killed kangaroo rat (*Dipodomys* sp.) on county road C001, Hidalgo County, New Mexico, USA (31.87143°N, 108.80624°W; WGS 84). Upon our arrival at 2320 h, we observed the snake displaying investigatory behavior toward the kangaroo rat carcass. The snake made multiple attempts to ingest the rodent but initially struggled to envelop

PHOTO BY A. CAMERON

Fig. 1. *Crotalus atrox* consuming a run-over kangaroo rat (*Dipodomys* sp.) in New Mexico, USA. This photograph was taken during the snake's third attempt to ingest the kangaroo rat which was ultimately successful.

its mouth around the rigid bony protrusions of the flattened carcass (Fig. 1). Twice, the snake ingested about half of the rodent, but subsequently regurgitated the prey item. In a third attempt, the snake successfully ingested the entire kangaroo rat and proceeded to move off the road at 2342 h.

It is unclear whether the kangaroo rat had been envenomated prior to being struck by a vehicle, but it was apparent that the rodent was run-over sometime that evening (i.e., 1800–2300 h). To our knowledge, this is the first field observation of *C. atrox* consuming a kangaroo rat that had been struck by a vehicle, although unpublished gut content data has recovered a presumed vehicle-struck *Dipodomys merriami* in a *C. atrox* from Cochise County, Arizona, USA (Schuett et al. 2016. *In* Schuett et al. [eds.], Rattlesnakes of Arizona, pp. 333–394. ECO Publishing, Rodeo, New Mexico). This observation provides important information toward generalizing the feeding habitats of *C. atrox* in that roadkill may be opportunistically incorporated into its diet.

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CROTALUS VIRIDIS **(Prairie Rattlesnake). PREDATION.** *Crotalus viridis* is found from southern Alberta and Saskatchewan (Canada), south into Montana and North Dakota southward through Arizona, New Mexico, and west Texas (USA) into northern Sonora and Chihuahua (Mexico; Stebbins 2003. A Field Guide to Western Reptiles and Amphibians. Third edition. Houghton Mifflin Company, New York, New York. 514 pp.). Predators of rattlesnakes, including *C. viridis*, are described in Klauber (1972. Rattlesnakes: Their Habits, Life Histories, and Influence on Mankind, 2 vol., University of California Press, Berkeley, California. 1533 pp.), Ernst and Ernst (2012. Venomous Reptiles of the United States, Canada, and Northern Mexico. The Johns Hopkins University Press, Baltimore, Maryland. 424 pp.), and Davis and Douglas (2016. *In* Schuett et al. [eds.], Rattlesnakes of Arizona, pp. 289–332. ECO Publishing, Rodeo, New Mexico). Here, we report a case of predation on *C. viridis* by a Mountain Lion (*Puma concolor*). Mountain Lions are apex predators, strict carnivores, and primarily consume mammals. A robust study on their diet documented that these big cats sometimes eat reptiles, such as *Caiman* sp. and *Iguana* sp., in southern parts of their range (Murphy and Ruth 2010. *In* Hornocker and Negri [eds.], Cougar: Ecology and Conservation, pp. 118–137. University of Chicago Press, Chicago, Illinois).

Fig. 1. Scat segment of *Puma concolor* with rattle (*Crotalus viridis*) intact from New Mexico, USA.

On 12 August 2020, within a wetlands complex comprised of mostly Coyote Willow (*Salix exigua*) in Pajarito Canyon, Los Alamos County, New Mexico, USA (35.83760°N, 106.25904°E; WGS 84; 2041 m elev.), we found a full tail from a *C. viridis* that was in a segment of a pile of scat from a *P. concolor* (Fig. 1). We identified the species as an adult *P. concolor* based on the overall dimensions of the scat, size of the pile, and the presence of Mule Deer (*Odocoileus hemionus*) hairs. We identified the rattlesnake as *C. viridis* based on tail morphology, rattle dimensions, and the geographic location. The scat segment that contained the *C. viridis* tail was 10.3 cm in length and 2.8 cm in diameter. After removing the tail from the scat, the basal rattle segment was 8.5 × 5.1 × 3.3 mm in length, width, and height. The tail was intact and contained six segments plus a button. The overall length of the tail was 21.8 mm. Thus, although *Crotalus atrox* is found nearby, we ruled it out based on rattle dimensions and overall appearance (Klauber 1940. Occ. Pap. San Diego Soc. Nat. Hist. 6:1–62). There are several anecdotal videos available online of Bobcats (*Lynx rufus*) depredating rattlesnakes in North America. While it is possible that the snake was scavenged, we feel that predation is a more parsimonious explanation based on the behavior of *P. concolor*. To the best of our knowledge, *C. viridis* has not been documented in the diet of *P. concolor*.

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DENDRELAPHIS MARENAE **(Gaulke's Bronze-back Tree Snake). DIET.** *Dendrelaphis marenae* (formerly *D. pictus*; Vogel and van Rooijen 2008. Herpetozoa 21:3–21) is an endemic, arboreal snake distributed throughout most of the Philippine archipelago (Leviton 1968. Philippine J. Sci. 97:391–394; Devan-Song and Brown 2012. Asian Herpetol. Res. 3:1–20; Brown et al. 2013. Zookeys 266:1–120; Leviton et al. 2018. Proc. California Acad. Sci. 14:399–568). On the islands of the Luzon Pleistocene Aggregate Island Complex (Luzon, Catanduanes, Polillo, Marinduque, and many small islands associated with these landmasses), its distribution overlaps with that of the

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Fig. 1. *Dendrelaphis marenae* capturing a typically sized adult female *Sanguirana luzonensis* on Luzon Island, Philippines.

Sanguirana luzonensis (Luzon Slender Stream Frog), which is abundant in undisturbed forested riparian habitats (Brown et al. 2000. Hamadryad 25:175–195; Siler et al. 2011. Check List 7:182–195; Brown et al. 2012. Check List 8:469–490; Brown et al. 2013. Zookeys 266:1–120).

On 8 August 2019, at 1150 h, we observed the predatory attack of an adult male *D. marenae* on an adult female *S. luzonensis* on the rocky bank of Tariktik River, at the base of Saddle Peak Mountain Range, Barangay Lidong, Municipality of Presentacion, Camarines Sur Province, Bicol Peninsula, Luzon Island (13.78691°N, 123.68391°E; WGS 84; 165 m elev.). Although *S. luzonensis* is nocturnal, *D. marenae* is diurnal and is typically encountered by field biologists sleeping in bushes and understory trees, after dark (RMB, pers. obs.). Our midday documentation of this predation event (Fig. 1) occurred when an individual *D. marenae* pursued a specimen of *S. luzonensis* out from under a large, overhanging, stream-side rock ledge, dislodged it from its retreat, and struck it head-first. A 15 min struggle ensued, during which the *S. luzonensis* maximally inflated itself, presumably to avoid being swallowed, and resisted vigorously with its hindlimbs, until it eventually deflated and succumbed. Both specimens were preserved, with the *S. luzonensis* still present in the undissected stomach of the *D. marenae* specimen; voucher deposited at the Biodiversity Institute, University of Kansas (presently uncataloged; RMB 25691). Leviton (1968. Philippine J. Sci. 97:391–394) previously documented unidentified frogs in stomachs of *D. marenae*; Vogel and van Rooijen (2008. Herpetozoa 21:3–21) reported an undocumented account of predation by *D. marenae* on an unidentified frog on Mindoro Island, where *S. luzonensis* does not occur. To our knowledge, this account represents the first documentation of predator-prey interactions between these species with disparate daily activity patterns.

Fieldwork was supported by NSF DEB 0743491 & 1654388 (and KU IACUC 185-05) to RMB.

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DRYMARCHON MELANURUS **(Central American Indigo Snake). BEHAVIOR/MALE-MALE COMBAT.** At 1730 h on 3 January 2020 in Tulum National Park, Tulum, Mexico, JR observed and recorded two adult *Drymarchon melanurus* exhibiting behaviors commonly associated with male-male combat rituals between colubrid snakes, including *Drymarchon* (Carpenter 1977. Amer. Zool. 17:217–223). The snakes were recorded for ca. 47 sec. although it is unknown when the interaction began or ended. During this observation, the snakes' bodies and tails were intertwined and their heads were raised off the ground (Fig. 1). The individuals repeatedly attempted to push the opposing snake's head downward, an action known as topping (Carpenter et al. 1976. Copeia 4:764–780; Gillingham 2001. *In* Seigel et al. [eds.], Snakes: Ecology and Evolutionary Biology, pp. 183–200. The Blackburn Press, Caldwell, New Jersey). We used our knowledge of the closely related Eastern Indigo Snake (*Drymarchon couperi*) and their combat rituals (Stevenson 2003. Herpetol. Rev. 34:251) to interpret and provide context for the current observation. Surprisingly, we could find little documentation related to combat in *D. melanurus*, which could be at least partially attributed to the taxonomic changes they have experienced. Previously, "aggressive" behavior between *D. melanurus* (formerly *D. corias melanurus*) has been reported, but without behavior indicative of combat and the authors suggested the individuals were perhaps feeding or exhibiting courtship (Waide and Thomas 1984. Herpetol. Rev. 15:10). Similarly, one can find pictures online of *D. m. erebennus* (Texas Indigo Snake) engaged in behavior consistent with combat, but the pictures lack context. We suggest the current observation confirms intraspecific combat for *D. melanurus* and addresses a gap in the literature. The videos of the encounter were deposited in The Georgia Southern University, Savannah Science Museum Herpetology Collection (GS 26465).

Fig. 1. Two *Drymarchon melanurus* exhibiting behaviors consistent with male-male combat.

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DRYMOBIUS MARGARITIFERUS **(Speckled Racer). DIET and SCAVENGING.** *Drymobius margaritiferus* is a slender, terrestrial colubrid found from southern Texas through Mexico and Central America to Colombia. This species frequents terrestrial-aquatic interfaces, preying on frogs and toads (Werler and Dixon 2000. Texas Snakes: Identification, Distribution and Natural History. University of Texas Press, Austin, Texas. 437 pp.). Scavenging behavior in snakes has been summarized by Devault et al. (2002. Herpetologica 58:429–436), who demonstrated that numerous species take advantage of opportunistic food resources, such as roadkill. It is easy to understand how snakes that use chemosensory behavior for tracking prey following a strike-and-release attack will consider dead prey acceptable. However, here we present an example of scavenging by a snake whose primary feeding method is "simple seizing" (Moon et al. 2019. *In* Bels and Whishan [eds.], Feeding in Vertebrates, pp. 527–574. Springer Nature, Switzerland).

On 1 September 2011, a *D. margaritiferus* was captured at Sabal Palm Sanctuary, 8435 Sabal Palm Rd., Brownsville, Cameron County, Texas, USA (25.85253°N, 97.41741°W; WGS 84) exhibiting a subcutaneous, left lateral protrusion extending 50% of the snake's actual body width. The protrusion was firm, elevating the skin and movable below the skin (Fig. 1). Despite the protrusion, the snake appeared to move normally. Radiographs revealed the object to be the pelvis, femur, and tibia/fibula of a mammalian hind limb with the pelvis traversing the body cavity (Fig. 2). Due to the impression that the ingesta would create difficulty for the snake, surgical removal was elected. Anesthesia was induced with isoflurane. A single skin incision over the largest protrusions followed by incision of the body wall and gastrointestinal tract allowed access to the limb, which was easily extracted. Vicryl 6-0 (absorbable suture) in a simple interrupted pattern was used to close the GI tract, body wall and skin in three separate layers. The snake recovered normally and resided in rehabilitation for 14 weeks, was documented to be feeding and passing stool, and was subsequently released at the site of capture. The hind limb was identified as that of a juvenile cottontail rabbit (*Sylvilagus* sp.). The skin and muscles were absent and only tendon remnant and shredded muscle attachments remained. The fresh color and integrity of the tissue's frayed edges combined with a lack of odor led to the conclusion that the limb had been freshly separated from the body, skinned, and the muscles removed, so it was likely recently abandoned by another predator, such as a bird of prey. The nutritional value of the bony tidbit would have been minimal and the ability of the snake to pass and digest this item is unclear. To our knowledge this is a first report of scavenging by a *D. margaritiferus.*

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Fig. 1. *Drymobius margaritiferus* with abnormal protuberance.

PHOTO BY GLADYS PORTER ZOO

Fig. 2. Dorsoventral radiograph of *Drymobius margaritiferus* that ingested the hind limb of a *Sylvilagus* sp.

ERYTHROLAMPRUS POECILOGYRUS **(Yellow-bellied Liophis). DIET.** *Erythrolamprus poecilogyrus* is a medium sized terrestrial or semi-aquatic colubrid (Corrêa et al. 2016. Anais da Academia Brasileira de Ciências 88:293–308) that is widely distributed across South America from southeastern Venezuela and eastern Guyana across Brazil, Bolivia, and Peru to Argentina, Paraguay, and Uruguay (Dixon and Markezich 1992. Texas J. Sci. 44:131–166; Nogueira et al. 2019. South Am. J. Herpetol. 14:1–274). *Erythrolamprus poecilogyrus* has been documented to be both diurnal and nocturnal (Vangilder and Vitt 1983. Amphibia-Reptilia 4:273–296; pers. obs.). Although juveniles

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Fig. 1. Adult *Erythrolamprus poecilogyrus* with regurgitated prey items (*Gymnotus carapo*) from Bolivia.

feed predominately on larval anurans and insects (Pinto and Fernandes 2004. Phyllomedusa 3:9–14; Prieto et al. 2012. J. Herpetol. 46:402–406) adult prey items include frogs, lizards, and fishes (Michaud and Dixon 1989. Herpetol. Rev. 20:39–41; Corrêa et al. 2016, *op. cit.*). *Erythrolamprus poecilogyrus* is associated with mesic habitats (Michaud and Dixon 1989, *op. cit.*) and underwater foraging has been documented (Schalk and Montaña 2012. Herpetol. Rev. 43:148). Whereas fishes are listed as prey items, very limited documentation of specific species exists in the literature.

At ca. 0930 h on 14 January 2020, we collected a dead adult *E. poecilogyrus* (CIRA-853: 43.5 cm SVL, 8.1 cm tail length, 65.0 g; Fig. 1) that had been recently killed by a groundskeeper next to a pond at the airport of Trinidad, Beni, Bolivia "Teniente Jorge Henrich Arauz" (14.8216°S, 64.9121°W; WGS 84). The airport is surrounded by seasonally flooded secondary forest, grassland, and disturbed habitat, characteristic of the Beni savannah. The snake had regurgitated two fish, both identified as *Gymnotus carapo* (identified by Reinaldo Cholima Bravo, Centro de Investigación de Recursos Acuáticos). The fish measured 18 and 15.4 cm total length, 12.0 and 7.3 g, for a total prey mass of 19.3 g and a predator-prey mass ratio of 0.297. The snake and prey were deposited into the Colección de Historia Natural de Herpetología of Centro de Investigación de Recursos Acuáticos-UABJB (CHNH CIRA-UABJB) in Trinidad, Beni, Bolivia.

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***FARANCIA ABACURA* (Red-bellied Mudsnake). THERMAL BIOLOGY.** Knowledge of body temperature variation in a free-living ectothermic species is fundamental to understanding many aspects of its physiology, behavior, and ultimately, its distribution, abundance, and response to global climate change (Buckley et al. 2012. Global Ecol. Biogeogr. 21:873–885). Accordingly, we provide the first report of field body temperatures for *Farancia abacura*.

In the course of radiotracking *F. abacura* for home range and movement studies in central Arkansas, USA (Plummer et al. 2020a. Herpetol. Conserv. Biol. 15:160–168; Plummer et al. 2020b. Wetlands 40:2489–2398), we collected concurrent body temperature data with implanted temperature-sensitive transmitters. We recorded body temperatures from five male and two female free-living *F. abacura* from April 2018 through October 2019. Annual body temperatures of *F. abacura* varied monthly and averaged 24.3 ± 0.25 (range: 9.2–35.8°C; N = 597; Fig. 1A). *Farancia abacura* are generally active at this locality from mid-April through mid-October (Plummer et al. 2020a, *op. cit.*). Body temperatures in April and October were transitional between activity temperatures in May–September and overwintering temperatures in December–February (11.7 ± 0.20; range: 9.2–15.1°C; N = 43; Fig. 1A). Body temperatures in both sexes were the highest with little variation among months or between sexes during most of the activity season (May–September; 27.3 ± 0.15; range: 17.3–35.8°C; N = 401; Fig. 1B).

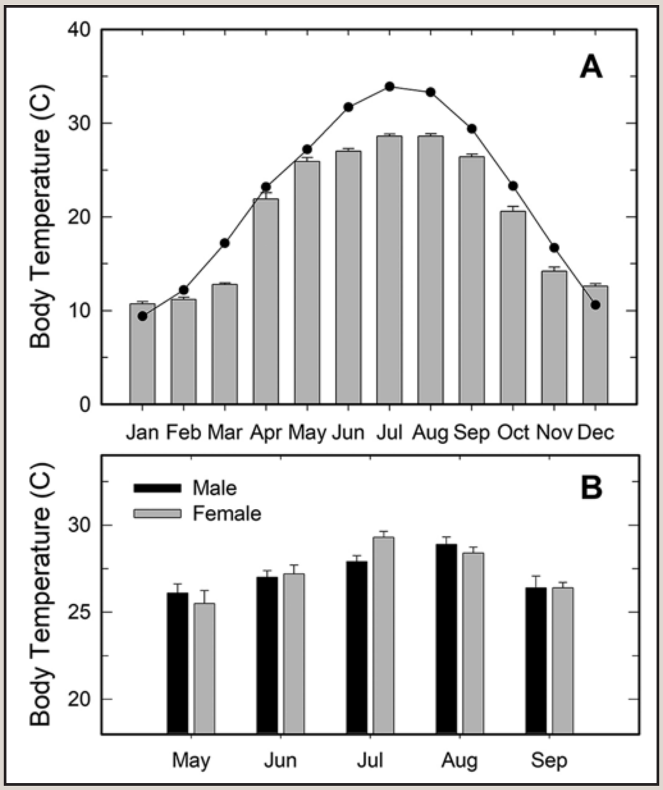

Fig. 1. Field body temperatures of *Farancia abacura* in central Arkansas, USA: A) annual variation; B) activity season variation by sex. Bars represent mean ± SE body temperature. Dots represent mean monthly air temperature (www.usclimate data.com; 15 Nov 2019).

We found individuals of *F. abacura* to be extraordinarily secretive and to spend most of their time immersed in water or burrowed in saturated soils and debris at the mud-water interface. We rarely observed basking or terrestrial travelling (Plummer et al. 2020a, 2020b, *op. cit.*). Based on these ecological traits, we expected body temperatures would mostly conform to the ambient mud and water temperature as is common for watersnakes (*Nerodia* spp.; Mushinsky et al. 1980. Copeia 1980:744–754). However, because we did not have operative or ambient water temperatures concurrent with snake body temperatures, we cannot test hypotheses regarding the extent of thermoregulation or thermoconformity in *F. abacura*. Nevertheless, the descriptive data reported herein remain informative because they provide the first field body temperatures reported for this poorly known, exceptionally secretive snake.

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***FARANCIA ABACURA* (Red-bellied Mudsnake). SPATIAL ECOLOGY/TEMPORARY EMIGRATION.** Mobile animals typically confine their daily movements to a restricted home range that excludes "…migrations, emigrations, or unusual erratic wanderings" (Brown and Orians 1970. Ann. Rev. Ecol. Syst. 1:239–262). Identifying an "erratic wandering" out of and returning to a home range, initially termed a "sally" (Burt 1943. J.

Mammal 24:346–352), is often difficult to distinguish from normal home range movements, but on occasion, it can be clearly recognized as in the following case.

We radiotracked an adult male *Farancia abacura* (770 mm SVL) from April–October 2018 in a small, isolated wetland pond on the Gilliam Biological Research Station of Harding University in Searcy, Arkansas, USA. Whereas most movements were relatively short (<40 m) multi-directional movements confined within a well-defined 0.95 ha Minimum Convex Polygon home range in the pond (Plummer et al. 2020. Herpetol. Conserv. Biol. 15:160–168), a distinct subset of movements was composed of sequential long-distance unidirectional movements along a single trajectory that took the snake out of the pond. From 4 April to 18 May 2018 the male confined its movements to its home range, but on 19 May, the snake left its home range and moved 185 m northeast followed by another 137 m the following day along the same trajectory. The movements took the snake 125 m north of the pond basin in a small ephemeral stream that discharged into the pond. Over the next two weeks, the male moved <10 m/day around a central location. On 7 June, the snake settled into an underground shelter site composed of a cluster of tree roots, soil, and herbaceous vegetation that partially bridged the stream. The snake remained in the shelter site for the next two weeks during which time the stream mostly dried, leaving a small adjacent pool as the nearest standing water. On 22 June, the snake left the shelter site and retraced its northeast sally by moving southwest into its pre-sally home range in the pond. The male remained in its home range until 9 August when, remarkably, it made another directional sally that closely paralleled its first sally in direction and speed of travel. The snake also took refuge in the same shelter site in which it had previously taken refuge from 7–22 June. It remained at the shelter site until 18 August when it retraced its movements south to its home range in the pond in which it moved until tracking ceased on 31 October 2018. No other snake of the eight *F. abacura* radiotracked in 2018 left its home range in the pond (Plummer et al. 2020, *op. cit.*). As is typical when radiotracking the extraordinarily secretive *F. abacura* (Plummer et al. 2020, *op. cit.*), at no time during the two sallies did we directly observe the snake.

Why the male *F. abacura* repeatedly moved to a specific shelter location is unknown. One possibility is that the snake sought a specific site to shed its skin. Another possibility is that the rapid directional behavior resulted from a male trailing the scent of an unseen female (Ford 2000. Chem. Signals Verts. 4:261–278). Individual snakes are known to repeatedly use a specific shelter site because of the presence of other individuals (Whitaker and Shine 2003. Herpetol. Monogr. 130-144). We knew of at least one other *F. abacura*, a 875 mm SVL adult female, that used the same shelter site. We tracked the female from the pond to the site where she was found on six days between 28 April and 17 May 2019 (Plummer et al. 2020. Wetlands 40:2489–2398).

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***FARANCIA ERYTROGRAMMA* (Rainbow Snake). PLASTIC MESH ENTANGLEMENT.** Plastic mesh deployed for soil erosion control has been demonstrated to be a particular hazard to snakes (Kapfer and Paloski 2011. Herpetol. Conserv. Biol. 6:1–9; Ward et al. 2020. J. Soil Water Conserv. 75:82A–87A). Plastic mesh has been found to be responsible for mortality in numerous snake species (Walley 1963. Herpetologica 19:216; Bonine et al. 2004. Herpetol. Rev. 35:176–177; Barton and Kinkead 2005. J. Soil Water Conserv. 60:33A–35A; Walley et al. 2005. J. Kansas Herpetol. 16:26–28; Low 2005. J. Kansas Herpetol. 13:9; Iverson and Durso 2018. Herpetol. Rev. 49:754; Kapfer and Paloski 2011, *op. cit.*, and references therein) and large-bodied snake species are at greater risk of entanglement (Ebert et al. 2019. Wildl. Soc. Bull. 43:231–237).

Fig. 1. Adult *Farancia erytrogramma* in South Carolina, USA, that died from exposure after entanglement in plastic mesh used for soil erosion control.

At 0900 h on 10 November 2020, AL discovered a recently deceased adult male *F. erytrogramma* (702 mm SVL, 859 mm total length) entangled in soil erosion mesh in a suburban neighborhood in Myrtle Beach, Horry County, South Carolina, USA (33.74166°N, 78.82810°E; WGS 84; 3 m elev.; Fig. 1). An *Agkistrodon piscivorus* (Cottonmouth), also dead, was tangled in the same mesh. The *F. erytrogramma* was collected and deposited in the North Carolina State Museum of Natural Sciences (NCSM 104642). Our observation adds to the list of species susceptible to the hazards of plastic mesh and underscores the need to use alternative erosion control methods or to modify the method of mesh installation (e.g., by burying the edge; Ward et al. 2020. J. Fish Wildl. Manag. 11:273–278). This is the second observation of *F. erytrogramma* in this area within one year (Durso and Laverick 2020. Herpetol. Rev. 51:618-619), which provides some evidence that tidal creeks remain good habitat capable of supporting populations of *F. erytrogramma*, despite population declines of its preferred prey (*Anguilla rostrata*) elsewhere (Haro et al. 2000. Fisheries 25:7–16).

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***GLOYDIUS USSURIENSIS* (Ussuri Pitviper). DIET.** *Gloydius ussuriensis* is a pitviper inhabiting the Russian Far East, northeastern China, and the Korean Peninsula (Orlov et al. 2014. Russ. J. Herpetol. 21:169–178) that feeds primarily on frogs and other amphibians, but also on small mammals and other animals (Orlov et al. 2002. *In* Schuett et al. [eds.], Biology of the Vipers, pp. 345–360. Eagle Mountain Publishing, Eagle Mountain, Utah; Orlov et al. 2014, *op. cit.*). Regarding the diet of *G. ussuriensis* populations inhabiting Gapa and Jeju islands,

Fig. 1. *Gloydius ussuriensis* in the process of consuming a *Craseomys regulus* in Baekyang-ri, Chuncheon, Republic of Korea.

Republic of Korea, a previous study has identified following prey species: *Scolopendra subspinipes mutilans* (Chinese Red-headed Centipede), *Hynobius quelpaertensis* (Jeju Salamander), *Kaloula borealis* (Boreal Digging Frog), *Rana uenoi* (Ueno's Brown Frog), *Pelophylax nigromaculatus* (Black-spotted Pond Frog), *Dryophytes japonicus* (Japanese Treefrog), *Amphiesma vibakari ruthveni* (Japanese Keelback), *Scincella vandenburghi* (Smooth Skink), *Crocidura shantungensis* (Asian Lesser White-toothed Shrew), *Sorex caecutiens hallamontanus* (Halla Mountain Shrew), and *Apodemus chejuensis* (Jeju Striped Field Mouse; Kim and Oh 2014. Korean J. Environ. Ecol. 28:657–663). However, the diet of mainland Korean populations is not well documented.

At 2310 h on 10 July 2020, we encountered an adult *G. ussuriensis* (ca. 47 cm total length) in the process of consuming a cricetid rodent in Baekyang-ri, Chuncheon, Republic of Korea (37.81774°E, 127.59125°W; WGS 84; 110 m elev.). The rodent was later identified as *Craseomys regulus* (Korean Red-backed Vole), based on location and the following external morphological characteristics: 1) bicolored tail that is dark brown dorsally, and white ventrally, 2) dorsal pelage brown and ventral pelage light grey (Jo et al. 2018. Mammals of Korea. National Institute of Biological Resources, Incheon, Republic of Korea. 573 pp.). Our observation provides the first record of *C. regulus* as prey of *G. ussuriensis*. Given that *C. regulus* is widespread across the Korean Peninsula (Jo et al. 2018, *op. cit.*), it may be an important prey item for *G. ussuriensis*.

We thank Taejin Park (National Institute of Ecology) for helping us identifying the rodent and Jongsun Kim (Kangwon National University) for helpful discussions on the diet of Korean snakes.

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HEBIUS BEDDOMEI **(Beddome's Keelback). DIET.** *Hebius beddomei* (formerly *Amphiesma beddomei*; Guo et al. 2014. Zootaxa 3873:425–440) is a diurnal natricine snake endemic to the Western Ghats of India from south of Tamhini Ghat, Maharashtra, to parts of Tamil Nadu and South Kerala (Shinde et al. 2020. IRCF Rept. Amphib. 27:109–110). It is known to prefer frogs, but also feeds on small toads (Whitaker and Captain 2004. Snakes of India, The Field Guide. Draco Books, Chennai, India. 495 pp.). However, there is insufficient information about the specific prey items recorded in the diet of this snake. Herein, I report an observation of *H. beddomei* feeding on a *Fejervarya rufescens* (Reddish Burrowing Frog). The prey was identified as *F. rufescens* using available literature (Purushotham and Tapley 2011. Froglog 16:2; Biju 2017. Zootaxa 4277:451–490).

Fig. 1. *Hebius beddomei* feeding on a *Fejervarya rufescens* in Karnataka, India.

At 0850 h on 18 June 2019, I observed an *H. beddomei* feeding on a *F. rufescens* (Fig. 1) on a mud path in the vicinity of Agumbe Rainforest Research Station in Agumbe, Karnataka, India (13.51829°N, 75.08906°E; WGS 84). The snake was swallowing the completely motionless prey feet-first, with more than half of its hind-body engulfed. The snake became wary of my presence and moved into the forest, with the prey still in its mouth. To my knowledge, this is the first report of *F. rufescens* in the diet of *H. beddomei*.

I thank Madras Crocodile Bank Trust and Agumbe Rainforest Research Station for providing me with an opportunity to volunteer for the King Cobra Ecology and Conservation project. I also thank Yatin Kalki for his extended support and guidance.

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HEBIUS BOULENGERI **(Tai-yong Keelback). DIET.** *Hebius boulengeri* occurs in China, Vietnam, Laos, Cambodia, and Thailand (David et al. 2013. Zootaxa 3694:301–335). This oviparous, terrestrial, and semi-aquatic species is found in primary and secondary forest at ca. 80–1450 m elev., where it is thought to be diurnal and to feed on amphibians and fishes (Jiang and Lau 2016. *Hebius boulengeri*. The IUCN Red List of Threatened Species 2016: e.T192130A96293644). Here, we report the predation of an adult *Ophryophryne* cf. *synoria* (O'Reang Mountain Toad) by an adult *H. boulengeri*.

At 2145 h on 19 October 2019, near the Suoi Lanh Stream, within Gung Re Commune, Di Linh District, Lam Dong Province, Langbian Plateau, southern Vietnam (11.45125°N, 108.06285°E, WGS 84; 1200 m elev.), we observed a gravid female *Ophryophryne* cf. *synoria* being eaten by a *H. boulengeri* (Fig. 1). We captured the snake in process of consuming the toad headfirst on a large rock near the stream. Due to the defensive behavior (body inflation) when attacked and large size of gravid toad, the consumption process was difficult, lasting ca. 20 min. This adds to the very limited knowledge of diet and natural history of the genus *Hebius*.

PHOTO BY HIEU MINH PHAM

FIG. 1. Adult *Hebius boulengeri* consuming a gravid female *Ophryophryne* cf. *synoria* in Di Linh District, Lam Dong Province, Vietnam.

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***HEBIUS CHAPAENSIS* (Sapa Keelback Snake). DIET.** *Hebius chapaensis* is a little-known species that occurs in southwestern China, northern Vietnam, and northern Laos. It is nocturnal, semi aquatic, and inhabits tropical or subtropical forests between at 1050–2046 m elev. (Ren et al. 2013. Zootaxa 4486:31–56). Here, we report the predation of an adult female *Amolops cremnobatus* (Lao Torrent Frog) by an adult *H. chapaensis*.

At 2030 h on 22 May 2020, in a stream in Longcheng District, Xaisomboun Province, northern Laos (19.04420°N, 102.75997°E; WGS 84; 890 m elev.), PB observed a female *A. cremnobatus* being predated by an adult *H. chapaensis* (Fig. 1). The snake was found under a boulder in the stream and headfirst ingestion already started. The observer (PB) did not wait for the predation event to be completed, as the snake was clearly disturbed by human presence. To our knowledge, this is the second prey item reported at the species level for *H. chapaensis*; the other record involved predation of tadpoles of *Zhangixalus duboisi* (Ren et al. 2013, *op. cit.*). This adds to the very limited knowledge of diet and natural history of snakes in the genus *Hebius*.

PHOTO BY PETER BRAKELS

FIG. 1. Adult *Hebius chapaensis* consuming a female *Amolops cremnobatus* in Longcheng District, Xaisombun Province, Laos.

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***HYPSIGLENA JANI* (Chihuahuan Nightsnake). PREDATION.** On 20 June 2020 three of us (AM, CAC, VMS) found the carcass of a juvenile *Hypsiglena jani* (Fig. 1) on the floor of a night roost utilized by Pallid Bats (*Antrozous pallidus*) in the entrance to the bathroom facilities at The University of Texas at El Paso's (UTEP) Indio Mountains Research Station (IMRS), in Hudspeth County, Texas, USA (30.78278°N, 105.01528°W; WGS 84; 1233 m elev.), located in the Trans-Pecos region of the Chihuahuan Desert. The snake was found on the floor along with various arthropod remains and bat feces and it is not uncommon to see prey accidentally dropped by bats at this roosting site. Judging by the decomposition stage of the carcass, it appeared that the snake had been killed several nights before. To the best of our knowledge, this is the first published report of predation of *H. jani* by *A. pallidus*.

Predation on *H. jani* by *A. pallidus* was expected as this small nocturnal snake is common at the site. Other reptiles reported consumed by *A. pallidus* at the same site were the lizards *Coleonyx brevis*, *Cophosaurus texanus*, *Urosaurus ornatus* (Lenhart et al. 2010. Southwest. Nat. 55:110115) and *Phrynosoma modestum* (Mata-Silva and Johnson 2011. Herpetol. Rev. 42:95), and the snake *Rena segrega* (as *R. humilis* by Mata-Silva and Johnson 2011. Herpetol. Rev. 42:444). In addition to the species mentioned above, a few other squamates such as *Phrynosoma hernandesi* (O'Shea and Vaughan 1977. J. Mammal. 58:269285; Bell 1982. Behav. Ecol. Sociobio. 10:217223) and *Coleonyx variegatus* (Johnston and Fenton 2001. J. Mammal. 82:362373) have been reported in the diet of *A. pallidus*. Other known

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FIG. 1 Carcass of a juvenile *Hypsiglena jani* found on the floor of a Pallid Bat (*Antrozous pallidus*) roosting site on Indio Mountains Research Station, Hudspeth County, Texas, USA.

predators of *H. jani* includes a house cat (Minton 1959 [1958]. Southwest. Nat. 3:2854), the snakes *Crotalus lepidus* (Mata-Silva et al. Herpetol. Rev. 41:235236) and *Diadophis punctatus* (French 2017. Herpetol. Rev. 48:448); cannibalism was reported in captivity (Degenhardt et al. 1996. Amphibians and Reptiles of New Mexico. University of New Mexico Press, Albuquerque New Mexico. 431 pp.).

Special thanks to the UTEP administration for providing a special permit to perform field research and travel support to IMRS during the period of COVID-19 restrictions. AM and CAC were funded by a URI 2020 grant awarded to VMS.

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***LAMPROPELTIS CALIFORNIAE* (California Kingsnake). BEHAVIOR/MALE-MALE COMBAT.** There are few published descriptions of male-male combat in *Lampropeltis* spp. under natural conditions. Moehn (1967. Copeia 1967:480–481) described the "combat dance" between two male *L. calligaster* (Prairie Kingsnakes) in the field over a period of 30 min, with the snakes "completely intertwined..." and "...in constant motion." For snakes in captive settings, Carpenter and Gillingham (1977. Southwest. Nat. 22:517–524) described and illustrated interactions of two male *L. holbrooki* (Speckled Kingsnakes) in a small artificial enclosure. Shaw (1951. Herpetologica 7:149–168) briefly described aggressive interactions between two captive male *L. annulata* (Mexican Milksnakes) that appeared to be associated with feeding. Tabulated categories of male–male combat behaviors in boid, colubrid, and viperid snakes (including *Lampropeltis* spp.) have been compared in an attempt to relate behavior patterns to phylogenetic relationships (Senter et al. 2014. PLoS ONE 9:e107528).

On 29 April 2019, at ca. 1215 h, one of us (SS) was alerted to the presence of an adult *L. californiae* in a water feature in her backyard in Apache Junction, northern Pinal County, Arizona, USA. The snake (designated here as "A") spent about 20 min soaking in the feature and drinking. Approximately 20 minutes later, SS was called back to the backyard where there were now three adult *L. californiae*. Two (A and B) were engaged in combat and the third (C) was ca. 1 m away and in a relaxed, motionless position. Snakes A and B were entwined and flat to the ground. Their movements in this interaction took the form of a spinning helix. The rate at which they wound around each other varied in a pulsing manner and as the helix formed by their bodies turned, first one snake and then the other would have its head and neck in a superior position. After a few minutes the smaller of the two fighting snakes (A) separated and the larger of the two (B) went north into the brush. Snake C then moved south and snake A followed closely behind it while tongue-flicking. At this point, SS noticed two *L. californiae* in the direction snake B had headed moments before.

Fig. 1. Male combat between two *Lampropeltis californiae* (California Kingsnakes) in Apache Junction, Arizona, USA, showing entwining of the snakes' bodies, and "body bridging": the lower snake (individual D) is arching the anterior of his body and dislodging the other snake from his superior position.

These two snakes (B and D) were evenly matched in size although snake D had noticeably whiter bands than snake B. The two snakes were wrapped around each other in a clockwise manner (viewed from the head end) with their heads in close proximity. Throughout the interaction, each individual attempted to hold a position on top of the other, with its anterior body on top of the other individual, 5–10 cm behind the head. Throughout, the snakes kept their heads forward, parallel, and slightly separated, with the superior individual 1–4 cm above, or slightly behind. The individual in the inferior position would react by either lifting its anterior body in an arch (up to 7–8 cm above the ground; Fig. 1) to drop the other snake off, then wrapping around to a position on top, or by pulling its head and neck back, slipping out from under the other, then wrapping around to a position back on top. During a 27-sec video sequence (Drost 2020. U.S. Geological Survey data release, https://doi.org/10.5066/P9R4Y2MI), there were eight such changes of superior position, with neither individual having an evident advantage. These two individuals continued this interaction for ca. 10 min. They were harassed at times by a Curve-billed Thrasher (*Toxostoma curvirostre*) pecking at their tails, presumably defending several fledglings in the vicinity, but neither snake showed any evident distraction or reaction to the bird. The two snakes remained in essentially the same place on the ground throughout the video sequence. However, their continued interaction gradually moved them down a slope to the bottom of a wash.

This match ended when snake D broke free and was followed by snake B under a shrub. Snake B then emerged and came back up the side of the wash flicking its tongue and seeming to follow the route of snakes A and C. By this time, though, snakes A and C had moved over the edge of the wash and were not seen again. No biting was observed during the interactions between either pair of snakes. Likewise, we did not observe any evidently tight constriction, which has been described by other authors (e.g., Hansen 1982. Master's Thesis, California State University, Sacramento, California. 110 pp.)—rather, the entwining coils of the snakes were relatively relaxed throughout. At one point in photos of the second interaction, however, snake B had noticeably puffed up its throat and neck while in an inferior position to D. Forceful pushing down of the head and neck of the inferior individual by the superior individual (referred to as "topping" by some authors, e.g., Senter et al. 2014, *op. cit.*) was also not evident during our observations.

All four snakes were individually recognizable based on differences in facial spots and body bands, evident in photographs taken during the interactions. The snakes were not captured and examined, but based on size and behaviors, we presume the fighting snakes (A, B, and D) were males and that C was a female. We do not know if any of the males copulated with the female.

In an unpublished thesis, Hansen (1982, *op. cit.*) described observations of nine instances of combat between individually marked male *L. californiae* in the Central Valley of California. All instances occurred during the height of breeding season in April and May. As with our observations, a female was present at three of the bouts observed by Hansen (1982, *op. cit.*), and, based on behavior of the males during and after the interactions, he believed that all of the bouts were associated with "sexual rivalry" over a nearby female. Observed behaviors mirrored those in our observations, with the males intertwined and rotating around each other slowly ("…one to several times per minute…,"; Hansen 1982, *op. cit.*) or rapidly, with similar body bridging by the individual in the inferior position to regain the superior position. Biting of one male by the other was observed in some of the interactions but was described as "occasional" and "deliberate." Hansen (1982, *op. cit.*) interpreted linear movement that occurred during male–male interactions as an intentional attempt by one male to move the other male out of the immediate area. However, as in our observations, significant linear movement was down slopes in each case, and the movement may have been inadvertent and uncontrolled.

Observations described for the two *L. holbrooki* in a captive arena (Carpenter and Gillingham 1977, *op. cit.*) involved much more movement—towards each other, parallel to each other, and away from each other—but included similar attempts to move on top of the other, and body-bridging by the individual on the bottom. Descriptions and illustrations emphasize alignment of the snakes' bodies, and/or one individual lying partly on top of the other. The trunks of the snakes were occasionally entwined, but they did not exhibit the nearly continuous helical winding around each other that we observed in the two different interactions of *L. californiae*. The authors also recorded three instances of one individual biting the other, and of the two males directly facing each other within a few cm; we did not observe either of these actions by *L. californiae*. Carpenter and Gillingham (1977, *op. cit.*) further noted actions they interpreted as submissive behaviors—moving the anterior part of the body away from the approaching individual, partial retreat, and lying coiled and pressed against the substrate, after 25 min of interaction. In contrast, in both of the interactions we observed, one individual simply disengaged and moved away. Although Carpenter and Gillingham (1977, *op. cit.*) suggested that the size of their artificial enclosure "…would have permitted [the two individuals] to remain separated," the space was small (1.2 × 1.2 m) and clearly did not allow either individual to move away entirely. This points to the need for caution in extrapolating behavioral interactions in artificial, captive conditions, to natural conditions.

We thank Meredith Hartwell of the Southwest Biological Science Center for assistance with video review and still image capture. Data and video generated during this study are available from the USGS ScienceBase-Catalog. Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the United States Government.

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LAMPROPELTIS GETULA NIGRA **(Black Kingsnake). DIET and FEEDING BEHAVIOR.** *Lampropeltis getula nigra*, like other members of the genus *Lampropeltis*, is known to prey on a wide variety of snake species including venomous pit vipers (Gibbons 2017. Snakes of the Eastern United States. University of Georgia Press, Athens, Georgia. 432 pp.) Although ophiophagous species preferentially consume their prey head-first, this behavior may be related to prey size, with smaller snakes being consumed tail-first in some South American species (Greene 1976. Z. Tierpsychol. 41:113–120). Here, I document an encounter where *L. g. nigra*, consumes a prey snake tail-first.

At 1630 h on 16 May 2020, at Land Between the Lakes National Recreation Area, Lyon County, Kentucky, USA (36.98760, 88.07947; WGS 84; 60 m elev.), a *L. g. nigra* (91.4 cm SVL; sex unknown) was found in a recently burned xeric oak-hickory forest along a terrace at the base of a limestone outcrop. The snake raised its head, revealing a live *Virginia valeriae* (Smooth Earthsnake) in its mouth. The kingsnake had grasped

Fig. 1. *Lampropeltis getula nigra* from Kentucky, USA seizing prey, *Virginia valeriae,* mid-body.

Fig. 2. *Lampropeltis getula nigra* from Kentucky, USA consuming prey, *Virginia valeriae,* tail first.

the earthsnake mid-body (Fig. 1) and proceeded to swallow it alive and ultimately tail-first (Fig. 2), without constriction. Although members of the *Lampropeltis getula* complex are known to consume *V. valeriae* (Elliot et al. 2008. Amphibians and Reptiles of Georgia. University of Georgia Press, Athens, Georgia. 419 pp.), this observation is notable because of the apparent difference in mass ratio between predator and prey, as well as the direction in which the prey was consumed; *L. getula* are known for generally consuming prey headfirst (Godley et al. 2017. Herpetol. Mongr. 31:47–68; Jackson et al. 2004. Zoology 107:191–200).

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***LEPTODEIRA FRENATA* (Mayan Cat-eyed Snake). DIET and REPRODUCTION.** *Leptodeira frenata* is a medium-sized dipsadid snake (ca. 740 mm total length [TL]) that occurs on the Atlantic versant, from central Veracruz to the Yucatán Peninsula in Mexico (Heimes 2016. Herpetofauna Mexicana Vol. I. Snakes of Mexico. Edition Chimaira, Frankfurt am Main. 572 pp.), northern Guatemala, and Belize (Lee 1996. The Amphibians and Reptiles of the Yucatán Peninsula. Cornell University Press, Ithaca, New York. 500 pp.). Anurans and lizards are known to be part of the diet of this species. In Chichén Itzá, an *L. frenata* contained a *Ctenosaura similis* (ca. 175 mm TL) in its stomach (Barbour and Cole 1906. Bull. Mus. Comp. Zool. 1:100–163). In Campeche, a specimen preyed upon *Anolis lemurinus* (Lee 1996, *op. cit.*); whereas in individuals from Chetumal, Mexico, *Sceloporus*, *Incilius valliceps* and *Smilisca baudinii* where consumed (Köhler et al. 2016. Mesoam. Herpetol. 3:929–947). In Guatemala, an individual was found with a *Triprion petasatus* in its stomach (Stuart 1935. Misc. Publ. Univ. Michigan Mus. Zool. 29:1–56). As for its reproduction, *L. frenata* is an oviparous species. A specimen collected in August, and other collected in November had vitellogenic follicles, with the larger ones belonging to the August female (Köhler et al. 2016, *op. cit.*). An individual from Cozumel contained well-development eggs in February (Himmelstein 1980. New York Herpetol. Soc. Bull. 16:18–34). A specimen was collected with seven mature eggs in April (Stuart 1935, *op. cit.*), and three collected gravid females laid eggs in captivity, depositing two, four, and seven eggs in February, January, and June, respectively (Köhler et al. 2016, *op. cit.*).

PHOTO BY J. RIZIERI AVILÉS-NOVELO

FIG. 1. An adult female *L. frenata* preying on a juvenile *C. similis*.

PHOTO BY J. RIZIERI AVILÉS-NOVELO

FIG. 2. The same female *L. frenata* with two adult males courting her.

On 4 January 2014, at 2330 h, during a night herpetofauna survey, JRAN found an adult female *L. frenata* (ca. 650 mm TL) preying on a juvenile *C. similis* (ca. 330 mm TL; Fig. 1) in a rock wall surrounded by tropical deciduous forest, 22.5 km southeast Mérida, in Hacienda Yabucú, Acanceh, Yucatán, Mexico (20.81057°N, 89.41620°W; WGS 84). The snake likely captured the iguana while it was sleeping among the rocks of the wall. Fifteen minutes after the aforementioned sighting, the same female, having consumed the lizard, was observed surrounded by two male individuals (Fig. 2), 45 cm from the first observation. The males were similar in size (ca. 470 mm TL) and they were competing to mate, coiling their tails with that of the female. The individuals continued to copulate for ca. 4 min before separating because of disturbance.

Although there is a previous record of a hatchling *C. similis* being consumed by an *L. frenata* (Barbour and Cole 1906, *op. cit.*), in the present case, the lizard was substantially longer and heavier than a hatchling (López et al. 2012. Rev. Científica FCV-LUZ 1:65–71). To our knowledge, these observations represent the first records of predation on nonhatchling *C. similis* and reproductive behavior of *L. frenata*.

We thank everyone at Hacienda Yabucú for allowing us the herpetological samplings at their installations.

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***LEPTODEIRA FRENATA* (Rainforest Cat-eyed Snake). DIET.** *Leptodeira frenata* is a mainly nocturnal, semi-arboreal, medium-sized snake occurring throughout the Yucatán Peninsula and the Atlantic slope of central Veracruz, Mexico, in deciduous forests to rainforests up to ca. 1000 m elev. (Heimes 2016. Herpetofauna Mexicana Vol. I. Snakes of Mexico. Edition Chimaira, Frankfurt am Main. 268 pp.). An opisthoglyphous species (Weinstein et al. 2014. Clin. Toxicol. 52:277–282), this snake generally preys on anurans and lizards (Henderson and Hoevers 1977. Copeia 2:349–355).

On 16 June 2016, at 2203 h, while in Km20's research camp (Calakmul Biosphere Reserve, Campeche, Mexico; 18.36505°N, 89.89253°W; WGS 84), we heard anuran vocalizations coming

PHOTO BY OLIVER JENNER

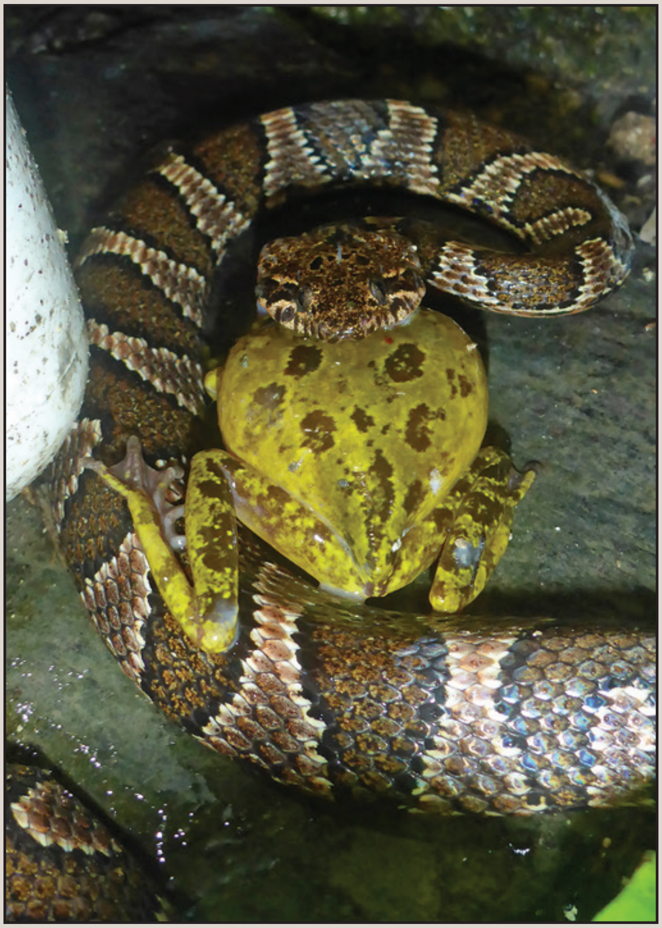

Fig. 1. Adult *Leptodeira frenata* preying upon a *Triprion petasatus* in Calakmul Biosphere Reserve, Campeche, Mexico.

from a concrete water tank. In the tank, we observed over twenty *Smilisca baudinii* (Common Mexican Tree Frog) and *Triprion petasatus* (Yucatán Casque-headed Tree Frog) in reproductive activity. An adult (ca. 5 cm SVL) *T. petasatus*, potentially disturbed by our presence, jumped away from the path we were walking and landed ca. 5 cm from an adult *L. frenata* (ca. 60 cm total length), positioned close to the base of the water tank. As soon as the frog touched the ground, the snake caught it headfirst and started to swallow it alive (Fig. 1). The predated *T. petasatus* immediately inflated itself and tried to escape, pushing with its hind legs against the snake's body (Fig. 1). The frog's escape attempts proved useless, as the snake successfully swallowed it alive. To our knowledge, this is the first record of *L. frenata* predating on *T. petasatus*.

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***LYCODON AULICUS* (Common Wolf Snake). DIET.** *Lycodon aucilus* is a common nocturnal snake found throughout south Asia, and is often found near human habitations (Whitaker and

PHOTO BY TANVIR AHMED

Fig. 1. An adult *Lycodon aulicus* ingesting a *Hemidactylus flaviviridis* on a concrete road at Pirojpur, Barishal, Bangladesh.

Captain 2004. Snakes of India, The Field Guide. Draco Books, Chennai, India. 481 pp.). Like other species of *Lycodon*, it is primarily a gecko and skink feeder, but also takes small mammals including rodents and bats (Tank and Sharma 2016. Herpetol. Rev. 47:480). On 24 April 2018, at 2139 h, an *L. aulicus* was found ingesting a *Hemidactylus flaviviridis* (Gekkonidae) on the concrete road at Pirojpur, Barishal, Bangladesh. The predation event reportedly occurred on the roof (ca. 3 m above ground) of a roadside store and subsequently the snake and prey fell to the road. We moved the snake off the road and ingestion continued. We revisited the location at 2230 h and neither the snake nor the gecko was found.

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***LYCOPHIDION NAMIBIANUM* (Namibian Wolf Snake). DIET.** *Lycophidion namibianum* is a small, uncommon species of nocturnal lamprophiid snake endemic to rocky desert and xeric savannas in northwestern Namibia and adjacent southern Angola. Members of the genus are characterized by their large recurved anterior teeth, which are used to hold onto their prey, chiefly fossorial lizards and snakes (Marais 2004. A Complete Guide to the Snakes of Southern Africa. Second edition. Struik Nature, Cape Town, South Africa. 312 pp.) or diurnal lizards, which are pulled from their retreats while sleeping (Branch 1976. J. Herpetol. 10:1–11). However, documented records of diet from this group are few.

A male *L. namibianum* (California Academy of Sciences [CAS] 263033: 250 mm SVL) collected on 22 November 2016 in the Maume riparian area of Namibe Province, Angola (13.8001°S, 13.123°E; WGS 84) was found to have a specimen of *Sepsina angolensis* (Angolan Burrowing Skink) in its stomach. The *S. angolensis* (64 mm SVL) was found almost completely intact except for some damage to the head and missing limbs. This represents only the second record of *L. namibianum* for Angola (Broadley 1991. Ann. Transvaal Museum 35:209–215; Branch 2018. Amphib. Reptil. Conserv. 12:41–82), the first record of a prey item for *L. namibianum*, and the first record of predation on *S. angolensis*. Dietary data for many southern and central African snakes are scarce and this is especially so for Angola, which emerged from four decades of war only in 2002.

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***MANOLEPIS PUTNAMI* (Thin-scaled Snake). DIET.** *Manolepis putnami* is a diurnal and terrestrial species endemic to Mexico. It feeds primarily on lizards, with *Sceloporus* and *Aspidoscelis* being the only genera registered (Ramírez-Bautista 1994. Manual de Claves Ilustradas de los Anfibios y Reptiles de la Región de Chamela, Jalisco, México. UNAM, Mexico. 127 pp.; Sánchez-de la Vega et al. 2012. Herpetol. Rev. 43:346; Bello-Sánchez and González-Christen 2016. Herpetol. Rev. 47:149). Here we report the first case of predation by *M. putnami* on *Urosaurus bicarinatus* (Tropical Tree Lizard), an arboreal and saxicolous lizard endemic to Mexico.

At 1200 h on 20 March 2020, an *M. putnami* was observed consuming an adult *U. bicarinatus* (Fig. 1) in tropical deciduous forest in Pinotepa Nacional, Oaxaca, Mexico (16.33000°N, 98.01277°W; WGS 84; 67 m elev.). The lizard had already been captured by the snake when it was observed, and both were on the ground. The snake proceeded to swallow the lizard in ca. 5 min.

I thank Sandra Jocelyn Garrido Mijangos and Javier Martínez Toledo for their help in translation and writing of this note.

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FIG. 1. *Manolepis putnami* consuming an adult *Urosaurus bicarinatus* in Pinotepa Nacional, Oaxaca, Mexico.

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***MASTICOPHIS FLAGELLUM TESTACEUS* (Western Coachwhip). DIET.** *Masticophis flagellum testaceus* is an active diurnal colubrid that ranges from northeastern Mexico and southern New Mexico northward to the American Midwest (Powell et al. 2016. Peterson Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Harcourt, Boston, Massachusetts. 494 pp.). Known prey items of *M. flagellum testaceus* include *Opheodrys aestivus*, *Phrynosoma cornutum*, *Uta stansburiana*, *Aspidoscelis spp.*, *Lepus californicus*, *Sylvilagus* sp., and species from the orthopteran family Acrididae (McKinney and Ballinger 1966. Southwest Nat. 11:410–412; Mueller and Whiting 1989. Herpetol. Rev. 20:72–73; Whiting et al. 1992. Snake 24:157–160). Herein, we supplement the list of known prey items for *M. flagellum testaceus* with the orthopteran species *Pediodectes haldemanii* (Haldeman's Shieldback).

FIG. 1. Partially digested *Pediodectes haldemanii* in the body cavity of a road killed *Masticophis flagellum testaceus* from Texas, USA.

On 6 June 2020 at 1135 h, one of us (LGB) found a road-killed *M. flagellum testaceus* (ca. 122 cm SVL) in Val Verde County, Texas, USA (30.12498°N, 101.31140°W; WGS 84; 637 m elev.). Scavenging vultures had opened several holes in the ventromedial portion of the body which exposed the snake's digestive tract and revealed a partially digested *P. haldemanii* (Fig. 1). To the best of our knowledge, this is the first published report of predation on *P. haldemanii* by *M. flagellum testaceus*.

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***MUSSURANA BICOLOR* (Mussurana). DIET.** *Mussurana bicolor* occurs in the states of Mato Grosso, Mato Grosso do Sul, Paraná, and Santa Catarina, Brazil (Costa and Bernils 2018. Herpetol. Bras. 1:57). On 25 October 2019, at 2230 h, we observed an *M. bicolor* (ca. 70 cm total length) next to one of the

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FIG. 1. *Mussurana bicolor* preying on a chiropteran.

accommodations in a hostel in the Pantanal sul-matogrossense, Brazil (19.4474°S, 57.0759°W; WGS 84; 118 m elev.). The snake was in the process of feeding on an unidentified chiropteran (Fig. 1) and there were bats flying ca. 2 m from the snake. The snake used part of its body to hold the bat just below the wings, thus providing support for the feeding process. It seemed to have difficulty ingesting the bat due to the anatomy of the wings; the *M. bicolor* used the coils of its body to position the bat's limbs, in order to facilitate the feeding. *Mussurana bicolor* is known to feed on small lizards, small rodents, amphibians, and snakes (Gaiarsa 2013. Pap. Avuls. Zool. 53:261–283). This work reports the first record of trophic interaction between *M. bicolor* and a chiropteran.

We are grateful to Wederson de Morais da Silva for Portuguese to English translation.

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***NAJA ATRA* (Chinese Cobra). DIET.** Although the majority of snakes feed on live prey, captive snakes readily accept dead food and herpetologists are increasingly recognizing the widespread consumption of carrion, especially roadkill, by snakes in the wild (DeVault and Krochmal 2002. Herpetologica 58:429–436). However, it is extremely rare for wild snakes to feed on cooked or vegetarian materials.

At ca. 1100 h on 18 July 2020, Hui-Ling Fan visited a badminton club in Meilunshan Park (23.99366°N, 121.61477°E; WGS 84), located on a suburban hill close to Hualien City, Taiwan. Outside the club, she encountered a woman who routinely provides food for stray dogs. The woman put some cooked rice in a dish and left the club. Within 10 min, a *Naja atra*, seemingly attracted by the smell, approached the dish and began to swallow the rice (Fig. 1). This foraging behavior lasted ca. 10 min until the snake was disturbed by a passerby who wanted to take photos. However, the snake soon returned, followed by another cobra. The first snake continued consuming rice, but the follower did not. After 5 min both snakes left the site. A video of the behavior can be seen at: https://www.youtube.com/watch?v=obl6oOI0-W8.

Fig. 1. *Naja atra* eating cooked rice which had been provided for stray dogs.

Naja atra is known to prey on a wide variety of vertebrates, especially rodents and other snakes, but to our knowledge, this is the first record of this species feeding on cooked rice. A similar case has been reported, in which a wild North American ratsnake (*Pantherophis obsoletus*) repetitively fed on canned dogfood from the back porch of a house (Parker and McCallum 2010. Herpetol. Rev. 41:502). We suspect that in our case, the rice was mixed with flavored meat soup to attract dogs, and thus confused the snake. This event demonstrates one problem with feeding stray dogs, in that normal behavior of nearby wildlife might be altered and even lead to potential conflicts between human and snakes.

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***NERODIA ERYTHROGASTER* (Plain-Bellied Watersnake). DIET.** *Nerodia erythrogaster* was considered by Ernst and Barbour (1989. Snakes of Eastern North America. George Mason University Press, Fairfax, Virginia. 282 pp.) as "mostly a fish eater." However, based on extensive literature review, Gibbons and Dorcas (2004. North American Watersnakes: A Natural

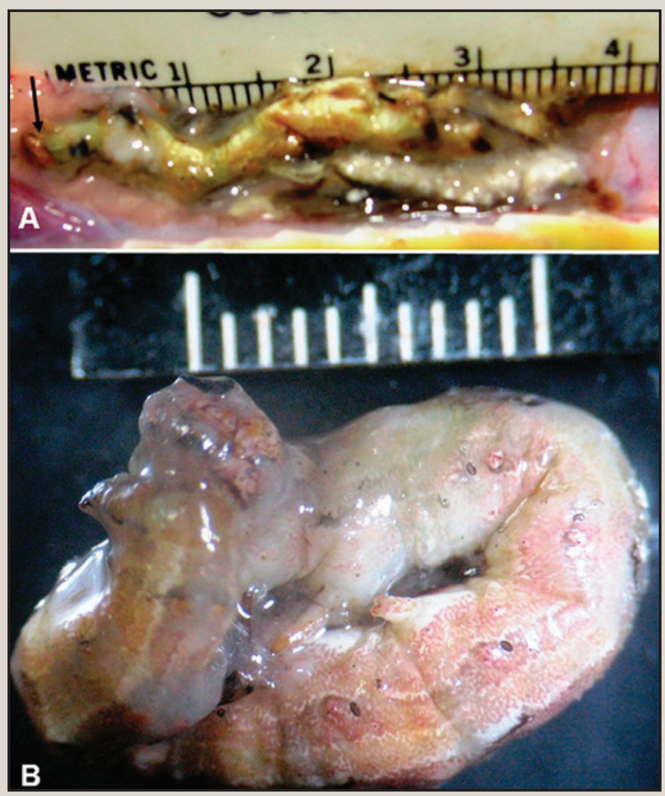

Fig. 1. Stomach contents of *Nerodia erythrogaster*; A) contents *in situ* showing head (arrow) and body of caterpillar; B) extracted whole caterpillar; scale is 1 mm/line.

History. University of Oklahoma Press, Norman. 438 pp.) report that *N. erythrogaster* tends to feed on more amphibians than do other watersnakes. Unknown "aquatic insects" per Ashton and Ashton (1981. Handbook of Reptiles and Amphibians of Florida. Part 1, The Snakes. Windward Publishing, Miami. 176 pp.) are also listed in their table but there is no mention of the species eating terrestrial insects and/or other arthropods. In a study conducted in Oklahoma, Preston (1970. Unpublished Ph.D. dissertation, University of Oklahoma, Norman) reported that 11 of 79 (14%) *N. erythrogaster* had food in their stomachs, including frogs, a tadpole, three fish, and one crawfish. Here, I report a novel instance of *N. erythrogaster* feeding on terrestrial insects and other arthropods in southeastern Oklahoma.

On 25 August 2020, an adult female (SVL = 735 mm) *N. erythrogaster* was collected by hand at a residence in Hochatown, McCurtain County, Oklahoma, USA (34.171077°N, 94.75184°W; WGS 84). It was euthanized by an intraperitoneal injection of sodium pentobarbital (Nembutal®), and a mid-ventral incision was made to expose the gastrointestinal contents, which contained insects and other arthropods (Fig. 1A–B). An intact lepidopteran caterpillar, portions of a grasshopper, beetle elytra, a harvestman (Arachnida), and several pine (*Pinus*) needles was identified from stomach contents. A voucher specimen of the snake was deposited into the Arkansas State University Museum of Zoology (ASUMZ) Herpetological Collection, State University, Arkansas, USA as ASUMZ 34100.

I thank S. E. Trauth (ASUMZ) for expert curatorial assistance. A Scientific Collecting Permit was issued to CTM by the Oklahoma Department of Wildlife Conservation, no. 1551646.

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***NINIA SEBAE* (Red Coffee Snake). REPRODUCTION.** *Ninia sebae* is a small terrestrial or semi-fossorial snake that is primarily nocturnal and feeds on earthworms, slugs and small snails (Solórzano 2004. Snakes of Costa Rica: Distribution, Taxonomy, and Natural History. INBio, Santo Domingo de Heredia, Heredia. 792 pp.). It is found on the Atlantic slope from México to Panamá and on the Pacific slope from Guatemala to Costa Rica. It is an oviparous species, laying up to five eggs per female (Goldberg 2007. Texas J. Sci. 59:311–316) which take up to 75–79 days to hatch; the neonates measure 8–13 cm total length (Solórzano 2004, *op. cit.*).

PHOTO BY LUIS ZÚNIGA

Fig. 1. Coloration of neonate *Ninia sebae* from Honduras.

On 15 February 2020 a gravid female *N. sebae* (400 mm total length) was captured at the Centro Nacional de Conservación y Recuperación de Especies Rosy Walther, Honduras (14.1228°N, 87.1907°W; WGS 84; 1303 m elev.). Four eggs could be seen through the snake's underside and it was held at the serpentarium for reproduction. On 18 March 2020 the female laid four eggs with an average length of 23.7 mm. The eggs were incubated (24°C, 70% humidity) and hatched on 23 May, after 66 days of incubation. The neonates averaged 153.7 mm total length and varied in their patterning (Fig. 1), demonstrating that different pattern morphs can be produced from the same litter. Eleven days later, on 3 June, the neonates underwent their first shed.

This work was performed at the serpentarium "Rosy Walther" as part of their conservation program. Special thanks to Mario Solis for his comments on this note and Kevin Pineda for English translation.

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***OPHEODRYS VERNALIS* (Smooth Greensnake). NEST PREDATION.** During nest monitoring for conservation project with *Opheodrys vernalis* in Lake and DuPage counties, Illinois, USA, we observed multiple incidences of eggs being preyed upon by both adults and larvae of *Necrophila americana* (American Carrion Beetle) between June 2017 and July 2020. Larval *N. americana* were frequently present in *O. vernalis* nesting sites and were observed preying upon on early-stage eggs (less than 1–2 weeks old) in all years of the study. We have observed *N. americana* larvae chew holes in the eggshells and feed on the egg contents (Fig. 1A). Adult *N. americana* were observed preying upon less than one-week old *O. vernalis* eggs in late June and early July in 2019 in a DuPage County site (Fig. 1B).

In mid-July 2019, a single three-week old *O. vernalis* egg was found within a communal nest with the yolk and developing

PHOTOS 1A, B, D–F BY ALLISON SACERDOTE-VELAT; PHOTO 1C BY MICHELLE ROY

Fig. 1. A) *Necrophila americana* larvae feeding upon less than one-week old eggs of *Opheodrys vernalis*; B) *N. americana* adult feeding upon less than one-week old eggs of *O. vernalis*; C) a developing *O. vernalis* embryo within an intact yolk sac removed from the eggshell by *N. americana* larvae; D) *N. americana* larva removing a late-stage *O. vernalis* embryo from an eggshell; E) *N. americana* feeding on late development embryo; F) communal *O. vernalis* nest with late development embryos and yolk removed from the eggshells with yolk sacs ruptured.

embryo removed completely removed from the eggshell, but still encased within the yolk sac (Fig. 1C). In this case, *N. americana* larvae were observed on adjacent eggshells from which the yolk and embryos had been consumed. On 24 July 2020, 16 of 18 *O. vernalis* eggs in a 21-day old communal nest, were preyed upon by *N. americana* larvae (Fig. 1D). We observed *N. americana* larvae removing the developing embryos from the eggshells (Fig. 1R), and the larvae were actively feeding on the yolk and embryos (Fig. 1F). In this situation, many of the yolk sacs were ruptured and the embryos were pulled from the eggshell and yolk sacs.

Previous studies have reported parasitism of *Pantherophis spiloides* (Gray Ratsnake) eggs by *Nicrophorus pustulatus* (Blouin-Demers and Weatherhead 2000. Ecoscience 7:395–397; Keller and Heske 2001. Trans. Illinois Acad. Sci. 94:167–169) and host-shift from carrion to *Boaedon fuliginosus* (African Housesnake) eggs (Smith et. al 2007. J. Evol. Biol. 20:2389–2399). These observations document use of snake eggs as breeding sites by *N. pustulatus*, such that the eggs and larvae of the beetles develop inside the snake eggs rather than in carrion. In these accounts, the adult *N. pustulatus* makes a hole in the snake egg to oviposit the brood. Larvae subsequently emerge from the snake eggs. The previous accounts suggest that parasitism by Silphidae may be a seldom documented, but potentially significant, source of egg mortality for oviparous snakes.

In our study, we have not observed silphid oviposition holes in *O. vernalis* eggs, so we do not consider this an example of parasitism, but rather egg predation by multiple life stages of *Necrophila americana*. It is possible that other members of the Silphidae, also prey upon or parasitize eggs of oviparous snakes. However, Smith et al. (2007, *op. cit.*) found that two additional species, *Nicrophorus orbicollis* and *Nicrophorus defodiens* did not use snake eggs for breeding. An interesting aspect of *N. americana* predation of *O. vernalis* eggs relates to the variation in incubation length of this snake. Our observations demonstrate that eggs deposited either early or late in the nesting season are vulnerable to *N. americana* predation. Thus, nests with long or short incubation windows may similarly succumb to this source of mortality.

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***OLIGODON OCTOLINEATUS* (Eight-lined Kukri Snake). ABOREALITY.** Members of the genus *Oligodon* (kukri snakes) are typically terrestrial specialists of squamate eggs as well as small vertebrates (de Queiroz and Rodríguez-Robles 2006. Am. Nat. 167:684–694), with the exception of *O. annulifer* which is often arboreal (Harrington et al. 2018. Biol. J. Linn. Soc. 125:61–71). *Oligodon octolineatus* is a widespread lowland species, known from Sundaland, including the Malay Peninsula, Sumatra, Borneo, Java, the Sulu Archipelago, and Sulawesi (Das 2010. A Field Guide to the Reptiles of South-east Asia. New Holland Publishers [UK] Ltd., London. 376 pp.). Limited information on the ecology of *O. octolineatus* has been documented, although it has been observed climbing palm fronds ca. 1 m from ground (Will 2018. Singapore Biodiv. Rec. 2018:32).

On 16 May 2015, an adult *O. octolineatus* was observed at ca. 2030 h within lowland forest on the trunk of a tree ca. 3.5 m above ground, under the tree canopy. The locality was within a community forest at Upper Baleh (03.345183°N; 115.3088°E, WGS 84), Kapit Division, central Sarawak, East Malaysia. On 24 August 2018, a second specimen (ZRC 2.549) was encountered in lowland forest adjacent to the Matang Wildlife Centre (1.5500°N; 110.4167°E, WGS 84), Kuching Division, western Sarawak, East Malaysia, ca. 2.2 m up on a tree at 1915 h. It was an adult (total length ca. 45 cm), observed motionless in a head-down position, the body supported by the peeling bark of the tree (Fig. 1). These records from Borneo constitute the first records of arboreality in *O. octolineatus* and are suggestive of natural activities such as foraging and resting in such habitats.

Fig. 1. *Oligodon octolineatus* on a tree trunk in the vicinity of the Matang Wildlife Centre, Sarawak, East Malaysia.

I thank Kelvin K. P. Lim for verifying the identity of the species and for the digital voucher number, the Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak for support; and the Sarawak Forest Department for research permit (NCCD.907.4.4.[Jld.7]–38).

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***OXYRHOPUS TRIGEMINUS* (False Coral). CHROMATIC ANOMALY.** Heterochromia is a disorder that affects iris pigmentation, defined by the abnormal distribution of melanin, usually due to chromosomal homogeneity, whether pathological or not (Manrique-Gonzales 2019. Revista del Cuerpo Médico

Fig. 1. Right (A) and left (B) lateral views of *Oxyrhopus trigeminus* with heterochromia, collected in São Mateus, Espírito Santo, southeastern Brazil.

del HNAAA 12:177). In total heterochromia, different colors are present in the two irises; while in partial heterochromia, a single eye contains two distinct colors (Partington 1964. Can. Med. Assoc. J. 90:1008). On 2 October 2019 we recorded the first case of total heterochromia in *Oxyrhopus trigeminus* (525 mm SVL, 101 mm tail length; Fig. 1). The snake was found active at 1700 h in the Municipality of São Mateus, Espírito Santo, southeastern Brazil (18.67526°S, 39.86087°W; WGS 84; 39 m elev.), and was collected by Iasmim Regina Boroto Vieira (MZUFV-2638). The snake had red color in the right eye and black in the left. It did not show any evidence of blindness in either eye, responding positively, and repeatedly, to the visual stimuli presented by the authors.

This work is part of "Herpeto Capixaba: for the knowledge and conservation of amphibians and reptiles of Espírito Santo." We thank support from FAPES/ VALE/ FAPERJ No. 01/2015, Process number 527/2016.

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***PHILODRYAS NATTERERI* (Paraguay Green Racer). DEFENSIVE BEHAVIOR.** *Philodryas nattereri* (Serpentes: Dipsadidae) is known from Paraguay and Brazil, where it is widespread and common in the Cerrado, Caatinga, and Chiquitano Dry Forest, with marginal records in Amazonia (Nogueira et al. 2019. S. Am. J. Herpetol. 14:1–174). The wide defensive repertoire of this species has been described (Mesquita et al. 2013. Pap. Avul. Zool. 53:99–113), with passing reference to so called Liana-mimicry (LM) or Body-Bending Behavior (BBB). This defensive behavior has been recorded mainly in colubrid and dipsadid snakes of South America (Beebe 1946. Zoologica 31:11–52; Abuys 1986. Litteratura Serpentium 6:19–30; Marques et al. 2006. Herpetol. Bull. 97:2–4; Maddock et al. 2011. Herpetol. Notes 4:79–81; Duarte 2012. Herpetol. Notes 5:303–304; Miranda et al. 2012. Herpetol. Bull.122:35–37; Mesquita et al. 2013, *op. cit.*), North America (Doherty-Bone 2009. Herpetol. Bull.109:38–39), Caribbean (Torres et al. 2015. Reptiles & Amphibians 22:27–28), and Asia (Kathe and Deshmukh 2020. Reptiles & Amphibians 26:241–242) but has not been well documented in *P. nattereri* in the wild. On 8 August 2020, at 1702 h, an adult *P. nattereri* from Fazenda Santa Vitória, Mozarlândia, Goiás, Brazil (14.49307°S, 50.45145°W; WGS 84; 300 m elev.) was observed and video recorded for 30 sec displaying BBB and concomitantly tongue flicking when approached while crossing an unpaved road (Fig. 1). The snake moved off the road after making visual contact with the observer for several seconds. The exact role of BBB in snake defensive or signaling behavior remains to be fully explored.

PHOTO BY JOÃO ANTONIO SÓCRATES VASCONCELLOS

Fig. 1. Adult *Philodryas nattereri* displaying body-bending behavior in Mozarlândia, Goiás, Brazil.

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***PROTOBOTHROPS MUCROSQUAMATUS* (Brown-spotted Pitviper). REPRODUCTION/EGG-GUARDING.** *Protobothrops mucrosquamatus* is a viperid snake found across much of Asia, from India, throughout mainland southeast Asia, and into southern China. In Vietnam, this species, known as "Ran luc cuom," is documented to occur from the southern reaches of the Annamite Mountains (as far south as Gia Lai Province) to as far north as Lao Cai Province (Nguyen et al. 2009. Herpetofauna of Vietnam. Edition Chimaira, Frankfurt am Main, Germany. 768 pp.). Although widely distributed and common, little is known about its natural history. In this note, to the best of our knowledge, we detail the first two records of egg-guarding for this species via two previously encountered individuals in northern Vietnam, as well as report the observed clutch sizes and the behaviors of the individuals once encountered.

During recent herpetofaunal surveys in Bai Tu Long National Park—an archipelago comprised of 40 islands (Gawor et al. 2016. Salamandra 52:23–41) off the coast of northeastern Vietnam in Quang Ninh Province—we detected two presumably female *P. mucrosquamatus* guarding their egg clutches on Đảo Ba Mùn (= Ba Mun Island; 21.05926°N, 107.59184°E; WGS 84; 30 m elev.). The first animal (Fig. 1A, C) was observed on 23 June 2017 at 2030 h, ca. 2.5 m above the ground guarding at least five eggs tucked into a crevice along a rock ledge adjacent to a stream. The individual was coiled around the clutch, but it quickly reacted to our light by moving the anterior third of its body upwards in a defensive posture, with the tail remaining wrapped around the eggs. This posture was maintained until we were beyond the individual's immediate sight. The second individual (Fig. 1B, D), detected on 27 May 2019, at 2250 h, was observed guarding three eggs in a medium-sized treehole (*Streblus* sp.) at ca. 1.5 m off the ground, situated on the bank of the same adjacent stream. We encountered this individual after it defensively struck outwards from the treehole. Subsequent to striking, the individual retracted back towards the clutch, wrapping a single coil around the eggs, and assumed a defensive posture (although not striking again). As we photographed the individual, it slowly retreated further back into the treehole, departing from the clutch and moving beyond sight.

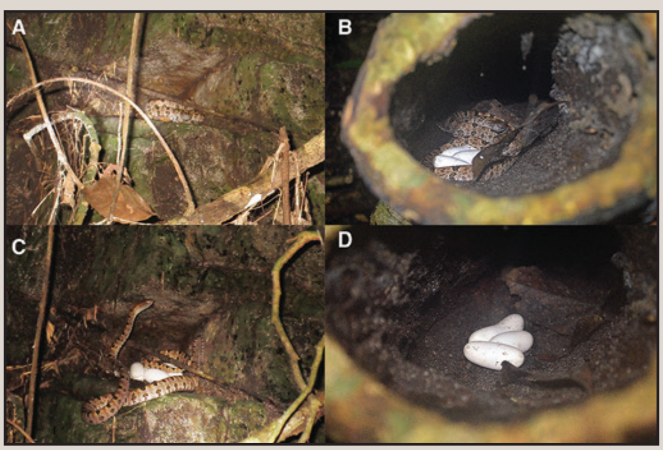

Fig. 1. The 2017 *Protobothrops mucrosquamatus* (A, C) as observed guarding a clutch of at least five eggs and the 2019 individual (B, D) in defensive posture as observed in a treehole guarding a clutch of three eggs.

Little is known about the reproductive biology of *Protobothrops* snakes, although, like many other pitvipers, maternal care has been previously documented. The individuals we encountered laid clutch sizes comparatively smaller than congeners, such as *P. kaulbacki*, which also exhibits egg-guarding and lays clutches of 6–32 eggs (Guo et al. 2007. Herpetol. J. 17:237–246). Clutch size and egg-guarding in captive-held *Protobothrops* species have also been noted, such as in *P. mangshanensis* (Olives et al. 2016. Clin. Toxicol. 54:290–292), and *P. cornutus* and *P. sieversorum* (Shiryaev et al. 2007. Russ. J. Herpetol. 14:57–64). One species, *P. kelomohy*, was even named for "mothers that lay eggs and stays and look after them during incubation time until hatching" (Sumontha et al. 2020. Trop. Nat. Hist. 20:43–59).

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***PTYAS NIGROMARGINATA* (Green Rat Snake). DIET.** Although *Ptyas nigromarginata* has a wide geographic range, little is known about its biology. It is known to be diurnal, terrestrial and arboreal, and inhabit hill evergreen, montane forests, and agricultural fields at 500–2300 m elev. (Vogel and Hauser 2013. Asian Herpetol. Res. 4:166–181). The diet of *P. nigromarginata* is known to consist of anurans, lizards, and rodents (Linzhuang and Wang 2015. Herpetol. Rev. 46:453). Here, we report predation on an adult female *Xenophrys* cf. *maosonensis* (Maoson Horned Toad) by an adult *P. nigromarginata.*

At 1600 h on 7 August 2020, in light rain, in the middle of an unpaved road in Khoun District, Xiangkhouang Province, northeastern Laos (19.10867°N, 103.64411°E; WGS 84; 1390 m elev.), a female *Xenophrys* cf. *maosonensis* was observed being

PHOTO BY PETER BRAKELS

Fig. 1. Adult *Ptyas nigromarginata* consuming a female *Xenophrys* cf. *maosonensis* in Khoun District, Xiangkhouang Province, Laos.

predated by an adult *P. nigromarginata* (Fig. 1). The snake had already started ingesting the frog headfirst when it was found. We directed the snake off the road and left the snake to digest the frog. To our knowledge, this is the second prey item recorded to the species level for *P. nigromarginata*, the first being *Diploderma yunnanense* (Linzhuang and Wang 2015, *op. cit.*).

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RHABDOPHIS SUBMINIATUS HELLERI **(Red-necked Keelback). REPRODUCTION.** *Rhabdophis subminiatus* is reported from northeastern India, Nepal, Bangladesh, southern China, and southeast Asia where it is found around hilly forest areas and lowlands, in vicinity of ponds and streams. Clutches are known to comprise 5–27 eggs, with an incubation period of 50 days. Hatchlings size measures from 130–190 mm (Das and Das 2017. A Naturalist's Guide to the Reptiles of India, Bangladesh, Bhutan, Nepal, Pakistan and Sri Lanka, Prakash Books India Pvt. Ltd., New Delhi, India. 176 pp.; Lalronunga et al. 2018. Herpetol. Rev. 49:140). Herein we briefly describe an observation on incubation period, reproductive season and hatchlings of this species from Mizoram, northeast India.

On 11 December 2016, a female *R. subminiatus* (817 mm SVL, 162 mm tail length) was captured at Setlak stream just outside the campus of Mizoram University (MZU), Tanhril, Aizawl, Mizoram, India (92.67362°N, 23.74152°E; WSG 84; 866 m elev.). The snake transferred to a terrarium (60 × 30 × 30 cm) at Mizoram University where it laid 15 eggs on 15 December 2016 which measured: mean (range) length = 20.22 mm (17.9–24.5 mm), and width = 11.41 mm (10.1–12.8 mm). The eggs were incubated in antifungal vermiculite (2 cm thick) under natural-like conditions with temperature and humidity of 10–28°C and 65–86%, respectively. At 0915 h on 17 April 2017, juveniles started hatching and a total of 12 eggs hatched successfully. The remaining eggs may have been unfertilized or infected by fungus. Mean (range) measurements of hatchlings (N = 13) were: SVL = 129.67 mm (127–135 mm), tail length = 42.35 mm (40–45 mm). The duration of incubation was 122 days, which exceeds the incubation period reported as 50 days by Das and Das (2017, *op. cit.*). Additionally, the timing of reproduction (eggs laid in December and hatched in April) contradicts with the report given as June–July by Whitaker and Captain (2008. Snakes of India, The Field Guide. Draco Books, Chennai, India. 385 pp.). This could be due to the difference in climate and seasonal variation in different parts of their distribution.

This work was conducted under the permission for herpetofaunal collection throughout Mizoram No.A.33011/2/99-CWLW/225 issued by the Chief Wildlife Warden, Environment, Forest and Climate Change Department, Govt. of Mizoram, India.

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SCAPHIODONTOPHIS ANNULATUS **(Guatemalan Neckband Snake). DIET.** *Scaphiodontophis annulatus* is an uncommon medium-sized terrestrial diurnal sibynophiine that occurs from Mexico to northern Colombia (Heimes 2016. Herpetofauna Mexicana Vol. I. Snakes of Mexico. Edition Chimaira, Frankfurt am Main, Germany. 572 pp.). Prey items consumed by this snake are mostly skinks (e.g., *Scincella assatus*, *S. cherriei*) but occasionally other lizards (e.g., *Norops* sp.) and frogs (Heimes 2016, *op. cit.*). We herein report an observation of a predation event by *S. annulatus* on another species of snake.

PHOTO BY BEAU GARCIA

FIG. 1. *Scaphiodontophis annulatus* preying upon *Tantilla moesta* in Calakmul Biosphere Reserve, Campeche, Mexico.

At 1109 h on 20 July 2019, we observed an adult *S. annulatus* (ca. 45 cm total length) preying upon an adult (ca. 33 cm TL) *Tantilla moesta* (Black-bellied Centipede Snake; Fig. 1) during a diurnal transect in Dos Naciones, Calakmul Biosphere Reserve, Campeche, Mexico (17.95642°N, 89.36662°W; WGS 84). For 24 min following the initial observation, the *T. moesta* attempted to escape using sudden back-and-forth movements and by wrapping itself around a piece of wood debris in an attempt to pull itself out of its predator's jaws. However, the *S. annulatus* had its prey tightly secured by the head, and the *T. moesta* eventually died. At that moment, the *S. annulatus* started to ingest its prey starting with the head. We did not record how much time it took for the *S. annulatus* to fully ingest the *T. moesta* as BG left the scene after the first sign of ingestion to prevent further disturbance. To our knowledge, this observation represents the first record of *S. annulatus* preying upon another snake and the first interaction between this species and *T. moesta*.

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SONORA SEMIANNULATA **(Variable Ground Snake). PREDATION.** Arthropods, including spiders, are generally viewed as the primary prey of *Sonora semiannulata* (Degenhardt et al. 1997. Amphibians and Reptiles of New Mexico. University of New Mexico Press, Albuquerque, New Mexico. 431 pp). Nonetheless, there is an observation of a large centipede (*Scolopendra heros*) killing and consuming a *S. semiannulata* in west Texas, USA (Johnson et al. 2007. Herpetol. Rev. 38:93–94). Indeed, over the past two decades an increasing number of workers

Fig. 1. *Sonora semiannulata* in web of *Asagena fulva* in Arizona, USA. Note the greenish colored portion of the snake, partially collapsed, where the spider was observed initially, presumably feeding.

have reported instances in which arthropods have subdued and consumed small reptiles (Jones et al. 2011. Herpetol. Rev. 42:440–441).

Female *S. semiannulata* in Arizona, USA, are thought to deposit eggs in June and July (Goldberg 2001. Southwest. Nat. 46:387–391). During late July and August hatchling *S. semiannulata* (ca. 100 mm total length) are regularly observed in the yard and garage of the first author (BKS) in north Phoenix, Arizona (33.61755°N, 112.06157°W; WGS 84). On 7 August 2020, BKS observed a dead *S. semiannulata* with its tail intertwined in the web of a small spider (Fig. 1). Although the *S. semiannulata* exhibited a black cap, it was distinguishable from *Tantilla* spp. by the presence of dark spots on the dorsal scales, absence of red ventral coloration, and a loreal scale. The spider was small (ca. 5 mm body length) with a bulbous abdomen. It was initially located just anterior to the tail of the snake, where it may have been feeding, but when BKS approached to investigate, it retreated inside a web tunnel constructed in an open metal tube (Fig. 1).

The spider was subsequently identified by ESW as a female *Asagena fulva* (Wunderlich 2008. Beitr. Araneol. 5:140–469; Levi 1957. Bull. Mus. Comp. Zool. 117:367–424). The specimen is deposited at the Hasbrouck Insect Collection at Arizona State University (ASUHIC0146476). This species is a cobweb spider in the family Theridiidae that is widespread across the United States but most common in the southwestern United States and Mexico (Levi 1957, *op. cit.*). Little is known about the life history or diet of this species; it has been recorded feeding on ants (Holldobbler 1970. Psyche 77:202–208). Members of the genus *Asagena*, like most theridiid spiders, make an irregular, tangled web with sticky threads that attach to the ground. When a prey item contacts these sticky threads, the strand of silk breaks free from the substrate and pulls the prey up into the web. While other theridiids have been documented feeding on vertebrates (*Steatoda*: Dunbar et al. 2018. Biol. Environ. 118:45–48; *Latrodectus*: Blondheim and Werner 1989. Brit. Herp. Bull. 30:26–27; O'Shea and Kelly 2017. Herpetofauna 44:49–55; Nyffeler and Vetter 2018. J. Arachnol. 46:541–549), our observations represent the first known instance of *A. fulva* preying on a vertebrate.

Thanks to A. Holycross, T. Jones, and R. Babb for discussions and comments on our observations and S. Rose for providing additional resources for spider identification.

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***STORERIA DEKAYI* (Dekay's Brownsnake). HABITAT USE.** *Storeria dekayi* has an extensive continental distribution from eastern Canada south into Central America (Powell et al. 2016. Peterson Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Harcourt Publishing Co., New York, New York. 494 pp.) and a statewide distribution in Arkansas, USA (Trauth et al. 2004. The Amphibians and Reptiles of Arkansas. University of Arkansas Press, Fayetteville, Arkansas. 421 pp.). It is among the few squamate species in the eastern USA which possesses the adaptiveness to maintain a long-term presence on suburban and urban residential lots (S/URL), aside from occasional occurrences. Characterization of S/URL use by *S. dekayi* in three cities in Arkansas proceeded from a shared image of a putative gravid female discovered by JRM from Little Rock, which added to experiences with the snake by JMW in suburban Fayetteville and SET in suburban Morrilton. Details on S/URL use by *S. dekayi* in three cities in Arkansas extend knowledge beyond the report of Gaul (2008. *In* Mitchell et al. [eds.], Urban Herpetology, pp. 361–363. Society for the Study of Amphibians and Reptiles, Salt Lake City, Utah) and a report on small fossorial snakes in natural habitats in North Carolina (Willson and Dorcas 2004. Southeast. Nat. 3:1–12).

In Fayetteville, Washington County, during ca. 50 years of habitation of a 55 × 55 m suburban lot by JMW, platted on plains pastureland previously used for livestock, there has been an increasing complexity and diversity of low-growing vegetation, development of stable, naturalized nooks with minimal disturbance, and growth of numerous large trees. Only four reptilian species have been observed on the property more than once over that period: *Terrapene carolina* (Eastern Box Turtle: ca. 10 observed, none in recent five years [NRY = 2016–2020), *Plestiodon fasciatus* (Common Five-lined Skink: ca. 5 observed, NRY), *Thamnophis sirtalis* (Common Gartersnake: ca. 10 observed, NRY), and *S. dekayi* (>20 observed, most within the last five years). Observations on *S. dekayi* at the lot in Fayetteville are as follows: 1) the species has been observed diurnally moving abroad only once; 2) it has never been observed dead on the street as reported by Gaul (2008, *op. cit.*); 3) it has been occasionally found during spring clean-outs of a flower bed; 4) in May 2019 JMW Jr. observed one individual drop in the home from a stiff bristle contractors broom kept in the garage; 5) in 2018 JMW Jr. found one individual in the room near the front door. However, over the past five years, mostly in the spring and summer, two feral cats fed on the property frequently delivered dead or wounded *S. dekayi* (i.e., >20) to the vicinity of the front door. The primary microhabitat supporting *S. dekayi* appeared to be a deep accumulation of leaves under a large ca. 50-year-old Southern Magnolia (*Magnolia grandiflora*) near which snakes were occasionally found during spring preparation of adjacent flower beds.

Based on observations by SET in Morrilton, Conway County, suburban residential dwellings with adjacent utility buildings, especially those with cultivatable features such as flowerbeds and shrubbery, also provide ideal microhabitats for *S. dekayi*. This snake has been the most commonly encountered species based upon cursory observations over a four-year period (2017–2020) in a relatively new subdivision just north of Morrilton. Several of the snakes have been observed by homeowners or discovered beneath wood mulch/soil composite microhabitats within the flowerbeds.

The observation of *S. dekayi* by JRM within a busy urban area of the city of Little Rock, Pulaski County, the first observation of the species thereon during nearly five years of her occupancy, occurred on 20 June 2020 at 1600 h on a residential lot with a house dating to 1930, characterized by ample vegetated microhabitats. The snake was observed crossing a sidewalk near an area that had recently been weeded.

Aspects of the biology and benign presence of *S. dekayi*, a small widely distributed, fossorial, natricine snake, that has facilitated its long-term presence on many S/URL in Arkansas and elsewhere include the following: 1) small size; 2) harmlessness to humans and pets; 3) secrecy and mostly nocturnal activity; 4) availability of an abundant food source consisting of earthworms and slugs; 5) high reproductive potential based on ovoviviparity; 6) ability to utilize a variety of habitats resulting from the activities of humans; 7) capacity to resist extirpation by predatory feral cats; 8) tolerance of its presence by an increasingly knowledgeable public. Under natural habitat conditions in many forested areas in and near Fayetteville, Arkansas, the small fossorial snakes *Carphophis vermis* (Western Wormsnake) and *Diadophis punctatus* (Ring-necked Snake) are abundant and easily located, and a similar pair involving *Carphophis amoenus* (Common Wormsnake) were reported to be abundant in North Carolina (Willson and Dorcas 2004, *op. cit.*). Whether either of these oviparous species may be more commonly encountered than ovoviviparous *S. dekayi* on S/URL in mountainous areas of Fayetteville requires further study.

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***TANTILLA GRACILIS* (Flat-headed Snake). PREDATION.** *Tantilla gracilis* is a small fossorial colubrid which occurs from southern Texas and northern Mexico to southern Illinois and eastern Kansas, USA (Powell et al. 2016. Peterson Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Harcourt, Boston, Massachusetts. 494 pp.). Known predators of *T. gracilis* include *Sialia sialis*, *Agkistrodon contortrix*, *Sistrurus miliarius*, *Lampropeltis holbrooki*, and *Steatoda* sp. (Braman and Pogue 2005. Wilson Bull. 117:100–101; Pruett and Jadin 2010. Herpetol. Rev. 41:99; McKnight et al. 2014 Herpetol. Notes 7:171–177; McAllister 2016. Herpetol. Rev. 47:479–480). Herein we supplement the list of known *T. gracilis* predators by describing the predation of a *T. gracilis* by *Baiomys taylori* (Northern Pygmy Mouse).

On 14 March 2020, in a pitfall trap of our trapping array in Bastrop, Texas, USA (30.20315°N, 97.22106°W; WGS 84; 167 m elev.), we found a live *B. taylori* atop a deceased *T. gracilis*. The mouse was promptly released and the *T. gracilis* carcass was collected. The snake's head was missing, as was the terminus of its tail, and a narrow incision was present near the posterior end of the body (Fig. 1). Permitting restrictions precluded sacrifice and dissection of the mouse but the circumstances strongly suggest an instance of predation, especially given the observed position of the mouse relative to the *T. gracilis* carcass. Both species utilize subterranean environments and are likely syntopic, making this predator-prey relationship possible outside of trap-mediated interactions.

Fig. 1. Ventral view of a *Tantilla gracilis* carcass which was found in a pitfall trap beneath a live *Baiomys taylori* (Northern Pygmy Mouse) in Bastrop County, Texas, USA.

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***THAMNOPHIS ELEGANS VAGRANS* (Wandering Gartersnake). PREDATION.** *Thamnophis elegans vagrans* is a wide-ranging, largely terrestrial generalist snake (Stebbins and McGinnis 2012. Field Guide to Amphibians and Reptiles of California. University of California Press, Berkeley. 552 pp.). On 14 July 2020 at 1902 h, while conducting stream surveys at Three

FIG. 1. *Thamnophis elegans vagrans* preyed upon by an invasive crayfish in Arizona, USA.

Forks in the Apache-Sitgreaves National Forest in Arizona, USA (33.84956°N, 109.31322°W; WGS 84; 2499 m elev.), we discovered a *T. e. vagrans* (252 mm SVL; Fig. 1) being consumed by an invasive *Orconectes virilis* (Virile Crayfish). When we first observed the snake, the anterior portion was exposed and floating in the water, not quite reaching the surface, while the posterior portion of the body was pinned under a large rock. The water was fast-flowing and ca. 35 cm deep. When we overturned the rock, we found two large crayfish underneath. One crayfish had the snake's body in its claw and released the snake when we overturned the rock. We measured the claw length of one of the crayfish, which was 48 mm.

Predation by invasive crayfish has been listed as a threat to other native gartersnakes in Arizona (Holycross and Rosen 2011. The narrow-headed gartersnake in the United States [*Thamnophis rufipunctatus*]: A report on its status, natural history, and threats. Unpublished report, Center for Biological Diversity. 28 pp.). Although crayfish are known to prey on garter snakes and especially on *T. elegans* in other parts of its range (Weaver 2004. Herpetol. Rev. 35:278), direct observations of predation remain rare. Our observation presents a valuable piece of evidence that invasive crayfish can and do prey upon *T. elegans* in Arizona.

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***THAMNOPHIS EQUES* (Mexican Garter Snake). DIET.** *Thamnophis eques* is a medium-sized natracine distributed throughout the central plateau of Mexico. It is known to feed on a wide variety of prey including leeches, slugs, earthworms, fishes, amphibians, reptiles, and rodents (*Peromyscus maniculatus* and *Microtus quasiater*; Macías García and Drummond 1988. J. Herpetol. 22:129–134; Rosen and Schwalbe 1988. Status of the Mexican and narrow-headed garter snakes [*Thamnophis eques megalops* and *Thamnophis rufipunctatus*] in Arizona. Report to U.S. Fish and Wildlife Service. iv+ 50 pp.; Manjarrez 1998. Herpetol. Rev. 32:464–468; Venegas-Barrera and Manjarrez 2001. Herpetol. Rev. 32:187).

On 27 September 2018 at 1651 h, during a tour of the wetland "Bordo las Maravillas" within the university campus "El Cerrillo" of the Autonomous University of State of Mexico, Toluca, Mexico (19.41270°N, 99.70088°W; WGS 84; 2609 elev.), we captured an adult male *T. eques* (476 mm SVL, 153 mm tail length, 55 g without prey) that regurgitated a partially digested

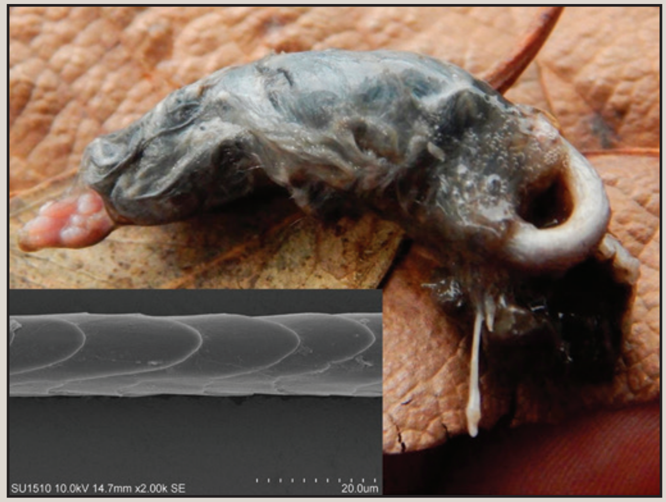

FIG. 1. Partially digested *Peromyscus melanotis* (Black-eared Mouse) recovered from a *Thamnophis eques* from Toluca, Mexico; inset: rodent guard hair showing lanceolate cuticular scale.

mouse pup (53.4 mm length, 6.3 g; Fig. 1). Analysis of rodent guard hair shows a lanceolate pattern of cuticular scales that is characteristic of *Peromyscus melanotis* (Black-eared Mouse; Baca y Sánchez-Cordero 2004. An. Inst. Biol. Univ. Nac. Auton. Mex. Zool. 75:283–437). Our record increases the small mammals known to be consumed by *T. eques* to three species.

We thank José Vilchis Conde of the Faculty of Sciences of the UNAM, for his support to obtain the photograph of the rodent guard hair.

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***THAMNOPHIS EQUES MEGALOPS* (Northern Mexican Gartersnake). REPRODUCTION.** *Thamnophis eques megalops* is a semi-aquatic snake distributed in Arizona and New Mexico, USA and northern Mexico (Rossman et al. 1996. The Garter Snakes: Evolution and Ecology. University of Oklahoma Press, Norman, Oklahoma. 332 pp.; Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Books, Washington, D.C. 668 pp.). This species has suffered a 90% population decline throughout its historical range and was listed as Threatened under the Endangered Species Act in 2014 (U.S. Fish and Wildlife Service. 2014. Fed. Reg. 79:38678–38746). Little is known about *T. e. megalops* reproductive cycles and strategies. Ovulation occurs in females in late March or early April, and copulation was speculated to occur in the fall (Rosen and Schwalbe 1988. Status of the Mexican and narrow-headed garter snakes [*Thamnophis eques megalops* and *Thamnophis rufipunctatus rufipunctatus*]. Final Report to U.S. Fish and Wildlife Service. Arizona Game and Fish Department, Phoenix, Arizona. 98 pp.). In other species and subspecies of *Thamnophis*, physiological and behavioral data indicate that fall mating is common (Blanchard and Blanchard 1941. Pap. Michigan Acad. Sci. 26:177–193; Aleksiuk and Gregory 1974. Copeia 3:681–689). Mating balls of gartersnakes are common in parts of North America, but there are very few mating ball records for *Thamnophis* spp. in the southwestern U.S. (Seigel et al. 2000. Am.

PHOTO BY SCOTT SPRAGUE

Fig. 1. Female and male *Thamnophis eques megalops* entwined at Bubbling Ponds Hatchery, Cornville, Arizona, USA on 5 March 2016.

PHOTO BY KRYSTAL ANDERSON

Fig. 2. Adult female *Thamnophis eques megalops* (head visible) and two male *T. e. megalops* attempting courtship at lower Tonto Creek, Gila County, Arizona, USA on 18 October 2017.

Midl. Nat. 143:453–462) and Mexico (Conant 2003. Am. Mus. Novit. 3406:1–64). Hybridization may occur between *Thamnophis radix* and *Thamnophis butleri* (Placyk et al. 2012. Conserv. Genet. 13:649–663) and *T. sirtalis* and *T. butleri* (Kapfer et al. 2013. J. Herpetol. 47:400–405), but hybridization among southwestern species has not been reported. Here we report spring and fall courtship, polyandry, and interspecies courtship and possible mating for *T. e. megalops.*

At 1736 h on 20 February 2016, at Page Springs Hatchery in Cornville, Arizona, USA (34.76082°N, 111.89195°W; NAD 83), TAS observed a radio-tagged male *T. e. megalops* (64.1 cm SVL, 105 g) entwined with a female. When approached, the female immediately moved downslope, and the male attempted to burrow into deep litter. Both individuals were agitated and snapped at the observer multiple times. The female stayed within 5 m of the location where the pair was first observed, while the male was captured for transmitter replacement. TAS did not examine the male for evidence of hemipenes.

A similar event was observed on 5 March 2016, at 1550 h, at Bubbling Ponds Hatchery in Cornville, Arizona, USA (34.76749°N, 111.89725°W; NAD 83). A volunteer on TAS's project saw a radio-tagged female *T. e. megalops* (87.7 cm SVL, 259 g) entwined with a male (Fig. 1). Their cloacae appeared to be pressed to each other, but mating could not be confirmed. The pair remained motionless as the volunteer took photos and video. When the observer moved too close, the individuals separated and moved in different directions before disappearing into dense vegetation.

At 1503 h on 18 October 2017, at lower Tonto Creek near Roosevelt Lake, Arizona, USA (33.76224°N, 111.25200°W; NAD 83; 646.8 m elev.), KA observed a radio-tagged adult female *T. e. megalops* (79.5 cm SVL, 185 g) in courtship with two male *T. e. megalops* (one male: 42.6 cm SVL, 31.5 g; Fig. 2). All three snakes were wrapped together around a dead salt cedar (*Tamarix ramosissima*) branch that was surrounded by dense sedge (*Carex* sp.) seedlings.

At 1137 h on 30 September 2016, at lower Tonto Creek's confluence with Roosevelt Lake, Arizona, USA (33.76147°N, 111.25046°W; NAD 83; 644 m elev.), JMM observed an adult male *Thamnophis cyrtopsis* (Black-necked Gartersnake; 55.6 cm SVL, 68.5 g) attempting courtship with a female *T. e. megalops* (62.7 cm SVL, 138.5 g). The pair of snakes were on the bank of a riparian wetland underneath the cover of leaf litter flood debris. The snakes were facing opposite directions and rotating clockwise. The male's tail was wrapped around the female's rear body in a corkscrew shape; his hemipenes were not visible. They unraveled from each other when captured. During subsequent snake processing (weighing, measuring, microchipping), the female's cloaca contained a milky substance that appeared to be semen.

To our knowledge, these are the first observations of *T. e. megalops* courtship and likely mating in the wild, of attempted mating between *T. cyrtopsis* and *T. e. megalops*, and of the first multiple mating (polyandrous) event for *T. e. megalops.* It is notable that courtship and mating events were observed during both the spring and fall, just after and before the inactive season, respectively.

We thank S. Sprague for photographing and reporting the second breeding observation and the Arizona Game and Fish Department and Salt River Project for funding. Research was conducted under Arizona Game and Fish Department scientific collecting permits, a United States Fish and Wildlife Service recovery permit, and Northern Arizona University Institutional Animal Care and Use Committee protocol.

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***XENOCHROPHIS TRIANGULIGERUS* (Triangle Keelback Snake). DIET.** Although *Xenochrophis trianguligerus* has a wide geographic range in India, Myanmar, Thailand, Cambodia, Vietnam, Malaysia, Indonesia, Singapore, and Brunei, little is known about its feeding habits and diet. This species nocturnal and semi-aquatic, inhabiting streams and standing water bodies in lowland forests and rice paddies to 1350 m elev. (Das 2010. A Field Guide to the Reptiles of South-east Asia. New Holland Publishers (UK), Ltd., London. 376 pp.). The diet *X. trianguligerus* is known to consist of frogs, tadpoles, and frog eggs (Stuebing et al. 2014. A Field Guide to the Snakes of Borneo. Second edition. Natural History Publications, Kota Kinabalu, Sabah. 319 pp.). Here, we report the predation of an adult female *Polypedates megacephalus* (Hongkong Whipping Frog) by an adult *X. trianguligerus.*

At 2340 h on 26 August 2020 (11.31081°N, 104.04002°E; WGS 84; 580 m elev.) in Kirirom National Park, Kompong Speu Province, Cambodia, CW observed a female *P. megacephalus*

PHOTO BY CONOR WALL

FIG. 1. Adult *Xenochrophis trianguligerus* consuming a female *Polypedates megacephalus* in Kirirom National Park, Kompong Speu Province, Cambodia.

being predated by an adult *X. trianguligerus* (Fig. 1). The snake initially waited motionless on the edge of the mountain stream. The snake then made a strike for the frog hidden in the undergrowth of a rattan tree (*Pandanus* sp.) The snake had a firm hold on the left rear leg of the frog and a great struggle ensued, with both creatures flipping and tangling amongst the undergrowth and the frog calling continuously in distress. After ca. 1 min of struggling, the frog leapt into the stream, taking the snake with it and both floated downstream with the gentle current. Although out of sight, the frog's distress calls were heard ca. 5 m downstream for ca. 10 mins, before finally ceasing. On seeing the photo the following day, locals informed me that the Khmer-language word for the snake is 'ពស់សម្លាប់កង្កែប', which literally translates to 'frog-killing snake'. This may give some indication of the importance and frequency of frogs in this snake's diet. To our knowledge, this is the first prey item for *X. trianguligerus* reported at the species level. This adds to the poor knowledge of diet and natural history of the *X. trianguligerus*.

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ERRATUM

In a recent natural history note concerning postmortem color change in *Opheodrys aestivus* (Rough Greensnake; Tatum and Durso 2020. Herpetol. Rev. 51:874–875), an error and two omissions were made. The catalogue number for the specimen was incorrect (the correct catalogue number is UNG R2020_0006), the source of funding was omitted (The University of North Georgia, Department of Biology), and the scientific collection permit number 1000540105, although correct, should have been associated with the named sub-permittee (N. Hyslop).

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