# 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. The section's intent is to convey information rather than demonstrate prose. 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: **Sean P. Graham** or **Crystal Kelehear Graham** (amphibians; grahasp@tigermail.auburn.edu); **James Harding** (turtles; hardingj@msu.edu); **Ruchira Somaweera** (crocodilians, lizards, and *Sphenodon*; ruchira.somaweera@gmail.com); 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/); **KEYWORD(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.

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## CAUDATA

***AMBYSTOMA GRANULOSUM* (Granular Salamander). ENDOPARASITE.** *Ambystoma granulosum* is an endangered salamander that inhabits lakes, dams, and ponds in the high elevation plateau in central Mexico (Aguilar-Miguel 2005. *Ambystoma granulosum*. Algunas especies de anfibios y reptiles contenidos en el Proyecto de Norma Oficial Mexicana PROY-NOM-059-ECOL-2000. Facultad de Ciencias, Centro de Investigación en Recursos Bióticos, Universidad Autónoma del Estado de México. Bases de datos SNIBCONABIO. Proyecto W035. México. D.F. 5 pp.). It is listed as critically endangered by the IUCN and very little is known about its ecology. To our knowledge, there are no published records of helminths from *A. granulosum*.

In May 2017, 15 individuals of *A. granulosum* were captured at Huapango Dam, municipality of Jilotepec, Estado de México, Mexico (19.93873°N, 99.72770°W, WGS 84; 2624 m elev.), which is one of the few localities where this species occurs (Frías-Álvarez et al. 2008. EcoHealth 5:18–26). During this survey, three salamanders exhibited encapsulated parasites in their skin. Incisions were made to recover three nematode larvae, one from each salamander.

DNA was extracted from one of the nematode larvae, and a fragment of the large subunit of the nuclear ribosomal gene (LSU rRNA) and a fragment of the cytochrome oxidase subunit II gene were sequenced. The other two nematodes were deposited at the Colección Nacional de Helmintos, UNAM, as CNHE 10663. Sequences were compared to those available in the GenBank nucleotide database, using the BLAST tool. Both molecular makers confirmed the nematode larvae as *Contracaecum* sp. and showed 96% and 91% identity with *C. multipapillatum*, respectively. Our observation represents the first parasitological record in the salamander *A. granulosum*. Other caudates are known to host this nematode; larvae of *Contracaecum* have been previously reported in the salamander *Siren intermedia texanum* (Sirenidae) in the state of Texas, United States (McAllister and McDaniel 1992. Proc. Helminthol. Soc. Washington 59:239–240). However, this is the first record of *Contracaecum* sp. found in Mexico, and the first host record for *A. granulosum*.

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***CHIROTEROTITRON CHONDROSTEGA.* PREDATION.** *Chiropterotriton chondrostega* is an endemic salamander from Mexico, and categorized as Under Special Protection by Mexican laws, and as Endangered according to the IUCN criteria. Its distribution encompasses the states of Hidalgo, Puebla, San Luis Potosí, Tamaulipas, and Querétaro (Dixon and Lemos-Espinal. 2010. Anfibios y Reptiles del Estado de Querétaro, México. Texas A&M University, Universidad Nacional Autónoma de México and CONABIO. CDMX, México. 428 pp.). It is an uncommon species that is distributed at elevations from 2000 to 2300 m, in pristine pine-oak forests. It is believed to be insectivorous (Vega-López and Álvarez. 1992. La Herpetofauna de los Volcanes Popocatépetl e Iztaccíhuatl. Instituto de Ecología, CDMX, México. 128 pp.).

At 1611 h on 17 July 2018, we encountered an adult *Rhadinaea gaigeae* preying on an adult *C. chondrostega* in a pine-oak forest in the municipality of Pinal de Amoles, Querétaro, Mexico (21.13030°N, 99.63140°W, WGS 84; 2430 m elev.). The snake captured the salamander by the head and struggled to immobilize its prey for 15 min before starting to swallow it, starting with the anterior body portion (Fig. 1). This is an unusual record because little is known about the natural history of both species, especially *C. chondrostega*. We did not find previous records of predation or feeding between these two species, but it is known that *R. gaigeae* may feed on other salamanders like *Aquiloeurycea cephalica* (Nieto and Pérez 1999. Anfibios y Reptiles del Estado de Querétaro. CONABIO. CDMX, México. 144 pp.), which is a sympatric species with *C. chondrostega*.

Fig. 1. *Chiropterotitron chondrostega* predated by *Rhadinaea gaigeae* in Pinal de Amoles, Querétaro.

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***CRYPTOBRANCHUS ALLEGANIENSIS* (Hellbender). EGG PREDATION.** Fish and crayfish which occupy streams where fully aquatic *Cryptobranchus alleganiensis* (Hellbender) salamanders occur are potential aquatic predators of salamander eggs (Axelsson et al. 1997. Amphibia-Reptilia 18:217–228; Drake et al. 2014. Herpetologica 70:378–387). Male eastern hellbenders typically guard nest shelters containing eggs for several months, possibly reducing predation (Nickerson and Mays 1973. The Hellbenders: North American Giant Salamanders. Milwaukee Public Museum, Milwaukee, Wisconsin. 106 pp.). In healthy hellbender populations with high concentrations of hellbenders and active nests, loose eggs are often observed outside of guarded nests in streams (Smith 1907. Biol. Bull. 13:5–39). However, outside of a few reports on fish associations with active hellbender nests (Settle et al. 2018. J. Ethol. 36:235-242.) or predation in lotic environments (Monello and Wright 2001. J. Herpetol. 35:350–353), little is known regarding predation of stream salamander eggs in the wild.

While surveying breeding activity in the mainstem and a tributary of the French Broad River of western North Carolina (specific localities on file with the North Carolina Wildlife Resources Commission and withheld due to conservation concerns), we observed three separate events of egg consumption within 48 h by two species of fish and one crayfish. On 8 September 2018, a hellbender egg was dislodged from a nest with a guarding male hellbender (Fig. 1A). This egg floated into the water column and was swept downstream approximately one meter where it was intercepted and consumed by an unidentified juvenile chub (Cyprinidae). From 1045–1130 h on 10 September 2018, we observed two separate feeding attempts of both a juvenile crayfish species (*Cambarus* sp.) and two *Rhinichthys atratulus* (Eastern Blacknose Dace), each predating and consuming a *C. alleganiensis* egg. The crayfish grabbed a single egg with its chelipad and consumed the egg within ~10 min. (Fig. 1B). Two individual Eastern Blacknose Dace initially investigated a separate, single egg for several minutes. After disturbing the outer membrane and

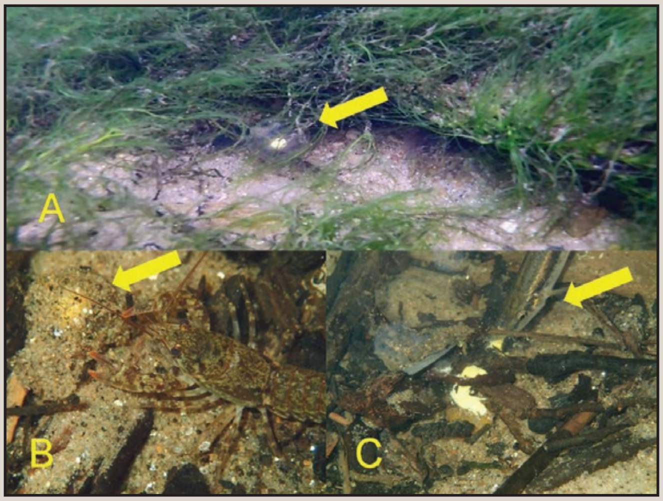


Fig. 1. A) *Cryptobranchus alleganiensis* egg outside of nest immediately before being consumed by a Chub (Cyprinidae); B) *Cambarus* sp. (Crayfish) consuming *C. alleganiensis* egg; and C) *Rhinichthys atralulus* (Eastern blacknose dace) consuming egg of *C. alleganiensis* in French Broad River tributary, North Carolina.

dislodging the embryo, they consumed the yolk within ~10 min. (Fig. 1C). Our report conveys the potential importance of loose *C. alleganiensis* eggs in streams, which may provide valuable nutrient resources for aquatic organisms during the hellbender breeding season.

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***PLETHODON PUNCTATUS*** **(Cow Knob Salamander). ARBOREAL BEHAVIOR.** A recent review on the climbing behavior of plethodontid salamanders (McEntire 2016. Copeia 104:124–131) reported that many *Plethodon* are facultatively arboreal. Here, we report observations of climbing behavior for *Plethodon punctatus*, a species of conservation concern that is only found on Shenandoah Mountain and Great North Mountain in eastern West Virginia and western Virginia, USA.

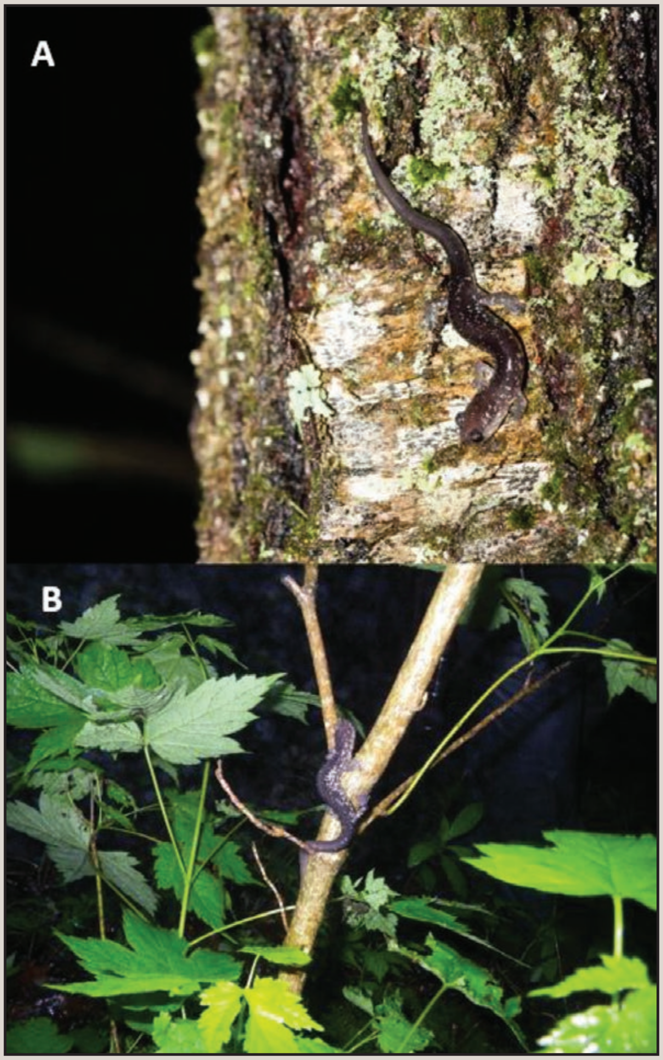


Fig. 1. *Plethodon punctatus* observed on trees in the George Washington National Forest, Pendleton County, West Virginia, USA: A) on a *Betula alleghaniensis* (Yellow Birch); B) on a pole-sized *Acer spicatum* (Mountain Maple).

While conducting field research on *P. punctatus* in the George Washington National Forest in spring and summer of 2018 (precise locations of observations withheld due to conservation concerns), we searched for individuals on the ground and on vegetation in 5 × 5 m plots, and opportunistically measured the height of salamanders (from the ground to the lowest part of the salamander) we detected above ground level in the study area. Out of 25 individuals observed in plots, eight were found climbing on trees, including a single observation of five *P. punctatus* climbing the side of a large multi-stem tree at 2200 h on 3 August 2018. We documented individuals at a mean height of 0.61 m and a maximum height of 1.9 m. We found *P. punctatus* climbing on *Acer pensylvanicum* (Striped Maple), *Acer rubrum* (Red Maple), *Acer spicatum* (Mountain Maple; Fig. 1), *Betula alleghaniensis* (Yellow Birch; Fig. 1), *Tsuga canadensis* (Eastern Hemlock), *Quercus rubra* (Northern Red Oak), and under the bark of dead standing trees. We did not observe *P. punctatus* on the leaves or stems of herbaceous understory vegetation. Our observations contribute to the knowledge of *P. punctatus* ecology, suggest that vertical structure could be an important foraging habitat component, and indicate that tree trunks should be searched carefully while surveying for this species.

This research was permitted by the West Virginia Division of Natural Resources (permit 2018.090), Virginia Department of Game and Inland Fisheries (permit 059581), and U.S. Forest Service (permit 2620), and approved by the West Virginia University Institutional Animal Care and Use Committee (protocol 1612004927).

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## ANURA

***ADENOMERA HYLAEDACTYLA*** **(Napo Tropical Bullfrog). PREDATION.** At approximately 2350 h on 13 October 2018 at the

Fig. 1. Adult *Adenomera hylaedactyla* preyed upon by *Avicularia* sp. at Maracá-Jipioca Ecological Station, Brazil.

Maracá-Jipioca Ecological Station, on a coastal island located in Amapá State, Brazil (2.00470ºN, 50.43670ºW, WGS 84), we found the spider *Avicularia* sp. (Theraphosidae) grasping an individual of the frog *A. hylaedactyla* ventrally with its pedipalps and cheljcerae. Within a few minutes the frog was motionless with its legs outstretched (Fig. 1). The observation lasted eight minutes. The spider and frog were photographed, but were not collected. Reports of the spiders of the genus *Avicularia* preying on frogs have not previously been reported. In addition, this is the first record of predation of this frog species by *Avicularia* sp.

We thank Thiago R. de Carvalho for identification of the frog and Antonio D. Brescovit for identification of spider. ICMBio/SISBIO for granting collecting permits (#48102-2). We are grateful to CNPq for the scientific initiation fellowship (#134760/2018-2).

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***AGALYCHNIS CALLIDRYAS*** **(Red-eyed Tree Frog). PREDATION.** *Agalychnis callidryas* inhabits lowland wet forests from southern Mexico to Panama. Females typically lay their eggs on plants as well as on human-made structures that overhang seasonal ponds, allowing tadpoles to fall into the water upon hatching. Like many amphibian species, *A. callidryas* eggs are highly vulnerable to a diverse range of predators, including snakes, wasps, monkeys, and fly larvae (Warkentin 1995. Anim. Behav. 60:503–510). Harvestmen primarily prey upon small soft-bodied arthropods, but they have also been observed feeding on earthworms, slugs, plant matter, and small vertebrate carcasses (Acosta and Machado 2007. *In* Pinto-da-Rocha et al. [eds.], The Biology of Opiliones, pp. 309–338. Harvard University Press, Cambridge, Massachusetts). To our knowledge, however, there are no previous observations of harvestmen feeding on the eggs of any species. Here we report what we believe to be the first observation of frog eggs being attacked and consumed by harvestmen (Arachnida: Opiliones).

At 2200 h on 1 July 2016, at La Selva Biological Station in Heredia, Costa Rica (10.43060°N, 84.00700°W; WGS 84), we observed three individual harvestmen (*Prionostemma* sp.) preying upon *A. callidryas* eggs. In all three cases, the eggs had been laid on artificial structures, including a metal railing and a plastic water tank near forest and swamp habitats. The harvestmen had the eggs partially in their mouths and, upon being startled, they picked up and carried the eggs while relocating. The gelatinous casings of the eggs were consumed over the course of several minutes, but we did not observe the direct predation of the embryos themselves. Despite not being directly consumed, this process is likely to lead to embryo death via nutrient loss, desiccation, or translocation away from the water.

Studying egg predation in *A. callidryas* is particularly interesting because tadpoles of this species have been shown to hatch early in response to predatory cues (Warkentin 2005. Anim. Behav. 70:59–71). It will be interesting to see if *A. callidryas* embryos have specific adaptations for detecting harvestmen predators. *Prionostemma*, in particular, is the most abundant genus of harvestmen at La Selva Biological Station and is likely to be common in other Neotropical rainforests as well (Proud et al. 2012. ISRN Zool. 2012:549765).

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***ANAXYRUS CANORUS*** **(Yosemite Toad). LARVAL DIET.** *Anaxyrus canorus* is a North American bufonid that breeds in ephemeral meadow ponds of the high elevation Sierra Nevada of California. Bufonid larvae are known to opportunistically scavenge dead conspecifics and other animals, which can increase their rate of growth and development (McDiarmid 1999. Tadpoles: The Biology of Anuran Larvae. University of Chicago Press, Chicago, Illinois. 444 pp.). Previous researchers have documented *A. canorus* larvae feeding on a variety of dead animals, including conspecific tadpoles, a *Pseudacris sierra* tadpole, a predaceous diving beetle larva, and a dead ground squirrel (Martin 1991. *In* Staub [ed.], Proceedings of the Northern California Herpetological Society 1991 Conference on Captive Propagation and Husbandry of Reptiles and Amphibians, pp. 17–32. Northern California Herpetological Society, Sacramento, California; Chan 2001. Herpetol. Rev. 32:101). Tadpoles have also been observed feeding on lodgepole pine pollen grains (Martin 1991, *op. cit.*).

Herein I present additional feeding observations of larval *A. canorus*, made during research conducted across the Sierra Nevada during 2006–2016. The first set of observations concerns non-native trout, which sometimes co-occur with *A. canorus* but have been shown experimentally to find *A. canorus* tadpoles distasteful. At ca. 1400 h on 9 July 2008, along the grassy margins of Sandpiper Lake in Sierra National Forest, Fresno County, California, USA (37.31008°N, 118.85203°W, WGS 84; 3188 m elev.), I observed *A. canorus* tadpoles scavenging on a dead trout of unknown species (Fig. 1). I observed this behavior a second time at 1300 h on 1 September 2011, in a small shoreline meadow near Sapphire Lake, Kings Canyon National Park, Fresno County, California, USA (37.15555°N, 118.69492°W, WGS 84; 3350 m elev.).

The second set of observations concerns adult toads. At 1230 h on 22 July 2011, at a mid-elevation meadow 0.75 mi W of Saddle Horse Lake in Yosemite National Park, Tuolumne County, California, USA (38.00204°N, 119.58549°W, WGS 84; elev. 2688 m), I observed *A. canorus* tadpoles consuming a dead adult conspecific of unidentified sex. I witnessed this behavior

Fig. 1. Tadpoles of *Anaxyrus canorus* scavenging on a dead trout in the shallow margin of a lake, Fresno County, California, 9 July 2008.

Fig. 2. Tadpoles of *Anaxyrus canorus* scavenging on a dead adult female toad in a meadow pond, Tuolumne County, California, 24 June 2014.

Fig. 3. Tadpoles of *Anaxyrus canorus* forming tight aggregations around sick or injured tadpoles in a meadow pond, Tuolumne County, California, 28 June 2012. Inset shows detail of one aggregation, notice tadpoles are oriented toward the bottom-center.

a second time in a subalpine meadow 2.5 mi W of Tioga Pass, also within Yosemite National Park (37.92065°N, 119.30364°W, WGS 84; elev. 3193 m). At 1630 h on 24 June 2014 I observed *A. canorus* tadpoles scavenging on a dead adult conspecific female toad (Fig. 2).

In all preceding observations, the tadpoles were swimming in and around the dead animal, and removing chunks of flesh. There was no apparent reason for any of the mortalities, but the tadpoles appeared to be scavenging opportunistically.

On one occasion I observed tadpoles engaging in opportunistic coprophagy. At 1630 h on 9 June 2013, in a montane meadow 1.25 mi E of Turner Meadow in Yosemite National Park (37.61201°N, 119.58503°W, WGS 84; elev. 2400 m), I observed tadpoles consuming deer scat.

On multiple occasions during the summers of 2010–2014, I observed *A. canorus* tadpoles scavenging dead conspecific eggs, without witnessing any evidence of active cannibalism. One particular observation suggests that such cannibalism may sometimes occur. At 1730 h on 28 June 2012 I observed tadpoles aggregated into two tight feeding clusters (Fig. 3) in a montane meadow pond in Yosemite National Park (37.97863°N, 119.37228°W, WGS 84, 2851 m elev.). I disturbed the clusters to find the source of the frenzy, but no dead animals were visible. Instead, 1–2 tadpoles missing bits of tail fin were observed swimming away. I suggest that sick or injured tadpoles may secrete chemical attractants that help to promote conspecific cannibalism, but this hypothesis needs to be pursued further.

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***DENDROPSOPHUS BRANNERI*** **(Little Frog). PREDATION.** *Dendropsophus branneri* is a small hylid frog that inhabits permanent and temporary ponds. The species is widely distributed throughout the Atlantic Forest and Caatinga, occurring along the Brazilian coast from Maranhão to Rio de Janeiro (Lutz 1973. Brazilian Species of *Hyla*. University of Texas Press, Austin, Texas. 265 pp.; Ab'Sáber 1977. Geomorfologia 52:1–21). Anurans are preyed upon by a great diversity of vertebrates such as fishes, lizards, snakes, mammals and birds (Duellman and Trueb 1994. Biology of Amphibians. John Hopkins University Press, Baltimore, Maryland. 670 pp.), as well as invertebrates, mainly arachnids and hemipterans (Toledo 2005. Herpetol. Rev. 36:395–400). At ~1900 h on 9 May 2018, near a temporary pond at the Integral Protection Conservation Unit Mata do Camucim, São Lourenço da Mata county, state of Pernambuco, northeastern Brazil (8.03334°S, 35.21667°W; WGS 84), we observed an adult male *D. branneri* being preyed upon by an adult spider of the species *Nephila clavipes*, which is frequently found at the edges of forest clearings, streams and watercourses, and preys mainly on flying insects such as flies, bees, wasps and lepidopterans (Robinson and Mirick 1971. The Predatory Behavior of the Golden-Web Spider *Nephila clavipes* (Araneae: Araneidae). Psyche 78:123–139). The spider was found on its web while forming a digestive cocoon around its immobile prey, which had its body still intact, making it possible to identify both species involved in the interaction. The specimens were not collected, only photographed and filmed, and these records are now held by the UFRPE Herpetological and Paleo-herpetological Collection (CHP-UFRPE 69999).

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***DENDROPSOPHUS PELIDNA*** **(Betania's Andean Treefrog). DIET.** *Dendropsophus pelidna* is a medium-sized Hylid inhabiting the Colombian and Venezuelan Andes, specifically in the state of Táchira, Venezuela, and in the departments of Boyacá and Norte de Santander, Colombia, with an altitudinal distribution between 2220 and 3000 m (Duellman 1989. Occ. Pap. Kansas Mus. Nat. Hist. 131:1–12). This species is nocturnal with a preference for ponds in open areas such as pastures and urban areas, and is very abundant (Guarnizo et al. 2012. Herpetologica 68:523–540).

Table 1. Diet of *Dendropsophus pelidna* from Betania and San Vicente, Táchita, Venezuela.

| Prey | Number (%) | Frequency of occurrence |
|---|---|---|
| Arachnida | | |
| Araneae | 5 (12.5) | 29.4 |
| Insecta | | |
| Indeterminate | 4 (10.0) | 17.7 |
| Coleoptera | 8 (20.0) | 35.3 |
| Diptera | 3 (7.5) | 17.7 |
| Homoptera | 2 (5.0) | 11.8 |
| Hemiptera | 1 (2.5) | 6.0 |
| Isoptera | 2 (5.0) | 11.8 |
| Larvae | 1 (2.5) | 6.0 |
| Lepidoptera | 3 (7.5) | 17.7 |
| Orthoptera | 4 (10.0) | 17.7 |
| Pulmonata | 1 (2.5) | 6.0 |
| Plants | | |
| Graminea | 6 (15.0) | 35.3 |
| Total | 40 | |

Documented information on the natural history of *D. pelidna* is limited to the original description (Duellman 1989, *op. cit.*), and no information exists on its food habits. Herein, we provide information on its diet, based on fecal samples of 18 individuals: 12 from San Vicente, Táchira, Venezuela (7.48300°N, 72.36600°W, WGS 84; 2460 m elev.) and six from Betania (7.45000°N, 72.43900°W, WGS 84; 2226 m elev.).

Of the 18 feces examined, 17 (94%) contained prey items, belonging to 13 prey categories (Table 1). Coleoptera was numerically the most represented, followed by incidentally ingested plant material. A similar diet has been reported for other species of *Dendropsophus* (Muñoz-Guerrero et al. 2007. Caldasia 29:413–425; Gutiérrez-Cárdenas et al. 2013. Herpetol. Rev. 44:120–121) and other anuran species.

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***HADDADUS BINOTATUS* (Robber Frog). DEFENSIVE BEHAVIOR.** Anurans are preyed upon by numerous species of invertebrates and vertebrates, and to enhance their survival chances display several defensive behaviors as noxious excretions, movements, vocalizations, among others (Toledo et al. 2011. Ethol. Ecol. Evol. 23:1–25). *Haddadus binotatus* is a medium-sized frog that inhabits forest areas in eastern and southeastern Brazil (Frost 2017. http://research.amnh.org/vz/herpetology/amphibia/Amphibia/Anura/Brachycephaloidea/Craugastoridae/Craugastorinae/Haddadus/Haddadus-binotatus; 8 Feb 2018). On 24 November 2017, in the Parque Nacional da Serra das Lontras, Bahia, Brazil (15.16979°S, 39.35047°W, WGS 84; 634 m elev.), we found an adult specimen of *H. binotatus* on the forest floor. While taking some photographs, the frog entwined its posterior limbs in the dorsal region forming an "×" shape, keeping its eyes open and anterior limbs close to the body (Fig. 1). This behavior, with dorsal interweaving of legs, was described recently for *Agalychnis aspera* as "legs-interweaving behaviour" (Gally et al. 2014. Herpetol. Notes 7:623–625). According to Toledo et al. (2011, *op. cit.*), this behavior has been reported for the Hyperoliid *Phlyctimantis keithae*, but this species additionally twists onto its back. "Legs-interweaving


Fig. 1. *Haddadus binotatus* displaying dorsally legs interweaving behavior (A, B) and normal position (C).

behavior" might be accompanied by aposematic or disruptive color patterns and the presence of noxious secretions, which does not seem to be the case of *H. binotatus*. This behavior may also hamper the predator from swallowing prey. This is the first report of the dorsally legs interweaving behavior for the anuran family Craugastoridae.

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***LITHOBATES BLAIRI* (Plains Leopard Frog). ECTOPARASITES.** Here we report an instance of ectoparasitism of a *Lithobates blairi* larva by a crustacean of the genus *Lernaea* (Family Lernaeidae). These organisms, commonly referred to as anchor worms, are well-known parasites of freshwater fishes (Hoffman 1996. Parasites of North American Freshwater Fishes, 2nd Ed. Cornell University Press, Ithaca, New York. 539 pp.). However, field observations of *Lernaea* infestation of amphibian larvae are uncommon and the impact of this parasite on amphibians is poorly understood (Kupferberg et al. 2009. Copeia 3:529–537; Zulma Salinas et al. 2016. Phyllomedusa 15:43–50).

On 22 June 2017, we captured three *L. blairi* tadpoles during funnel trap sampling of a farm pond in the Kellerton Bird Conservation Area in Ringgold County, Iowa, USA (40.70600°N, 94.07700°W, WGS 84). While counting and sorting trap contents, we observed that one of these individuals appeared to have ectoparasites protruding from its body. We collected photographic evidence and noted the occurrence. Later inspection of the photographs led us to the conclusion that the tadpole was infested by copepods of the genus *Lernaea*. Following mating, cyclopoid female lernaeids embed into the body of their host where they mature into parasitic adult females and begin to produce eggs (Steckler and Yanong 2017. *Lernaea* (Anchorworm) Infestations in Fish, Document FA185. University of Florida, Institute of Food and Agricultural Sciences Extension). At least six adult female parasites were attached to the tadpole, with most concentrated on the lateral surfaces of the body near the base of tail (Fig 1A). A later survey conducted on 22 July 2017 failed to yield any additional *L. blairi* tadpoles for inspection.

Although *Lernaea* infestation has been associated with limb deformities in metamorphs (Kupferberg et al. 2009, *op. cit.*), *L. blairi* individuals encountered around the edges of the pond did not appear to be noticeably malformed. However, we did note that the dorsal and ventral tail fins of the infested individual were significantly reduced (Fig. 1B), and upon release back into the pond the tadpole struggled to right itself. The other two *L. blairi* individuals that we captured (not illustrated) also had notably reduced fins, though we did not observe any physical signs of the parasites on these individuals. We cannot be certain that the reduced fins were the result of the infestation and we are not aware of any other reports of reduced or abnormal fins in copepod-infested anuran larvae. Previous studies report observations of hind and fore limb deformities but contain no mention of tail fin deformities (Tzi Ming 2001. FrogLog 46:2–3; Kupferberg et al. 2009, *op. cit.*).

We suspect that the presence of *Lernaea* in the pond resulted from the stocking of *Pimephales promelas* (Fathead Minnow; Cyprinidae). We captured a total of five *P. promelas* minnows in this pond during our 2017 sampling. *Pimephales promelas* are commonly introduced to farm and fish ponds as baitfish

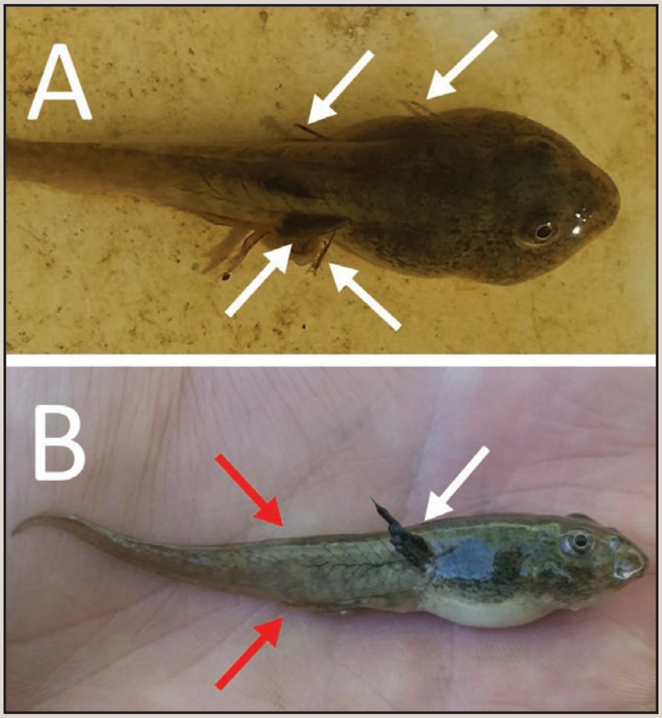


Fig. 1. *Lithobates blairi* (Plains Leopard Frog) tadpole with evidence of infestation by copepods of the genus *Lernaea* (anchor worms). Mature *Lernaea* females attached to the tadpole are indicated by white arrows (A & B). The dorsal and ventral fins of the tadpole (indicated by the red arrows) were significantly reduced (B).

(Stone and Thomforde 2001. Publication No. 120. Southern Regional Aquacultural Center) and field caught individuals have been observed to exhibit high levels of *Lernaea* infestation (Marcogliese 1991. J. Parasitol. 77:326–327). Since we were unaware of the nature of the infestation until later when the photographs of the tadpole were used to identify the parasites, thorough inspection of the minnows was not performed. Nevertheless, we believe it very likely that stocking of cyprinid minnows was linked to this instance of *Lernaea* infestation. This raises the possibility that these baitfish, which are typically considered to be non-predatory and less harmful to amphibians than predatory species (Hecnar and M'Closkey 1997. Biol. Cons. 79:123–131), could be disease vectors that have indirect negative impacts on amphibian populations. To our knowledge, this is the first report of the ectoparasite *Lernaea* infecting *L. blairi* (Dodd 2013. Frogs of the United States and Canada, Volume 2. The Johns Hopkins University Press, Baltimore, Maryland. 982 pp.).

All sampling and handling of fish and amphibians was conducting under University of Illinois at Urbana-Champaign Institutional Animal Care and Use protocol number 17090 and Iowa Department of Natural Resources permit number SC1184.

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***LITHOBATES CLAMITANS* (Green Frog). PARTIAL LEUCISM.** On 2 May 2018, at 2100 h, in the northwestern part of the Powdermill Nature Reserve, Westmoreland County, Pennsylvania, USA (40.16245°N, 79.26648°W, WGS 84× 460 m elev.), we found a large *L. clamitans melanota* tadpole (Gosner stage 39–40; Gosner 1960. Herpetologica 16:183–190) in an artificial pond. This tadpole exhibited the leucistic variant of albinism, sometimes referred to as hypomelanism, exhibiting a loss of all body pigment and normally colored eyes (Fig. 1A). The individual was photographed again on 1 June 2018, at which time its legs exhibited normal coloration, yet the body and tail remained pallid (Fig. 1B), indicating partial leucism. The metamorphosed frog was photographed once more on 10 June 2018 and the body was pallid, limbs colored, and the tail bud was now normally colored (Fig. 1C). Another large white tadpole of an unknown species was observed but not captured from this same pond in spring 2015 (L. Horner, pers. comm.).

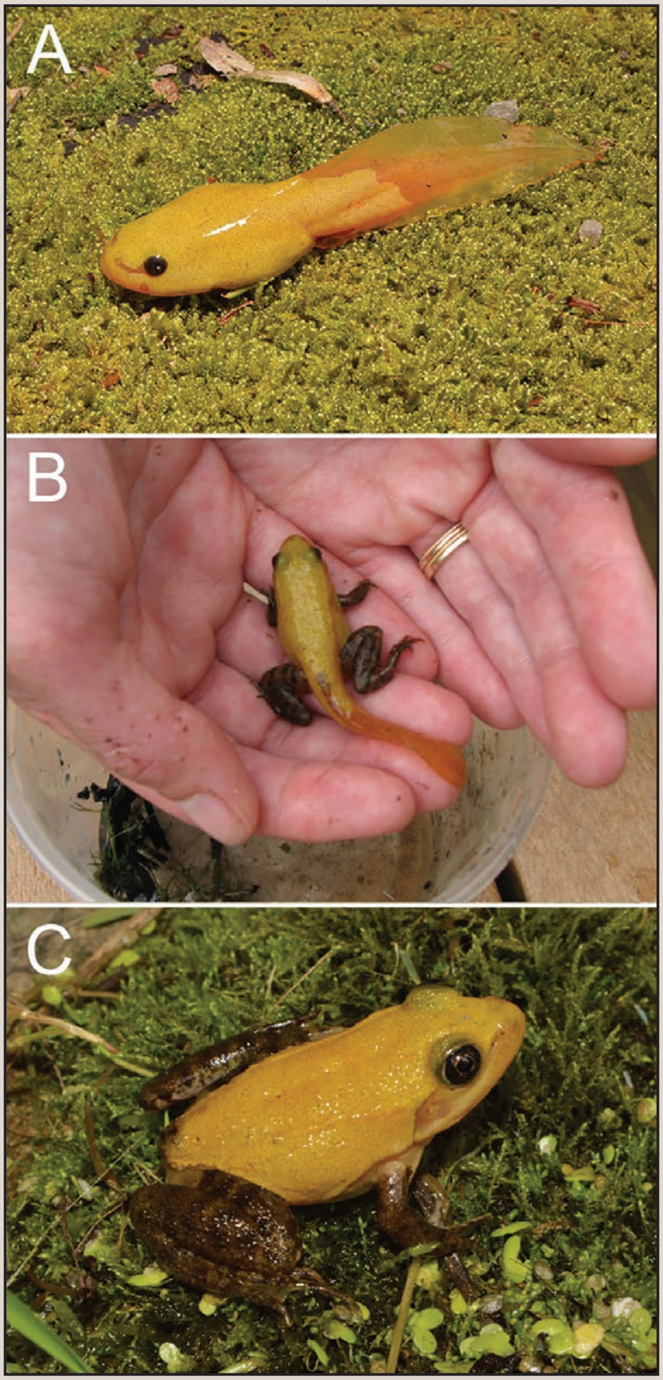


Fig. 1. Partially leucistic Green Frog (*Lithobates clamitans melanota*) found in an artificial pond at the Powdermill Nature Reserve, Westmoreland County, Pennsylvania, USA. A) Tadpole photographed on 2 May 2018. B) Metamorphosling photographed on 1 June 2018. C) Metamorphosed frog photographed on 10 June 2018.

Albinism (and its variants) has been reported from individuals of *L. clamitans* in the wild from several states, including New Jersey, New York, Tennessee, and Vermont (Hensley 1959. Pub. Mus. Michigan St. Uni. 1:133–159; Dyrkacz 1981. Herpetol. Circ. 11:1–31). From Pennsylvania, an albino *L. clamitans* was collected on 22 May 1941 in Monroe Co., and a partially albino adult (i.e., leucistic) was collected in Crawford County on 15 August 1942 (Hensley 1959. *op. cit.*). In Canada, there are also reports of albino *L. clamitans* individuals from Debert and Port Hood in Nova Scotia, and Kazabozua in Quebec (Hensley 1959. *op. cit.*). To the best of our knowledge, this is the first detailed record of a partially leucistic *L. clamitans* found in the wild.

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## TESTUDINES — TURTLES

***APALONE FEROX* (Florida Softshell). DIET.** *Apalone ferox* is known to be primarily carnivorous with a generalist diet consisting of a wide range of invertebrates and vertebrates, including crayfish, mollusks, frogs, fish, and insects (Guyer et al. 2015. Turtles of Alabama. University of Alabama Press, Tuscaloosa. 288 pp.). Variation in diet is likely a result of resource availability, variety of habitats found throughout the species' range, or the opportunistic feeding behavior of the species. American Alligators (*Alligator mississippiensis*) and Florida Softshells co-occur throughout the latter species' entire range (Powell et al. 2016. Peterson Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Harcourt Publishing. Co., Boston, Massachusetts. 512 pp). Here we present the first apparent record of crocodilian predation by a Florida Softshell.

On 1 August 2018, while checking non-baited paired hoop-net traps for a riverine turtle ecology project, we collected an adult female *A. ferox* and a partially predated juvenile American Alligator from a trap in the Fish River in Baldwin County, Alabama, USA. There were no other animals present in the trap and the predation appeared recent, with tissue missing from around the alligator's hind legs. Although adult alligators are apex predators, survivorship of juveniles is a function of size, and juveniles are more susceptible to predation (Rootes et al.

Fig. 1. *Apalone ferox* and partially eaten *Alligator mississippiensis* collected from a trap set in the Fish River, Baldwin County, Alabama.

1991. Estuaries 14:489–494). Though the current observation did occur within a hoop-net trap, it speaks to the dietary breadth of *A. ferox*. The lack of damage to the trap, and the presence of only two animals within the trap suggests that this alligator was past the life stage where parental care (protection) was likely. Given these species co-occurrence throughout the Florida Softshell's range, opportunistic predation of juvenile alligators by the turtles seems plausible.

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***BATAGUR AFFINIS* (Southern River Terrapin). DIET IN THE WILD.** *Batagur affinis* occurs in coastal rivers and estuaries of Peninsular Malaysia, Sumatra, Thailand, Cambodia, and Vietnam, although wild populations are now much reduced or extirpated in most range countries (Moll et al. 2015. Chelon. Res. Monogr. 5:90.1–90.17). In Cambodia, *B. affinis* was feared extinct until a small population was "rediscovered" along the Sre Ambel-Kaong River system in 2001 (Platt et al. 2003. Chelon. Conserv. Biol. 4:691–695). This population has since been the focus of an intense recovery effort involving egg collection from the wild, head-starting of hatchlings, and eventual reintroduction of subadult turtles (Sovannara and Gately 2009. Turtle Survival 2009:94–95; Moll et al., *op. cit.*).

Conservation efforts notwithstanding, much about the ecology of *B. affinis* remains poorly known (Moll et al., *op. cit.*). In particular, information on the diet of wild *B. affinis* is strikingly sparse, and for the most part limited to two published studies (Moll 1980. Malaysian J. Sci. 6A:23-62; Davenport et al. 1992. Herpetol. J. 2:133–139) and unpublished observations (Moll et al., *op. cit.*) from Malaysia. Collectively, these reports indicate that *B. affinis* is omnivorous and consumes a diet consisting of fruits, particularly mangrove apples (*Sonneratia* sp.), leafy vegetation, and mollusks. In Cambodia, Platt et al. (*op. cit.*) reported that fishermen baited set-lines with *Sonneratia* fruit to catch *B. affinis*; otherwise dietary information specific to this population is lacking. We here present additional data on the diet of wild *B. affinis* in Cambodia based stomach contents

Fig. 1. Stomach contents of a reintroduced *Batagur affinis* found dead in the Kaong River, Cambodia after living in the wild for 32 months. Note large prawn and numerous small, yellowish seeds of mangrove apple (*Sonneratia* sp.).

recovered from a reintroduced turtle and ethnoherpetological folk knowledge (sensu Platt et al. 2018. Nat. Hist. Bull. Siam Soc. 63:67–114) provided by indigenous informants.

We obtained stomach contents from the bloated carcass of a reintroduced subadult female *B. affinis* found dead in the Kaong River (Koh Kong Province) on 10 February 2017. Although we could not determine the cause of death with certainty, the turtle may have drowned after being stunned by electro-fishing gear used by fish poachers known to operate in the area. Based on information provided by local villagers, we estimate the turtle had succumbed about five days previously. This turtle was hatched in May 2006 from a clutch of eggs incubated on a protected sandbank along the Sre Ambel River, reared in captivity for almost nine years, and then, together with 20 other turtles, transferred to a "soft-release" acclimation pen on 24 June 2015. The turtles were held in the pen until being allowed to self-liberate on 24 July 2015. Each turtle was outfitted with an acoustic tracking device (Sonotronics® Model CT-05-48-E) to facilitate post-release monitoring of dispersal and survival. When found dead, the turtle had been living in the wild for approximately 32 months during which time straight-line carapace length increased from 341 mm to 410 mm (growth rate = 2.1 mm/month [25.2 mm/year]). Passive receivers deployed along the river indicated the turtle moved 31.8 km downstream from the soft-release pen and then returned upstream before being found dead; the floating carcass was recovered 23.2 km downstream from the soft-release pen.

Shortly after recovering the carcass, we opened the turtle and removed the stomach, which contained numerous *Sonneratia* seeds, unidentified vegetation (probably Poaceae), a largely intact prawn (Decapoda), and many small pieces of chitin that could not be assigned to a specific taxon (Fig. 1). Although juveniles readily consume prawns in captivity (Moll et al., *op. cit.*), our observation appears to be the first report of these prey in the diet of wild *B. affinis*. While the loss of this turtle to electro-fishers was lamentable, our findings indicate that at least in this case, head-started *B. affinis* are capable of foraging effectively after being released into the wild.

Additional information on the diet of wild *B. affinis* was provided during informal and unstructured interviews (Martin

1995. Ethnobotany: A Methods Manual. Chapman Hall, London. 395 pp.) of six local villagers who formerly harvested *B. affinis* and their eggs for domestic consumption; three of these individuals are now employed as field staff by the conservation project. Our informants reported finding the remains of prawns, fish, and freshwater clams (*Corbicula*), foliage of coon-tail (*Ceratophyllum*) and mangrove fern (*Acrostichum aureum*), and fruits/seeds of hog-plum (*Spondias*) and mangrove apple in the feces of harvested *B. affinis*. According to our informants, the fruits and seeds of mangrove apple were the most frequently encountered dietary item in the feces. On occasion, small stones were also noted in the feces; these may have been ingested incidental to feeding, or deliberately ingested as a mineral source or perhaps as grit to facilitate digestive processing of the fiber-rich diet (Platt et al. 2012. Herpetol. Rev. 43:640). While we acknowledge the limits of folk knowledge, our experience (Platt et al. 2018, *op. cit.*) and that of others (e.g., Thirakhupt and van Dijk. 1995. Nat. Hist. Bull. Siam Soc. 42:207–259) indicates indigenous informants are generally reliable sources of information on the natural history of locally occurring chelonians.

Our observation and ethnoherpetological folk accounts from Cambodia compliment previous dietary studies of *B. affinis* in Malaysia. Based on this collective body of work, the diet of wild *B. affinis* consists of fruit (especially *Sonneratia* sp.), aquatic vegetation, and animal protein in the form of mollusks, prawns, and fish. In captivity, fish is an especially important food that enhances the growth of juvenile *B. affinis* and probably does likewise in the wild (Davenport et al., *op. cit.*). Similar to our observations in Cambodia, Moll et al. (*op. cit.*) consider *Sonneratia* fruit to be a dietary staple of *B. affinis* in coastal habitats of Malaysia. Because large numbers of *Sonneratia* fruit are consumed and seeds apparently emerge intact after passing through the digestive tract, the role of *B. affinis* as a potential dispersal agent for this tree warrants further investigation.

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***CARETTA CARETTA* (Loggerhead Sea Turtle). HYBRIDIZATION IN THE MEDITERRANEAN.** Hybridization among marine turtle species was first suggested by Garman 1888 (Bull. Essex Inst. 20:1–13) between *Caretta caretta* and *Eretmochelys imbricata* (Hawksbill Sea Turtle) in the Caribbean. Almost one century later, hybrids between *C. caretta* and *E. imbricata* were described, based on morphological features, in Japan and

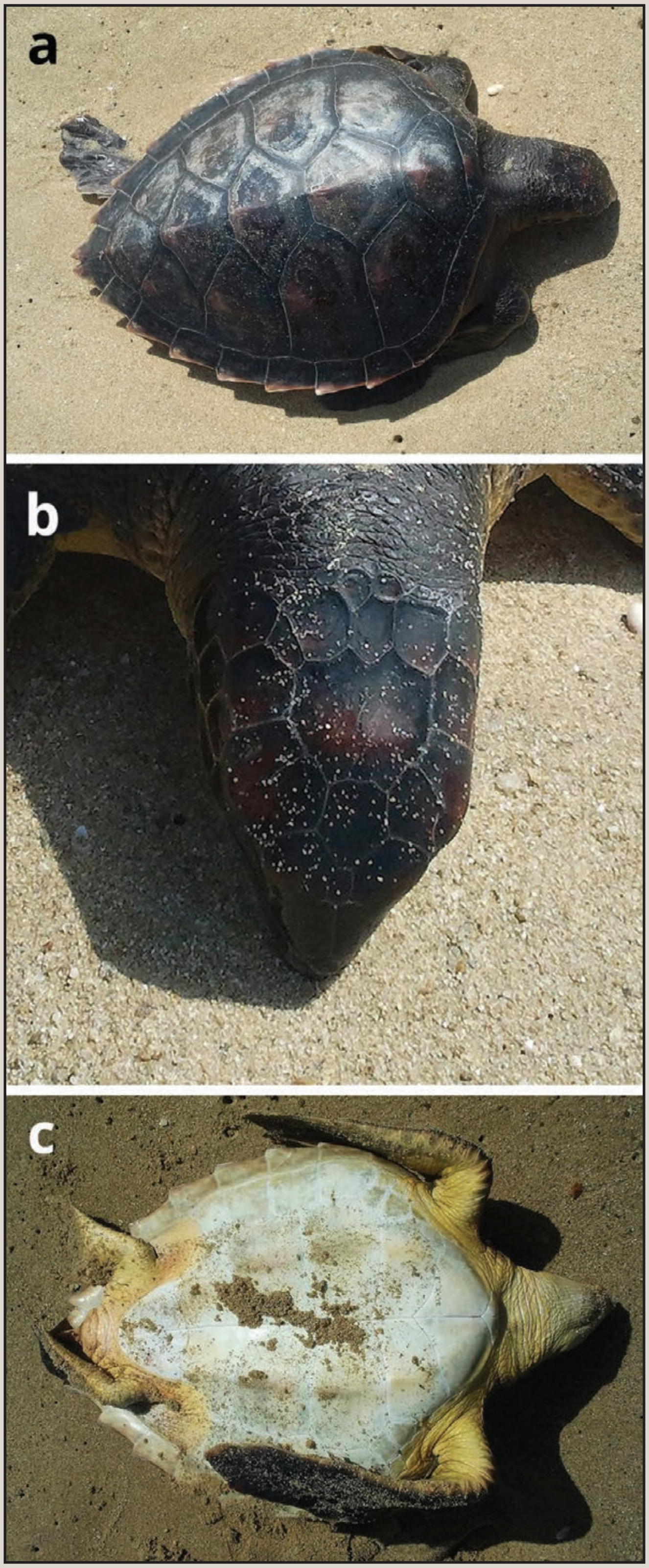


Fig. 1. Photos of putative hybrid specimen (*Caretta caretta* × *Eretmochelys imbricata*) showing: (a) general appearance, carapace outline, number of carapace scutes, anterior costal scutes not in contact with nuchal scute, serration of marginal scutes; (b) prefrontal scales; (c) inframarginal scutes, color of plastron, serration of marginal scutes.

Table 1. Main morphological characters of *Caretta caretta*, putative hybrid, and *Chelonia mydas*.

| Character | *Ca. caretta* | Hybrid | *Ch. mydas* |
|---|---|---|---|
| Prefrontal scales | 2 pairs | 2 pairs | 1 pair |
| Costal scutes (left-right) | 5-5 | 4-4 | 4-4 |
| Inframarginal scutes (left-right) | 3-3 | 4-4 | 4-4 |
| Anterior costal scutes in contact with nuchal scute? | yes | no | no |
| Second claw on front flippers? | yes | no | no |
| Carapace outline | heart-shaped | heart-shaped | oval |
| Serration of marginal scutes | yes | yes | no |
| Plastron color | yellow | creamy-white | creamy-white |

China (Kamezaki 1983. Jpn. J. Herpetol 10:52–53; Frazier 1988. Sanctuary [Asia] 8:15–23). Natural hybridization between *C. caretta* and *E. imbricata* as well as between *Chelonia mydas* (Green Sea Turtle) and *E. imbricata* were identified in the southwestern Atlantic using protein electrophoresis (Wood et al. 1983. Copeia 1983:839–842; Conceição et al. 1990. Comp. Biochem. Physiol. 98B:275–278). With the advent of genetic assays, hybridization among various genera of Cheloniidae was confirmed in the Atlantic (Karl et al. 1995. J. Hered. 86:262–268; James et al. 2004. Can. Field. Nat. 118:579–582) as well as in the Pacific (Kamezaki et al. 1996. Umigame Newsl. 30:7–9; Seminoff et al. 2003. Bull. Mar. Sci. 73:643–652). The highest reported frequency of interspecific hybrid combinations in marine turtles occurs between *C. caretta* and *E. imbricata* in Brazil where about 42% of nesting females with *E. imbricata* phenotype are actually hybrids with *C. caretta* (Lara-Ruiz et al. 2006. Conserv. Genet. 7:773–781). Nevertheless, outside Brazil, reports of natural hybridization are very limited. As far as it can be ascertained no marine turtle hybrids have been recorded in the Mediterranean, although in this virtually enclosed basin breeding populations of *C. caretta* and *Chelonia mydas* are numerous and present restricted gene flow with those in the Atlantic (Casale and Margaritoulis 2010. Sea Turtles in the Mediterranean: Distribution, Threats and Conservation Priorities. IUCN, Gland, Switzerland. 294 pp.).

ARCHELON, the Sea Turtle Protection Society of Greece, has operated since 1992 a nationwide Sea Turtle Stranding Network, which reports injured and dead turtles found along the Greek coastline. Members of the network are Coast Guard officers, local NGOs, and concerned citizens. In case of a stranded dead turtle, network members visit the stranding location, observe the condition of the turtle, record carapace measurements, undertake a basic external examination to determine cause of death, photograph the specimen, and organize its disposal. In case of an injured turtle, network members arrange for its transportation to ARCHELON Sea Turtle Rescue Centre in Glyfada, close to Athens.

On 12 September 2013, a recently dead juvenile sea turtle was reported to the Stranding Network from Paros Island, Cyclades, Greece (precise location: Chryssi Akti 37.0103°, 25.2400°; WGS 84). The specimen was measured (straight carapace length [SCL] of 28 cm, straight carapace width [SCW] of 24 cm) and photographed by the local Coast Guard officers and taken for burial by the local municipality. The exact site of burial was not recorded and tissue samples for genetic analysis were not collected. However, from the acquired photographs (Fig. 1), although superficially resembling a *C. caretta*, the turtle exhibits several morphological characters belonging to *C. mydas* (Table 1). Furthermore, although the size of the head in comparison to body size resembles *C. mydas*, its shape is more similar to that of *C. caretta*.

The intermediate morphological characters of the examined juvenile specimen suggest that it could be a hybrid between a *C. caretta* and a *C. mydas*, and would thus be the first hybrid sea turtle recorded in the Mediterranean.

Both species reproduce in the eastern Mediterranean, featuring the same breeding seasonality and same nesting beaches in the Levantine Basin (e.g., Turkey, Cyprus, Syria, Israel, Lebanon) (Casale and Margaritoulis 2010, *op. cit.*), with ample opportunities for inter-specific mating. In the Mediterranean, it is estimated that annually about 7200 *C. caretta* and 1600 *C. mydas* nests are laid (Casale and Margaritoulis 2010, *op. cit.*). Further, severe exploitation most of *C. mydas* occurred in the Levantine Basin, where both species coexist, from about the 1920s until the 1970s (Sella 1982. *In* Bjorndal [ed.], Biology and Conservation of Sea Turtles, pp. 417–423. Smithsonian Institution Press, Washington, DC). The above differences and decreases in population sizes may imply potential hybridization.

In Greece, although *C. caretta* is the most abundant sea turtle species, *C. mydas* are not uncommon. From a total of 226 injured turtles admitted to the ARCHELON Sea Turtle Rescue Centre from Greek coasts, 3.5% have been identified as *C. mydas* (Panagopoulos et al. 2003. *In* Margaritoulis and Demetropoulos [eds.], Proceedings of the First Mediterranean Conference on Marine Turtles, pp. 202–206. Barcelona Convention - Bern Convention - Bonn Convention [CMS], Nicosia, Cyprus).

The lack of records of hybrid specimens in the Mediterranean is probably a result of non-reporting or of inability of observers to distinguish among species because of the inherent phenotypic plasticity of morphological characters. It is therefore important that marine turtle workers in the region report any "unusual" specimens and, whenever possible, collect tissue samples. Genetic analysis would validate potential hybridization events identified by morphology and contribute to quantifying the extent of this phenomenon in the Mediterranean.

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***CHELONOIDIS CHILENSIS* (Chaco Tortoise). ENDOPARASITES.** Two species of the genus *Chelonoidis* occur in Argentina, both of which are considered nationally endangered. In Argentina, *C. chilensis* is distributed over the northern two thirds of the country (Prado et al. 2012. Cuad. Herpetol. 26:375–387). Adults are largely herbivorous, but dietary choices may vary according to the available resources (Richard 1994. Cuad. Herpetol. 8:131–140). In Argentina, relationships between nematodes and turtles have received limited attention. The previous summary of nematode parasites in Testudinidae includes 79 Oxyurida and 25 Ascaridida with 11 species known from the Neotropical region (five Oxyurida and six Ascaridida) (Bouamer and Morand 2006. Ann. Zool. 56:225–240). We know of no previous published parasite records for *C. chilensis* and we establish the initial helminth list in the present note.

One adult female *C. chilensis* (carapace length = 19 cm) was obtained from the Rehabilitation Center for Wildlife, Environmental Education and Responsible Recreation (Parque Faunístico), Rivadavia Departament, Province of San Juan, Argentina, in November 2018. The specimen had died from unknown causes. The body cavity was opened by a mid-ventral incision and the digestive tract was removed and examined with a stereoscopic binocular microscope. The nematodes found were stored in 70% ethanol. Nematode analysis was done using the diaphanization by lactophenol technique, and identification was performed using an Arcano optical microscope. The specimens were deposited in the parasitological collection of the Department of Biology, National University of San Juan (UNSJPar 255, 256). Two species of nematodes were identified in the large intestine: *Falcaustra* sp. (3 males, 43 females) and *Labiduris* sp. (6 males, 63 females). At this time there are apparently no reports of *Falcaustra* sp. or *Labiduris* sp. in *C. Chilensis* from Argentina.

The adult stages of *Falcaustra* mainly parasitize turtles (Baker 1987. Mem. Univ. Newfoundland Occas. Pap. Biol. 11:1–325). The specimens of *Falcaustra* sp. identified in this study possess the following diagnostic characteristics: large nematodes with lateral alae absent, oesophageal isthmus spherical, oesophageal bulb well differentiated, elongated esophagus with short pharynx and presenting a bulb provided with small dilation or pseudobulb, pre- and post-anal papillae, and oviparous female, with the vulva in the posterior half of the body. *Labiduris* sp. identified herein possess these characteristics: monodelphic ovaries, oral opening apical in position, oral opening ventrally displaced, subventral lip with a fringe, cuticle without spines, and vulva separate from rectum and anus (Mondal and Manna 2013. J. Parasit. Dis. 37:134–141). The information reported here represents an initial contribution to the knowledge of parasites in *C. chilensis* in particular and Argentinian turtles in general.

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***CHELYDRA SERPENTINA* (Snapping Turtle). GROWTH AND MATURITY.** Although the reproductive ecology of *Chelydra serpentina* has been well studied at our field site at Gimlet Lake, Garden County, Nebraska, USA (Iverson et al. 1997. Herpetologica 53:96–117; Hedrick et al. 2018. Can. J. Zool. 90:221–228), the only available data on female growth for that population are based on preliminary counts of scute annuli made in the 1980s and 1990s. We here report an analysis of growth based on a von Bertalanffy analysis of 50 recaptures coupled with estimated age data for 18 females initially aged by scute annuli and later recaptured (27 times) over the past 37 years. In order to anchor the von Bertalanffy curve (method following Jones 2017. Chelon. Conserv. Biol. 16:215–228), we included two juvenile

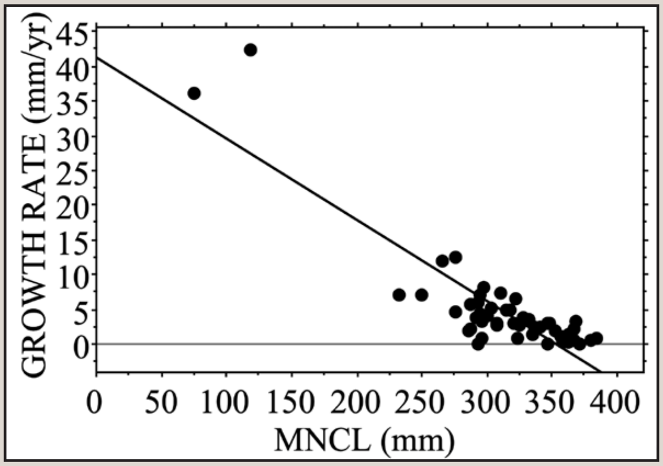


Fig. 1. Relationship between carapace growth rate (GR; mm/yr) and mean carapace length at first and last capture (MNCL; mm) for female *Chelydra serpentina* in western Nebraska. Least square regression line is plotted: N = 50; mean recapture interval = 5.16 yr; range = 1–15 yr; GR = 41.373 – 0.1169 MNCL; r = 0.87; P < 0.0001.

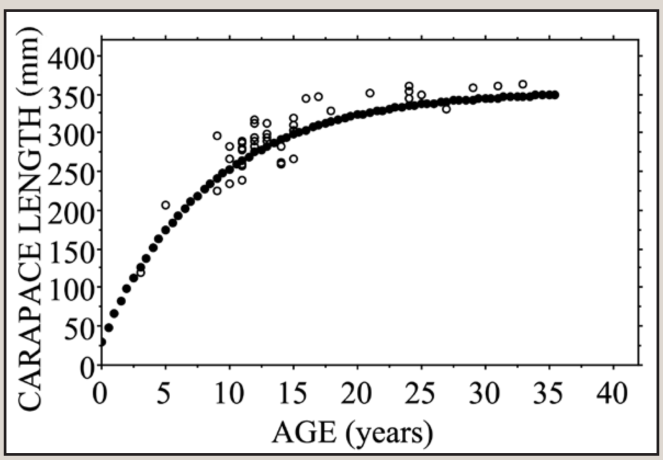


Fig. 2. Carapace growth (in mm) of female *Chelydra serpentina* based on a von Bertalanffy growth model (solid dots) and estimated ages (in winters) based on 50 recaptures originally aged by counts of scute annuli (open circles). Von Bertalanffy growth model is CL = 353.92 $(1 - 0.9152e^{-0.1169t})$, where t = age in years.

females (with 3 and 5 annuli) that were captured only once but assumed to have grown from a mean hatchling size of 30 mm CL (JBI, unpubl.). This analysis suggests an asymptotic carapace length of 354 mm (Fig. 1), which corresponds well with our age estimates based on annuli (Fig. 2).

The smallest five nesting females in our previous study (Iverson et al. 1997, *op. cit.*) measured 282, 283, 284, 290, and 295 mm CL, respectively; however, through 2017 our smallest nesting females were 258 (11 annuli), 259 (11 annuli), 262 (14 annuli), 263, 264, 265, 266, and 269 mm CL. We also measured an additional 12 nesting females between 271 and 279 mm CL, and 14 between 280 and 285 mm CL. Our new data decrease the size at maturity, but apparently do not diminish the previously reported age at maturity after attaining 10–12 winters.

Our two oldest, ageable females (34 and 33 years) were each originally captured with 12 annuli in 1994 (317 mm CL) and 1993 (311 mm CL), respectively, and later recaptured in 2017 (280 mm CL) and 2014 (362 mm CL). These do not represent maximum longevity, as some authors have reported *C. serpentina* living beyond 40 years (Galbraith and Brooks 1989. J. Wildl. Mgmt. 53:502–508; Slavens and Slavens 1999. Reptiles and Amphibians in Captivity Breeding—Longevity and Inventory January 1, 1999. Slaveware, Seattle, Washington. 400 pp.; Moll 2001. Son. Herpetol. 14:50–51).

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***CHELYDRA SERPENTINA* (Snapping Turtle). PREDATORY ENCOUNTER.** The identication of predators of wild birds can be difcult, especially in aquatic environments. We report a predatory encounter between a *Chelydra serpentina* (carapace length = 26.3 cm), from an introduced population, and an adult Common Gallinule (*Gallinula galeata*). Since we rescued the bird, the entire sequence of the predatory event is not described.

On 17 May 2018 at 1240 h, we observed a Common Gallinule struggling and unable to fly from the shallow water among dense Yellow Water-Primrose (*Ludwigia peploides*) near the shore of an artificial water treatment pond at Prado Basin, Santa Ana River, Corona, Riverside County, California, USA (33.91258°N, 117.64021°W; WGS 84; 150 m elev.). After 3–4 minutes, it appeared that the bird was snagged and unable to free itself. Since the bird was partially submerged and immobile, and vocalizing in a series of distress calls (Fig. 1), one of us (ELE) approached the bird in an attempt to free it. As the bird was lifted above the surface of the water, the head of a Snapping Turtle appeared in a clump of woody debris, grasping the left foot of the bird. Upon disturbance the turtle apparently loosened its grip and the bird instantly flew ca. 10 m to a dense patch of bulrush (*Scirpus*). The turtle, covered in mud, was quickly apprehended by grabbing one extended rear leg, then the other. It was temporarily retained for data collection and photographed (Fig. 2), then released at point of capture.

Although no details were provided, the Snapping Turtle is included as a predator of the Common Gallinule within the turtles' natural range in Louisiana (Bell and Cordes 1977. Proc. Southeast. Assoc. Game Fish Comm. 31:295–299). This aquatic turtle often behaves as a subsurface sit-and-wait ambush predator, attacking passing prey, including wading and dabbling avifauna (Ernst and Lovich 2009. Turtles of the United States and Canada, 2nd ed.. Smithsonian Institution Press, Washington, DC. 827 pp.). This introduced, omnivorous, and highly adaptable turtle has been reported from most of the larger drainages in southern California (Jennings 2004. California Fish Game 90:161–213). Consequently, the introduced *C. serpentina* should be recognized as a likely predator on the diverse shore and wading avifauna of southern California. Photographic vouchers were deposited at the San Diego Natural History Museum herpetology photographic collection (SDSNH-HerpPC 05384 - 05388).

Fig. 1. Adult Common Gallinule (*Gallinula galeata*) being held by an adult *Chelydra serpentina* in a water treatment pond at Prado Basin, Corona, Riverside County, California, USA.

Fig. 2. An adult *Chelydra serpentina* captured while it was attempting to capture an adult Common Gallinule (*Gallinula galeata*).

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***DEIROCHELYS RETICULARIA MIARIA* (Western Chicken Turtle). REPRODUCTION.** Western Chicken Turtles are considered rare and declining throughout their range (Ryberg et al. 2017. Herpetol. Conserv. Biol. 12:307–320). Herein we present the first reproductive data for *Deirochelys reticularia* from Texas, USA. On 3 April 2018 at 1126 h, a female *D. reticularia* was found nesting by Ginger Falgoust in Fort Bend County, Texas, at Fulshear (29.70723°N, 95.90473°W). A total of 12 eggs were laid with mean size measurements (L × W) of 34 mm × 24 mm. On 7 April 2018, the eggs were gathered from the nest site and incubated in a mixture of vermiculite and perlite with a relative humidity of 70% at 82°F. After 67 days, seven neonates hatched; mean hatchling measurements were: carapace length = 32 mm, carapace width = 28.5 mm, plastron length = 28.5 mm, plastron width = 22.2 mm, shell height =15.4 mm, and mass = 9 g. No sign of embryonic development was present in the remaining five eggs. On 1 July 2018, the baby turtles were released to the wetland adjacent to the original nest site.

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***EMYDOIDEA BLANDINGII* (Blanding's Turtle). FEEDING.** Freshwater turtles have a soft, flattened eye lens enabling them to see well on land and in water (Moldowan et al. 2015. Can. Field-Nat. 129:403–408), and presumably enabling them to hunt and forage both terrestrially and aquatically. Nonetheless, most aquatic turtles feed underwater, employing suction-feeding (Claude et al. 2004. Syst. Biol. 53:933–948). Aquatic emydid turtles are not expected to feed on land because the low viscosity and density of air makes it difficult, perhaps even impossible, to swallow prey (Stayton 2011. J. Exp. Biol. 214:4083–4091). In nature, *Chrysemy picta* (Painted Turtles) have been observed foraging on bog mats (Moldowan et al. 2015, *op. cit.*) and *Clemmys guttata* (Spotted Turtles) have been observed plucking food from spider webs (Rasmussen et al. 2011. Herpetol. Rev. 40:286–288); in both instances, the prey was captured out of the water but prey consumption was not observed. Whether *Emydoidea blandingii* can feed on land is under dispute. Some authors argue that terrestrial food sources, such as berries and slugs, are consumed when on land, while others suggest that prey caught on land must be brought into the water to be consumed (Ernst and Lovich 2009. Turtles of Canada and the United States. Johns Hopkins University Press, Baltimore, Maryland. 827 pp.). An analysis of *E. blandingii* stomach contents and fecal matter yielded fresh prey items; however, visual observations during that same study indicated that prey items were scavenged from clumps of aquatic vegetation (Rowe 1992. J. Herpetol. 26:111–114), as observed for *C. picta* by Moldowan et al. (2015, *op. cit.*).

Here we describe an observation of a male *E. blandingii* in an immobile posture on a basking log with an adult *Plathemis lydia* (Common Whitetail Dragonfly) in its mouth. On 21 May 2018, in central Ontario, Canada at ca. 1100 h, an adult male *E. blandingii* (CL = 23.8 cm; 1890 g), was observed on a log ca. 1 m long in an open water marsh (ca. 10.4 ha) in an area with a water depth of 1.2 m. For ca. 1 h the turtle did not move, and its neck was fully extended with its head up in the air. At ca. 1200 h, the turtle was captured and did not try to flee when approached, but appeared to be immobile. After being captured, the turtle dropped the deceased odonate from its mouth, and resumed regular fleeing behavior, including vigorous limb movement and scratching. Because the turtle did not move from its position on the log during our approach, we assume it had the adult *P. lydia* in its mouth for the entirety of the one-hour observation period.

Odonate larvae are common in the diet of *E. blandingii* (Kofron and Schreiber 1985. J. Herpetol. 19:27–40); however, adult dragonflies are much less common and are likely difficult to capture (Stayton 2011, *op. cit.*), though turtles may sometimes encounter them floating on the water's surface. The immobile posture employed by the turtle while it was presumed to have held the odonate in its mouth may have resulted for a number of reasons, including an inability or difficulty to consume prey out of water. Although odonates are not known to be poisonous or to possess stingers (Needham and Westfall Jr. 1955. A Manual of the Dragonflies of North America [Anisoptera]. University of California Press, Berkeley. 615 pp.), they do display abdominal spine growth and thickening in response to predatory cues in the wild (Arnqvist and Johansson 1998. Ecology 76:1847–1858) and these spines, along with size, may have caused the turtle to remain immobile as it attempted to secure a difficult-to-handle prey item in its mouth. Alternatively, the turtle may simply have forgotten about the prey in its mouth, as suspected in observations of feeding *Glyptemys insculpta* (Wood Turtles; J. Harding, pers. comm.). Our observation could be seen to corroborate studies on feeding behaviors of *E. blandingii* in the wild that suggest they drag prey back to the water before consumption (Ernst and Lovich 2009, *op. cit.*), but it does not support results from lab studies in which food was consumed on land when no water was present (Ernst and Barbour 1972. Turtles of the United States. University of Kentucky Press, Lexington, Kentucky. 347 pp.). Further research could illuminate the frequency and potential ubiquity of terrestrial feeding by certain aquatic turtles in the wild.

All work involving animals was carried out under an approved Laurentian University Animal Care protocol (AUP 2013-03-01) and was authorized by permits from the Ontario Ministry of Natural Resources and Forestry. Financial and in-kind support for this work was provided by the Natural Sciences and Engineering Research Council, Northern Ontario School of Medicine, and Laurentian University.

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***GEOCHELONE PLATYNOTA* (Burmese Star Tortoise). MAXIMUM BODY SIZE AND GIANTISM.** *Geochelone platynota* is a critically endangered tortoise endemic to the Dry Zone of central Myanmar. Once abundant, populations were reduced to near-extinction by a combination of long-term chronic

Table 1. Morphometric measurements and reproductive output for six large female Burmese Star Tortoises (*Geochelone platynota*) held in a conservation-breeding center in Bagan, Myanmar. Tortoises examined and measured on 25 March 2018. Individual identification number followed by qualitative assessment of pyramiding in parentheses (EX = Extreme; MO = Moderate; MI = Minor/not-present). CL = straight-line carapace length; CW = maximum carapace width; PL = plastron length; SD = maximum shell depth. Reproductive data are from the 2016–2017 breeding season. Clutches = number of clutches produced by each female during the 2016-17 breeding season. Total eggs = total number of eggs produced by each female during the 2016–2017 breeding season.

| Identification #/ (Pyramiding) | CL (mm) | CW (mm) | PL (mm) | SD (mm) | Annuli | Clutches | Total eggs |
|---|---|---|---|---|---|---|---|
| 146 (EX) | 455 | 310 | 385 | 234 | 20 | 0 | 0 |
| 137 (EX) | 378 | 247 | 331 | 216 | 17 | 0 | 0 |
| 141 (MO) | 365 | 247 | 313 | 194 | 18 | 0 | 0 |
| 002 (MI) | 336 | 212 | 274 | 169 | Worn | 1 | 1 |
| 128 (EX) | 320 | 211 | 270 | 165 | 16 | 4 | 26 |
| 096 (MO) | 319 | 210 | 255 | 148 | 16 | 3 | 22 |

subsistence harvesting coupled with over-collecting to supply high-end international pet markets. As a result, by the early 2000s *G. platynota* was considered functionally extinct in the wild (Platt et al. 2011. Chelon. Res. Monogr. 5:57.1–57.9). A conservation-breeding program has since proven extremely successful, biological extinction now appears unlikely (Platt et al. 2017a. Herpetol. Rev. 48:570–575), and reintroduction is currently underway at two protected areas in Myanmar (Platt et al. 2017b. Turtle Survival 2017:38–43).

Successful conservation efforts notwithstanding, basic natural history information on *G. platynota* remains surprisingly sparse (Platt et al. 2011, *op. cit.*). Of particular interest is the upper asymptotic body size attained by *G. platynota*, which remains ill-defined despite the importance of such data for describing growth patterns and validating models of allometric relationships (Wilkinson et al. 2016. Copeia 104:843–852). Smith (1931. The Fauna of British India, including Ceylon and Burma. Vol. 1. Loricata and Testudines. Taylor and Francis, London. 185 pp.) gives the maximum carapace length (CL) of *G. platynota* as 260–280 mm and the largest wild-caught tortoise measured by Platt et al. (2003. Oryx 37:464–471) had a CL of 278 mm, leading Platt et al. (2011, *op. cit.*) to suggest that *G. platynota* attains a CL of "at least" 300 mm. We here present morphometric measurements of six female *G. platynota* with CL > 300 mm; as such, these individuals likely represent the upper asymptotic body size for this species.

The six female *G. platynota* are part of a large conservation-breeding group (ca. 200 tortoises) maintained at Lawkanandar Wildlife Sanctuary (LWS) in Bagan, Myanmar to produce offspring for head-starting and eventual reintroduction into the wild (Platt et al. 2017a, *op. cit.*). These females were obtained for the breeding program after being confiscated from illegal wildlife traffickers by the Forest Department during the early 2000s, hence their specific provenance is unknown; however, all six undoubtedly originated from the wild. The females are housed together with other tortoises in a large outdoor communal breeding enclosure where curatorial staff closely monitor the reproductive output of each individual (Platt et al. 2017a, *op. cit.*).

We examined the six large females as part of a routine veterinary health assessment at LWS on 25 March 2018. Unique numbers are painted on the carapace of each tortoise for individual identification. Using a pair of tree calipers we measured (to the nearest 1.0 mm) the straight-line CL (from posterior marginals to anterior edge of nuchal scute), maximum carapace width (CW), mid-line plastral length (PL; from base of anal notch to posterior edge of gular scute), and maximum shell depth (SD; vertical distance from plastron to highest point of carapace) of each tortoise. Because plastral annuli were worn smooth precluding an accurate assessment, we instead counted the number of annuli on the anterior-most pleural scute of the carapace. Carapacial pyramiding (condition in which the carapacial scutes become raised and pyramid-shaped; Platt et al. 2014. Star Tortoise Handbook for Myanmar: Conservation Status, Captive Husbandry, and Reintroduction. Wildlife Conservation Society-Myanmar Program, Yangon, Myanmar. 90 pp.) was noted if present and subjectively ranked as extreme, moderate, or minor/not-present. The number of clutches and total number of eggs produced by each female during the 2016–17 breeding season were obtained from records maintained by curatorial staff at the facility.

The CL of these large female *G. platynota* ranged from 319 to 455 mm (Table 1) with the largest individual (Fig. 1) exceeding the previously assumed size maxima (ca. 300 mm; Platt et al. 2011. *op. cit.*) by 150 mm. Excessive to moderate carapacial pyramiding was present on all but one of the tortoises. Pyramiding is common among the assurance colony founders, and although the underlying causes remain poorly understood, the condition may be a response to genetic factors, incubation temperatures, xeric conditions during early growth, or a protein-rich diet (reviewed by Platt et al. 2014, *op. cit.*). Our discussions with tortoise hunters in different parts of the Dry Zone (Platt et al. 2018. Nat. Hist. Bull. Siam Soc. 63:67–114) anecdotally suggest there is also a geographic component to this condition; i.e., tortoises from certain regions are more likely to exhibit carapacial pyramiding. The number of carapacial annuli on five females ranged from 16 to 20 with the largest female exhibiting the greatest number of annuli; however, the assumption that annuli counts correspond to age has yet to be verified in *G. platynota*. The annuli of one female proved too abraded and faint for us to accurately count.

Interestingly, only the two smallest females in this group produced clutches containing typical numbers of eggs (mean clutch size for *G. platynota* is 4.4 eggs [range = 1–11] with multiple clutches/season; Platt et al. 2011, *op. cit.*) during the

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Fig. 1. Record-sized female *Geochelone platynota* (CL = 455 mm) at a captive-breeding center in Bagan, Myanmar. Note extreme pyramiding of the carapace.

2016–17 nesting season, while a third female deposited one clutch consisting of but a single egg. The three largest females produced no eggs during the most recent nesting season, and according to breeding records, have never produced a clutch in the past. Observations by the staff suggest that males are unable to successfully copulate with these three females owing to their large body size. Pyramiding can also interfere with copulation (Platt et al. 2014, *op. cit.*). Nonetheless, we assume these females would regularly produce eggs even if these are unfertilized. Excessively large body size coupled with an apparent inability to reproduce leads us to suggest the three very large females probably suffer from giantism, a condition in which large body size results from a growth hormone disorder such as acromegaly (Woodward et al. 1995. J. Herpetol. 29:507–513; Verburgh. 2018. The Longevity Code. The Experiment Publishing, New York. 309 pp.). We therefore posit that the upper functional asymptotic CL in female *G. platynota* is approximately 320 mm.

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***GOPHERUS POLYPHEMUS* (Gopher Tortoise). PREDATION.** *Gopherus polyphemus* is listed as a threatened species by the Florida Fish and Wildlife Commission (Florida Wildlife Code Chap. 68A-27 F.A.C), and the eastern population (including Florida) is under consideration for listing as threatened by the US Fish and Wildlife Service (USFWS 2011. Federal Register 74:46401–46406). *Canis latrans* (Coyote) are invasive in Florida, and have been expanding their range across the state (Hill et al. 1987. Wildl. Soc. Bull. 15:521–524; Thornton et al. 2004. J. Mammal. 85:973–982). Here we report on the predation of an adult *G. polyphemus* by *C. latrans*.

At 2031 h on 4 April 2018, a camera trap (Reconyx PC800 Professional) set to trigger on motion detection captured an image of an adult *C. latrans* carrying an adult *G. polyphemus* in its mouth (Fig. 1). The camera was set to capture bursts of three pictures 5 seconds apart, with the *C. latrans* and *G. polyphemus* captured only in the first picture of the three. This camera was located on the fence-line of a soft-release enclosure for translocated *G. polyphemus* in Okaloosa County, Florida (30.47535°N, 86.76312°W; WGS 84), as part of a paired design of cameras located inside, on the fence, and outside of the enclosure, to capture images of potential predators. Although we have no direct proof that the *G. polyphemus* in the picture was killed by the *C. latrans*, we suspect this tortoise was a female that had been encountered in late February at a burrow near the fence camera that captured the picture. In early May, the remains of that female were found on the outside of the enclosure between the fence camera and the paired outer camera.

*Canis latrans* are considered predators of hatchling and juvenile *G. polyphemus* (Smith et al. 2013. J. Wildl. Manag. 77:352–358; Dziadzio et al. 2016. J. Wildl. Manag. 80:1314–1322). Previous reports of predation by *C. latrans* on *G. polyphemus* include finding the gular projection of the plastron from a two to three-year-old *G. polyphemus* in *C. latrans* scat (Moore et al. 2006. Herpetol. Rev. 37:78–79). While many other predators are thought to prey on eggs, hatchlings, and juveniles (e.g. snakes, birds, mammals; Butler and Sowell 1996. J. Herpetol. 30:455–458), there are fewer known predators of adult *G. polyphemus*, although predation on an adult *G. polyphemus* by feral dogs has been reported (Causey and Cude 1978. Herpetol. Rev. 9:94–95).

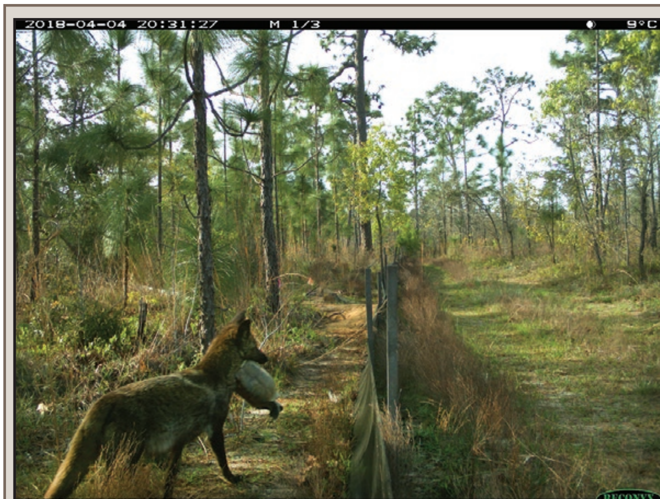


Fig. 1. A camera trap image of a *Canis latrans* carrying an adult *Gopherus polyphemus*, near the fence of a soft-release translocation site in Okaloosa County, Florida.

The effect of predation on translocated *G. polyphemus* is not well documented, but long-lived, slow growing species like *G. polyphemus* are particularly impacted by the loss of adults in the population, so predator management is likely important for at least the initial maintenance of these populations (Ashton and Burke 2007. J. Wildl. Manag. 71:783–783; Tuberville et al. 2008. Biol. Conserv. 141:2690–2697).

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***GRAPTEMYS GEOGRAPHICA* (Northern Map Turtle). COLORATION.** In the genus *Graptemys*, typical coloration of the iris of the eye is yellow, with a black stripe that bisects the iris (see photos in Lindeman 2013. The Map Turtle and Sawback Atlas: Ecology, Evolution, Distribution, and Conservation. University of Oklahoma Press, Norman. 460 pp.). Variation exists in populations of some species, however. In many populations of *G. pseudogeographica* and *G. ouachitensis* throughout the southern Mississippi River drainage, most individuals have a white iris, typically with no black stripe in *G. pseudogeographica* and occasionally with a reduced or absent black stripe in some individuals of *G. ouachitensis* (Lindeman 2003. Chelon. Conserv. Biol. 4:564–568; Tumlinson and Surf 2015. J. Arkansas Acad. Sci. 69:157–160). In *G. pseudogeographica* in the Calcasieu River drainage of southwestern Louisiana, a dark brown, almost black iris is strongly predominant (Lindeman et al. 2015. Herpetol. Rev. 46:179–185). Here I report a second incidence of *Graptemys* populations that display dark irises.

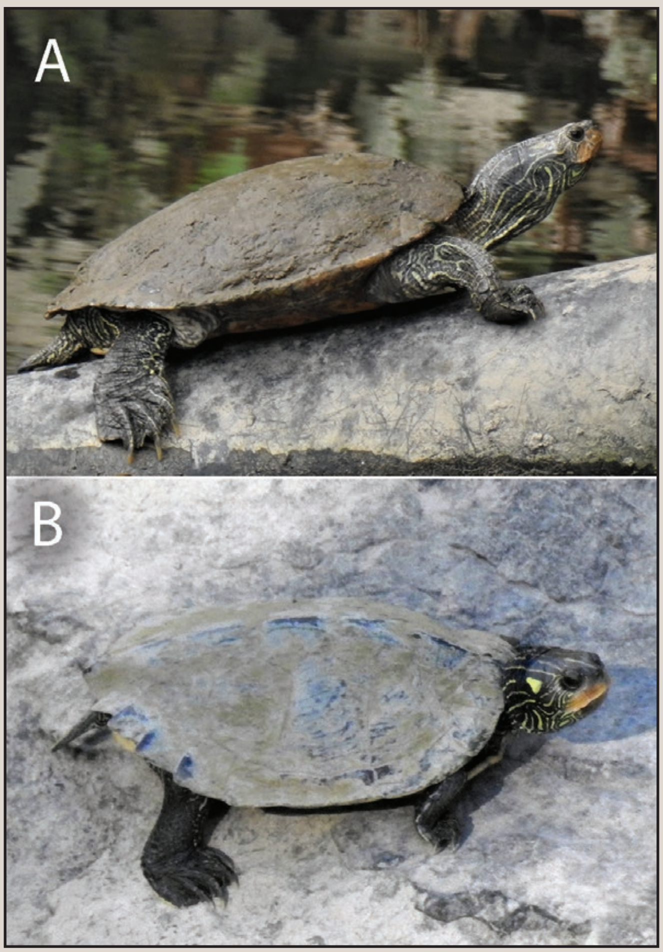


Fig. 1. A) Adult female and adult male *Graptemys geographica* exhibiting dark brown irises, Middle Fork of the Holston River, Chilhowie, Smyth County, Virginia. B) Juvenile female *G. geographica* exhibiting a dark brown iris, Clinch River, Castlewood, Russell County, Virginia.

On 6 and 9 October 2018 I used a Nikon CoolPix with an 83´ zoom lens to photograph basking *Graptemys geographica* at two sites on the Clinch River in Russell County, Virginia, and six and two sites, respectively, on the North and Middle Forks of the Holston River in Smyth County, Virginia. A total of 90 *G. geographica* were seen, of which 60 were photographed with enough clarity to determine eye color (24 from the Clinch River, 20 from the North Fork of the Holston, and 16 from the Middle Fork). All photographed turtles had dark eyes (Fig. 1).

This second report of dark brown iris coloration in *Graptemys* is noteworthy because it concerns a distant relative of the species from the first report and because the populations in question are not geographically isolated. The previous report of dark iris coloration in *G. pseudogeographica* were from sites throughout an isolated Gulf Coastal river drainage, the Calcasieu River (Lindeman et al., *op. cit.*). The rivers that yielded the present results are part of the Tennessee River drainage, a major southeastern portion of the greater Mississippi River drainage. A yellow iris with a black stripe through it is typical of populations of *G. geographica* in Lake Erie in Pennsylvania, the Susquehanna River drainage in New York and Pennsylvania, and several sites in the Mississippi River drainage, including the Current River in Missouri, the East Fork of the White River and the Wabash River in Indiana, and the Elk River, a Tennessee River tributary that flows from central Tennessee into Alabama (P. Lindeman, unpubl. observ.). It would be interesting to know how far downstream of the western Virginia localities this characteristic extends, as well as its genetic basis and whether that genetic basis is the same or different for the Virginia populations of *G. geographica* and the Calcasieu River drainage populations of *G. pseudogeographica*. Researchers should report additional incidences of atypical eye coloration for populations of *Graptemys* species.

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***KINOSTERNON HIRTIPES* (Rough-footed Mud Turtle). JUVENILE HABITAT.** Hatchling and juvenile turtles are typically under-sampled in ecological studies because these smaller size-classes are secretive and inconspicuous, occur at low densities, and often prove difficult to trap (Muldoon and Burke 2012. Can. J. Zool. 90:651–662; Selman 2018. Herpetol. Conserv. Biol. 13:399–407). Consequently, the ecology of hatchling and juvenile turtles is poorly known, despite the importance of these size-classes in life-history models and management plans (Muldoon and Burke, *op. cit.*). In particular, there is a notable paucity of information concerning the habitats used by juvenile turtles, which is regrettable given these data are critical for conservation planning (Selman, *op. cit.*). Because juveniles often use different habitats than adults (Reich et al. 2007. Biol. Lett. 3:712–714), managers cannot assume that protection of adult habitat confers protection to juvenile life-stages (Selman, *op. cit.*). Thus, without specific knowledge of juvenile habitats these areas may be over-looked when designing species management plans (Selman, *op. cit.*).

In the United States, *K. hirtipes* is known from < 10 small, isolated populations in Presidio County, Texas (Scudday and Miller 1986. The status of the Chihuahuan mud turtle, *Kinosternon hirtipes murrayi*. Report to United States Fish and Wildlife Service, Washington, D.C. 43 pp.; Platt and Medlock. 2015. Herpetol. Rev. 46:424–425) where this turtle is classified as a Critically Imperiled, Threatened, and Species of Greatest Conservation Need (Texas Parks and Wildlife Department. 2013. Species of Conservation Concern. Available online at: www.tpwd.state.tx.us). Furthermore, *K. hirtipes* is considered among the least-studied North American turtles and little is known about its natural history (Lovich and Ennen 2013. Amphibia-Reptila 34:11–23). *Kinosternon hirtipes* reportedly inhabits spring-fed wetlands and creeks in Texas (Scudday and Miller, *op. cit.*) and Mexico (Legler and Vogt 2013. The Turtles of Mexico. University of California Press, Berkeley. 402 pp.); however, the specific habitats used by hatchlings and juveniles remain undescribed. We here report observations of small juvenile *K. hirtipes*, describe the habitats where these turtles were found, and provide conservation recommendations.

Our observations were made during population studies (2007–2010) of *K. hirtipes* at a wetland located on private and public lands in the Alamito Creek drainage, southeast of Marfa, Texas. The wetland consists of four small spring- and rain-fed earthen ponds (combined surface area = 7812 $m^2$) with maximum water depth of about 1.5 m, depending on recent precipitation. The ponds contain scattered emergent vegetation (*Typha* and *Scirpus*) and in places, thick mats of filamentous algae and *Chara*. Our study site and environmental characteristics of the surrounding area are described in greater detail elsewhere (Wilde and Platt 2011. J. Big Bend Stud. 23:85–106; Platt et al. 2016a. Herpetol. Conserv. Biol. 11:142–149). We sampled turtles using a variety of methodologies including wire-mesh funnel traps, collapsible crab traps, hoop nets, and seining (Platt et al. 2016b. Acta Herpetol. 11:221–225), and measured carapace length (CL; midline CL of Iverson and Lewis 2018. Herpetol. Rev. 49:453-460) with dial calipers (Platt et al., *op. cit.*).

We captured six small juvenile *K. hirtipes* during our study, all of which were associated with extensive mats of dense filamentous algae and *Chara*. On 7 September 2007, four juvenile *K. hirtipes* (CL = 42–54 mm) were captured by pulling a seine (5 m long × 1.2 m high; mesh = 1.0 cm) through a thick algal mat. Feces recovered from two of these turtles contained small pieces of vegetation and finely macerated insect remains. The following year (15 July 2008), a slightly larger juvenile (CL = 58 mm) was captured when we seined the same algal mat. And lastly, on 11 September 2011, we captured another juvenile (CL = 52 mm) as it walked along the shoreline moments after emerging from an algal mat. Taken together, these were the smallest of 97 *K. hirtipes* (CL to 178 mm) captured during our study. Growth models of *K. hirtipes* in Mexico (Iverson et al. 1991. J. Herpetol. 25:64–72) indicate these small juveniles were 1–2 years old. Larger juveniles (CL = 63–90 mm; N = 27) were captured in wire funnel traps, collapsible crab traps, and hoop nets deployed in open water, cattail beds, and among submerged woody debris during our study.

Collectively, our captures suggest that algal mats serve as important nursery habitats for small juvenile (and probably hatchling) *K. hirtipes*. Algal mats are rich in invertebrate prey that comprise much of the diet of smaller *K. hirtipes* (Platt et al. 2016b, *op. cit.*), and dense filamentous algae provides escape cover for juveniles (Pitt and Nickerson 2012. Copeia 2012:367–374). The use of algal mats could also reflect thermal preferences of small turtles (Congdon et al. 1992. Can. Field-Nat. 106:241–248). Similar to our observations, Pitt and Nickerson (*op. cit.*) found three species of juvenile turtles (*Graptemys geographica*, *Trachemys scripta elegans*, and *Chelydra serpentina*) inhabiting algal mats in a riverine system and speculate that in addition to food and cover, inhabiting algal mats is a way for juvenile turtles to partition aquatic habitats, thereby avoiding intraspecific competition with larger conspecifics.

Our results also suggest that trapping may be an ineffective method for sampling the smallest size-classes of *K. hirtipes*. Despite the small mesh size (12.5 mm) that precluded escape from our traps and nets, all of the small juvenile turtles we captured were taken by seining. Our lack of trapping success may have been due in part to food preferences, as the canned sardines and fresh fish used as bait might not be attractive to small juvenile *K. hirtipes* (e.g., Melancon et al. 2011. Southeast. Nat. 10:399–408), which subsist largely on invertebrates (Platt et al. 2016a, *op. cit.*). Moreover, traps proved difficult to effectively deploy among thick algae. The paucity of juveniles in population studies of freshwater turtles is frequently attributed to trap bias (Ream and Ream 1966. Am. Midl. Nat. 75:325–338; Wilbur and Morin 1988. *In* Gans et al. [eds.], Biology of the Reptilia: Defense and Life History. Vol. 16, pp. 387–439. Alan R. Liss, Inc., New York).

Given the apparent importance of algal mats to the smallest size-classes, we recommend that specific steps be taken to protect this habitat in wetlands harboring populations of *K. hirtipes*. Specifically, fencing should be used to prevent livestock from entering wetlands—or at least that part of a wetland where algal mats are present—and breaking up algal mats. Additionally, proposals to restore or create artificial wetlands suitable for *K. hirtipes* should include provisions for establishing algal mats (perhaps by transplanting from ponds without turtles) adjacent to predator-proof nesting mounds (Buhlmann and Osborn 2011. Northeast. Nat. 18:315–334; Platt et al. 2019. West. North Amer. Nat., *in press*) to serve as easily accessible nursery habitat for hatchlings. And finally, adequate water levels should be maintained in wetlands throughout the year to prevent mats from desiccating and reduce exposure of turtles to predators (Platt et al. 2018, *op. cit.*).

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***LISSEMYS SCUTATA* (Burmese Flapshell Turtle). NESTING BEHAVIOR.** *Lissemys scutata* is endemic to the Ayeyarwady (formerly Irrawaddy), Sittaung (formerly Sittang) and Thanlwin (formerly Salween) basins of Myanmar (Rhodin et al. 2017. Chelon. Res. Monogr. 7:1–292) where it inhabits natural and anthropogenic wetlands (Platt et al. 2018a. Nat. Hist. Bull. Siam Soc. 63:67–114). Despite being common and widely distributed within Myanmar, the natural history of *L. scutata* remains largely unstudied (Platt et al. 2018b. Hamadryad 38:20–24), with information on reproduction being notably sparse. Smith (1931. The Fauna of British India, including Ceylon and Burma. Vol. 1. Loricata and Testudines. Taylor and Francis, London. 185 pp.; as *L. punctata scutata*) states "the female lays her eggs in December, scraping a hole for them in the mud and then covering them up." More recently, Platt et al. (2018a, *op. cit.*) provide additional observations of nests, eggs, and reproductive phenology. Otherwise, almost nothing is known concerning the reproductive biology of *L. scutata*. We here report observations of previously undescribed behaviors associated with nest site selection, nest construction, and egg-laying in *L. scutata*.

Our observations were made at Mahamuni Pagoda in Mandalay, Myanmar on 10 December 2018. There is a large (ca. 48 × 68 m; about 1.5 m deep) pond on the grounds of this Buddhist pagoda where visitors release turtles and fish in hopes of earning karmic merit. Merit release of captive animals (usually fish, turtles, and birds) is a central tenant of Buddhism. Native turtles released into pagoda ponds are usually of local provenance (Platt et al. 2018a, *op. cit.*). A floating sand-filled platform (4 × 4 m; sand depth ca. 45 cm) provides a substrate for basking and nesting by turtles in the pond. In addition to *L. scutata*, the pond also contains *Trachemys script elegans*, several very large *Nilssonia formosa*, abundant fish, and ornamental waterfowl.

We approached the pond at 1558 h (Myanmar Time = GMT + 6.5 hours) and noted two female *L. scutata* (estimated carapace length [CL] of 200-250 mm) excavating nests on the floating platform. Shortly thereafter (1610 h), one female abandoned her attempt after continued disruption by ornamental waterfowl resting on the platform. Nest construction by the other female was well-advanced at this point (ca. 50% of final hole depth) and continued as we watched (Fig. 1A). The female stood with all four legs firmly planted on the substrate; the plastron was either elevated above or at times, resting on the substrate, especially as hole depth increased. To excavate the nest, one rear leg was thrust into the cavity, rotated several times, and then withdrawn. Sand scooped up with the rear foot was deposited to one side of the excavation, the leg was then extended into a near-horizontal position, briefly but forcibly shaken to dislodge adhering sand, and planted on the substrate beside the hole. This sequence was then repeated using the opposite rear leg. As the excavation progressed, a shallow depression formed beneath each rear foot and a low, crescent-shaped mound rose behind the deepening cavity. After reaching what appeared to be maximum hole depth (ca. 10 cm) between 1700–1720 h, the female continued to use her rear legs to enlarge and sculpt the interior of the nest.

At 1737 h (dusk) the female abruptly ceased digging, raised her body on both rear legs, and stood poised over the edge of the nest hole, with tail pointing downward. The first egg was deposited at 1738 h, followed by six more laid at intervals ranging from 36 to 67 seconds (mean interval = 50 seconds). At 1745 h the female began alternately using both rear feet to rearrange the topmost eggs. About five minutes later, she started scraping sand over the eggs with both rear feet. During this process, the

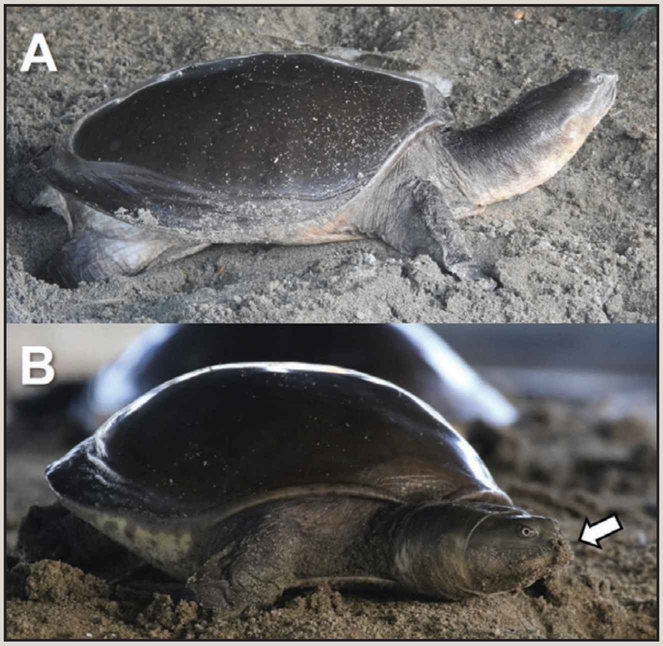


Fig. 1. A) Female *Lissemys scutata* excavating a nest on a sand-filled platform at a pagoda pond in Mandalay, Myanmar. At this point, the excavation is nearing maximum depth. B) Another female *L. scutata* searching for a nest site on the floating platform. This female used her nose to occasionally probe substrate, hence the adhering sand (white arrow).

female would cease scraping sand over the clutch whenever one of her feet came in contact with an egg, and then spend several minutes repositioning the egg before resuming entombment. This behavioral sequence was repeated multiple times during the next 35 minutes and appeared to be triggered by tactile contact with an egg. At 1810 h the female briefly suspended activity, moved to a different position along the rim of the hole, and then resumed covering the clutch. Five minutes later (1815 h), the female abruptly ceased efforts to bury the eggs, moved away from the nest, and then entered the water. Two eggs remained partially exposed when she departed the nest.

To briefly summarize, 136 minutes elapsed between our arrival (1558 h) and completion of nesting (1815 h). Nest construction required 99 minutes, but because the hole was partially excavated when we arrived, the time devoted to this activity was undoubtedly longer, perhaps considerably so. Importantly, the time required for nest construction is also probably dependent on substrate; i.e., nests excavated in harder substrates (e.g., loam and clay) likely take longer to excavate than those in sand. Egg-laying was completed in seven minutes, and the female required 30 minutes to bury the clutch.

In addition to the nesting female, we observed another female *L. scutata* (CL ca. 200 mm) searching for a nest site (Fig. 1B). This female emerged from the water at 1635 h and began moving around the platform. During these ambulations, she would occasionally pause for a few moments, horizontally extend her neck and head, slowly lay the gular region on the substrate, and hold this position for < 60 seconds before moving on. In several instances she used her nose to carefully probe the substrate. At 1636 h the female began excavating a hole, and then quickly abandoned this effort and resumed ambulating around the platform, repeating the behaviors described above. Nest construction began at a second microsite (1642 h) that was only partially visible from our vantage point. We terminated observations as the ambient light began to fail with the approach of dusk.

In conclusion, our observations of nesting by *L. scutata* coincide with the December nesting season given by Smith (*op. cit.*). Similarly, local villagers stated that nests examined by Platt et al. (2018a, *op. cit.*) in January 2017 were constructed in mid-December 2016. December falls in the early to middle part of the annual dry season which extends from late September into late May or early June (Platt et al. 2017. Herpetol. Rev. 48:570–575). Hatchlings are said by local informants to emerge in June, although this remains to be empirically verified (Platt et al. 2018a, *op. cit.*). The clutch of seven eggs deposited by the female we observed in the pagoda pond is within the range of 7–9 eggs reported for *L. scutata* by local informants (Platt et al. 2018a, *op. cit.*).

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***MORENIA PETERSI* (Indian Eyed Turtle). LIFE HISTORY AND DISTRIBUTION.** *Morenia petersi* is an elusive freshwater turtle with a restricted distribution in India. It is known to occur in the tributaries of Ganga and Brahmaputra rivers. Ecology of this rarely encountered species is poorly known, but they have been observed in lentic habitats, such as oxbow lakes, ponds, and rivers. In the *Terai* (marshy jungles and floodplains at the lower foothills of the Himalayas) in India, two individuals of *M. petersi* were captured from the River Sarju in Paska village in the Gonda District of Uttar Pradesh in India (the precise location is not provided as turtles face serious threat of poaching, and *Morenia petersi* is a rare and much sought-after species). The River Sarju is a minor tributary of the River Ganga, and has diverse habitats such as swamps, marshes, and relatively clean slow-flowing river stretches. This constitutes suitable habitat for the species (Singh et al. 2009. *In* Vasudevan [ed.], Freshwater Turtles and Tortoises of India. ENVIS Bulletin: Wildlife and Protected Areas, Vol. 12[1], Wildlife Institute of India, Dehradun, India). With only a handful of sightings of this species in the wild, any new report adds to the knowledge about its distribution and ecology.

As part of a field study, turtles were caught in hoop traps consisting of four metal rings of 60 cm diameter with a 10 cm opening and a round mesh size of 2.5 cm. They were placed near the riverbank edges at depths of 1.5–2.0 m near submerged vegetation, and the traps were baited with tinned sardines. Our trapping method was not targeted at *M. petersi*. Morphometric measurements were made using digital vernier calipers to the nearest .01 cm and weight was measured using a spring balance to the nearest 1 g. The air and water temperature were measured using a digital thermo-hygrometer. The first capture on 30 December 2015 at 1500 h was an adult male (SCL = 16.0 cm; Tail length = 1.17 cm; 400 g) (Fig. 1) which had an insect egg mass on the edge of the plastron (Fig. 2), and the second capture on 5 January 2016 at 1430 h was a sub-adult male (SCL = 11.6 cm; tail length = 0.6 cm; 200 g). Both turtles were scute-notched for individual identification and released at the capture location (Fig. 3). The air and water temperature during captures was 19–20°C and 17.4°C, respectively. The bait was eaten in the hoop traps on both capture days, indicating an opportunistic omnivorous diet for this species. *Morenia petersi* was thought to be exclusively herbivorous, with jaws specialized for folivory (Das and Sengupta 2010. *In* Rhodin et al. [eds.], Conservation Biology of Freshwater Turtles and Tortoises. Chelonian Research Monographs No. 5, pp. 045.1–045.5). Our observations of the two individuals of *M. petersi* coincides with the breeding season of the species, reported to span from late December to late January (Das 1995. Turtle and Tortoises of India. Oxford University

Fig. 1. Adult male *Morenia petersi* captured from Sarju River, Uttar Pradesh, on 30 December 2015, with typical pale green circles present on the costals.

Fig. 2. Bright yellow plastron of *Morenia petersi* with insect egg mass seen attached to edges.

Fig. 3. Sub-adult male *Morenia petersi* released near river bank edge after marking and measurements.

Press, Bombay. 179 pp.). No other freshwater turtle species were encountered during this period. Six other freshwater turtle species, Spotted Pond Turtle (*Geoclemys hamiltonii*), Indian Roofed Turtle (*Pangshura tecta*), Indian Tent Turtle (*Pangshura tentoria*), Crowned River Turtle (*Hardella thurjii*), Indian Flapshell Turtle (*Lissemys punctata*), and Peacock Softshell Turtle (*Nilssonia hurum*) were captured in hoop traps and gill nets from the same locality from late January to April.

*Morenia petersi* is currently listed as Vulnerable on the IUCN Red List (www.iucnredlist.org; accessed 7 October 2018). It occurs inside, or in proximity to, protected areas, restricted to pockets in Dudhwa National Park (Javed and Hanfee 1995. Hamadryad 20:21–26), Pobitora Wildlife Sanctuary, Kaziranga National Park, Deepor Beel Ramsar Site (Baruah and Sharma 2010. ReptileRap 9:6–7), Sundarbans Tiger Reserve (Bhupathy et al. 1994. J. Bombay Nat. Hist. Soc. 91:149–150), and Haridwar near Rajaji National Park in Uttarakhand (Bahuguna 2010. Herpetol. Rev. 41:242). Broadly, the geographic range of the species is restricted to the *Terai* region. The present record represents a new locality in the *Terai* at River Sarju in Gonda district, which is outside protected areas, and the closest previous record is ca. 210 km (straightline) from Dudhwa National Park. These isolated populations could indicate extirpation of the species throughout much of its former range, presumably due to loss of habitat, pollution, and hunting. Ecological and population genetic studies are needed to assess the species' current population status. We thank Abhijit Das for confirmation of species identification.

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***PSEUDEMYS TEXANA* (Texas River Cooter). MAXIMUM SIZE.** On 23 June 2012, an adult female *Pseudemys texana* was captured at Comal Springs, Comal County, New Braunfels, Texas, USA, as part of a long-term mark and recapture study. This turtle had a maximum carapace length of 34.3 cm. This specimen, hard mark # 159 (Passive Integrated Transponder # 8446) exceeds the maximum published carapace length of 33 cm reported by Ernst and Lovich (2009. Turtles of the United States and Canada, 2nd edition. John Hopkins University Press, Baltimore, Maryland. 827 pp.), eclipsing the record by 13 mm. This turtle has been recaptured five additional times and has not grown in the six years of population monitoring. In addition, two additional large female *P. texana* from our study population exceed the known record of 33 cm by 5 mm and 7 mm, respectively, with an additional dozen animals within 2–3 mm of the that 33-cm mark. In conjunction with the overall species size record, Ernst and Lovich (*op. cit.*) reported that the largest male for the species had a carapace length of 25.3 cm. The largest male in our study has a maximum CL of 28.0 cm. An additional 19 males captured during our six-year study have maximum CLs of over 25.3 cm. We hypothesize that the study site, a freshwater spring that has very little water temperature fluctuation, has resulted in these turtles having an almost year-long growing season. Comal Springs has a yearly water temperature range of 22–23°C. These warm, constant temperatures provide ideal growing conditions for aquatic turtles, and a long growing season for plants and algae, as well as a long active period for other fauna, thus providing the potential for year-round food availability (Munscher et al. 2015. Herpetol. Notes. 8:133–140; Walde et al. 2016. Southeast. Nat. 15:N16–N22).

The previous size record for the species (Ernst and Lovich, *op. cit.*) was measured using "straight-line" carapace measurement, while our study uses "maximum carapace" length. Although the two measurements can differ (see Iverson and Lewis 2018. Herpetol. Rev. 49:453–460) we note that within our population (> 1100 individuals) this difference ranges between 4–7 mm. Thus if we were to deduct the maximum difference of 7 mm from our maximum measurement of 34.3 mm this turtle would still be considered a new size record for the species.

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***TERRAPENE ORNATA* (Ornate Box Turtle). DIET.** Ornate Box Turtles are generally considered to be largely carnivorous, although various plant materials are consumed (Ernst and Lovich 2009. Turtles of the United States and Canada. 2nd Edition. John Hopkins University Press, Baltimore, Maryland. 827 pp.). Invertebrates, especially insects, can make up a majority of prey, including grasshoppers, crickets, beetles, caterpillars, cicadas, and other true bugs (Legler 1960. Univ. Kansas Publ. Mus. Nat. Hist. 11:527–669; Ernst and Lovich, *op. cit.*). Families of beetles known to be consumed by *T. ornata* include Cantharidae, Carabidae, Cerambycidae, Chrysomelidae, Curculionidae, Lampyridae, Phengodidae, and Scarabaeidae (Legler, *op. cit.*; Ernst and Lovich, *op. cit.*).

On 3 August 2018, we observed and photographed a female *T. ornata* feeding on an adult Hairy Rove Beetle (*Creophilus maxillosus*; Family Staphylinidae) adjacent to a pitfall trap (5-gal bucket) baited with a decomposing rat to survey carrion beetles in the Sandhill Region of Nebraska (Gracie Creek Ave., 3.5 km E of U.S. Highway 183, Loup County; 42.06501°N, 99.46031°W; WGS 84). We also observed pieces of two diurnal burying beetles (*Nicrophorus carolinus*; Family Silphidae) associated with this individual. This feeding behavior appeared opportunistic in nature, with the turtle consuming carrion-feeding insects attracted to the baited pitfall trap. On the same day, a second *T. ornata* also was observed wedged underneath the wooden cover of another pitfall trap, 1.6 km east of the first observation (42.06578°N, 99.44150°W; WGS 84); this turtle may also have been attracted to potential insect prey, but this could not be confirmed.

Our observations represent the first documentation of the families Staphylinidae and Silphidae in the diet of *T. ornata*, with the turtle apparently being attracted to the insect activity at baited traps for carrion beetles. Beetles in the family Silphidae have been reported to be consumed by a number of lizard species, but not yet to our knowledge documented in the diet of any species of turtle (Young 2014. Coleopterists Bull. 68:221–234). Other vertebrates, including Northern Leopard Frogs (*Rana pipiens*) and Virginia Opossums (*Didelphis virginiana*), have been documented consuming carrion beetles, including the endangered American Burying Beetle (*Nicrophorus americanus*), at bait stations for *N. americanus* (Jurzenski and Hoback 2011. Coleopterists Bull. 65:88–90). *Nicrophorus americanus* is nocturnally active (Bedick et al. 1999. J. Insect Conserv. 3:171–181). In general, *T. ornata* is diurnal, though females can be nocturnal when nesting (Ernst and Lovich, *op. cit.*; Tucker et al. 2014. Am. Midl. Nat.171:78–89; Tucker et al. 2015. Copeia 103:502–511). We have only observed *T. ornata* at a few (<1%) of hundreds of pitfall traps set to document burying beetles in the Sandhill Region of Nebraska. The nocturnal activity of *N. americanus* and diurnal foraging by *T. ornata* suggests that diurnal necrophagous insects may be likely prey, especially at vertebrate carrion, but nocturnal burying beetles, including *N. americanus*, are less likely to be eaten by these turtles.

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***TERRAPENE YUCATANA* (Yucatan Box Turtle). COURTSHIP AND MATING BEHAVIOR.** *Terrapene yucatana* is a medium-sized box turtle that lives in the tropical dry forests of the Yucatan Peninsula in Mexico. There is apparently no published information on courtship or mating behavior of *T. yucatana* in the wild or in captivity, but it is assumed that these behaviors take place during the four to five-month wet season between July and November (Legler and Vogt 2013. The Turtles of Mexico. University of California Press, Berkeley, California. 326 pp.). In this note we provide the first observations of *T. yucatana* courtship behavior and mating in the wild.

During the 2018 wet season we observed courtship and mating behavior on four separate occasions near Xul, Yucatan, Mexico at a field station that is owned and operated by Kaxil Kiuic: The Millsaps Biocultural Reserve (20.08750°N, 89.55611°W; WGS 84). These observations took place at the start of a mark-recapture and radio telemetry study. Therefore, individuals mentioned here were marked with notches after the initial capture and two were equipped with radio transmitters when these observations occurred (females #2 and #9). The first observation occurred on 10 September 2018 at 0941 h when we observed male #7 and female #6 copulating (Fig. 1A), then on

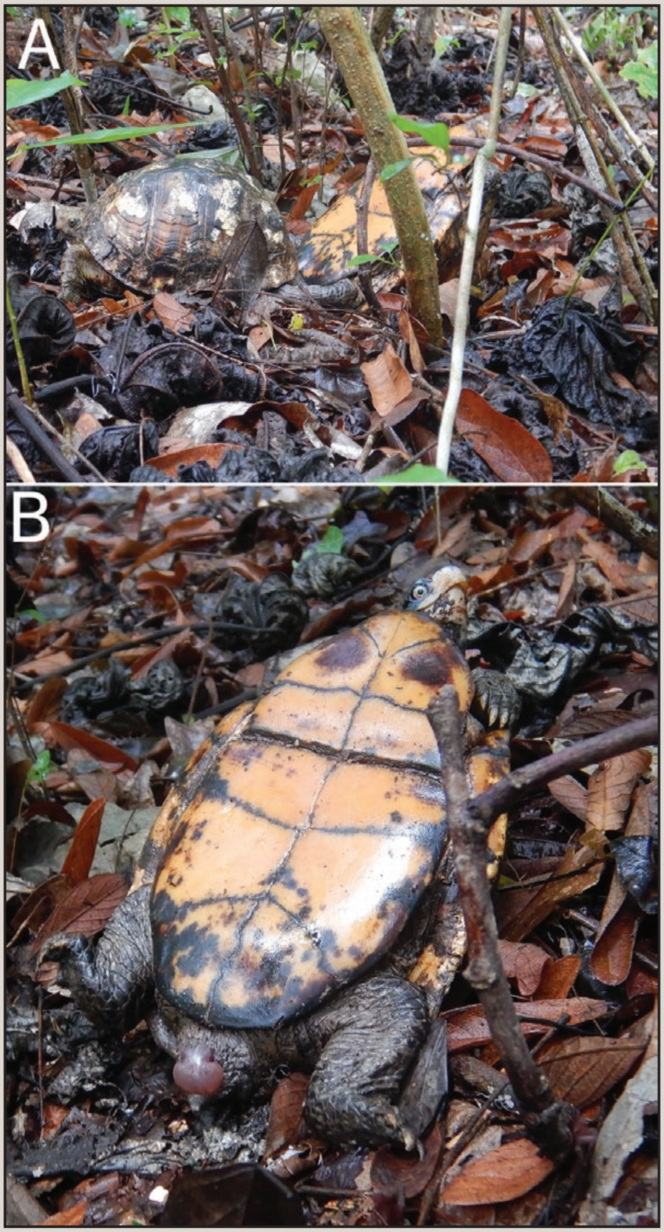


Fig. 1. A) Male #7 and female #6 *T. yucatana* copulating at 0941 h on 10 September 2018. B) The female walked away after the observer approached, and the male remained on his back with his penis exposed until being captured for measurements.

13 September 2018 at 1549 h we observed male #17 and female #2 together but not copulating. On 22 October 2018 at 0959 h we observed male #17 mounting female #9 but not copulating, and on 12 November 2018 at 0741 h we observed male #17 and female #9 copulating. All of these observations occurred within 0.5 ha area of primary forest. The minimum distance between two observations was 5 m (13 September and 12 November) and the maximum distance was 126 m (10 September and 13 September). All three observations of male #17 occurred at the base of a hill within 65 meters of each other.

Courtship and mating behavior have been described in detail for *Terrapene carolina carolina* (Evans 1953. Herpetologica 9:189–192). Evans proposed that there are three sequences of courtship behavior in *T. c. carolina*. In the first phase, the male approaches within about 10cm of the female, both investigate each other, the male begins circling, then the circling behavior can lead to the male biting, pushing, or dragging the female until she decides to mate or walk away. If the female decides to mate, the male mounts the female in the second phase and attempts to copulate. If the female is perceptive and relaxes her plastron for the male, then third phase begins when the male falls backward and inserts his penis. During the third phase the male appears to be laying on his carapace (Fig. 1A), which can last up to three hours.

Our observations in *T. yucatana* seem to coincide with each of the three phases described by Evans (*op. cit.*). Our second observation on 13 September 2018 may represent the first phase, in which the male initially approaches the female and no copulation occurs. It appears that we observed the second phase on 22 October 2018 when male #17 was mounting female #9 in the upright position with his rear claws inserted into the female's plastron and could not confirm if the male's penis was inserted. The third phase was observed on 10 September 2018 (Fig. 1A) and 12 November 2018 in which both males were completely on their backs, rear claws in the female's plastron, and insertion of the penis was confirmed (Fig. 1B).

These observations support the suggestion that courtship and mating behavior of *T. yucatana* occurs during the wet season from July to November and that it is similar to that of *T. c. carolina* (Legler and Vogt, *op. cit.*; Evans, *op. cit.*). This note represents the first published account of breeding behavior in *T. yucatana* and we stress the importance of future research for this poorly known species.

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## CROCODYLIA — CROCODILIANS

***ALLIGATOR MISSISSIPPIENSIS* (American Alligator). DIET.** American Alligators are opportunistic feeders, eating a variety of prey items of all classes of animals. In eastern Texas, a recent study indicates a large majority of their diet consists of invertebrates regardless of alligator size (Saalfeld et al. 2011. Southeast. Nat. 10:659–672). Herein we report an observation of a juvenile American Alligator predating the eggs of a Red-eared Slider (*Trachemys scripta elegans*) as they were being laid.

Fig. 1. Juvenile *Alligator mississippiensis* eating the eggs of *Trachemys scripta elegans* as they are laid.

On the morning of 24 April 2018 between 0900 and 1000 h, KA was hiking the Creekfield Lake Trail at Brazos Bend State Park, Fort Bend County, Texas, USA (29.37526°N, 95.59506°W, WGS 84; 0 m elev.) along the edge of the ca. 1.4-ha lake. She happened upon a young alligator, ca. 60 cm total length, positioned ca. 0.5 m behind the female turtle, ca. 30 cm carapace length. When the turtle began laying her eggs in a freshly excavated nest, the alligator approached and started devouring the eggs. KA took video recordings and still photographs documenting the alligator eating the turtle's eggs as they exited her cloaca (Fig. 1). Ultimately the alligator was observed consuming at least 4–5 eggs in this manner before moving away. It is unclear whether the turtle continued laying eggs after the incident, since KA continued hiking after the alligator departed.

To our knowledge this is the first documented occurrence of an American Alligator predating the eggs of any turtle species as they were being laid. We thank Travis LaDuc for reviewing this note.

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***CAIMAN YACARE* (Yacare Caiman, Jacaré do Pantanal). TADPOLES IN DIET.** *Caiman yacare* is a large predator distributed in Bolivia, Paraguay, Argentina, and Brazil (Uetz et al. 2018. The Reptile Database; http://www.reptile-database.org, accessed 15 September 2018). It is an opportunistic predator, eating what is most abundant in its environment (Santos et al. 1996. Herpetol. J. 6:111–117). The diet of adults is dominated by fish, but also includes mammals, birds, and amphibians in minor proportions, while juveniles tend to consume more insects and smaller prey than adults (Santos et al., *op. cit.*). Here, I report an unusual event where a juvenile of *C. yacare* predated tadpoles of *Leptodactylus podicipinus*.

This observation occurred at Base de Estudos do Pantanal, Universidade Federal de Mato Grosso do Sul (19.5761°S, 57.0266°W; WGS 84), in the municipality of Corumbá, state of Mato Grosso do Sul, Brazil. During a field trip to record parental care of *Leptodactylus podicipinus*, I observed a juvenile *C. yacare* (SVL ca. 47 cm) feeding on a school of tadpoles at the edge of a temporary pond. After several minutes the mass of tadpoles separated and the caiman moved out to deeper waters. Later, when the predator left the area, the attending female *L. podicipinus* returned, and after a couple of minutes the tadpoles started to aggregate, although the size of the school was considerably smaller.

Female *L. podicipinus* guard the nest and tadpoles until completion of metamorphosis (Martins 2001. J. Herpetol. 34:135–139). Nest guarding may include aggressive behaviors toward predators (Prado et al. 2002. Copeia 2002:1128–1133). Although this type of parental care can be effective against bird or fish predators (Vaz-Ferreira and Gehrau 1974. Rev. Biol. Uru. 2:59–62), it will not deter predation by a caiman.

Ontogenetic changes in crocodilian diets are known for several species, including *C. yacare* (Santos et al., *op. cit.*; Platt et al. 2013. J. Herpetol. 47:1–10). Adult crocodilian predation of post-metamorphic anurans is well documented, although this is considered a minor component of their diets (e.g., Tucker et al. 1996. Copeia 1996:978–988). On the other hand, juvenile crocodiles preying on tadpoles is not well documented, as only one report of *C. yacare* preying on tadpoles of *Pseudis paradoxa* in temporary ponds is available (Santos et al., *op. cit.*). Notably, *P.*

*paradoxa* tadpole do not form aggregations and are larger than the adult frogs (Emerson 1988. Biol. J. Linn. Soc. 34:93–104).

The importance of anurans in crocodilian diets is likely underestimated due to the comparatively rapid digestion (Platt et al. 2006. Herpetol. J. 16:281–290). Juvenile *C. yacare* and other crocodilians should be considered as potential predators for free-swimming tadpoles with schooling behavior. I thank Diego J. Santana for suggestions on the manuscript.

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***CROCODYLUS ACUTUS* (American Crocodile). ECTOPARASITES.** In southern Florida, *Crocodylus acutus* occurs in coastal habitats that support high abundances of mosquitoes. Females of most mosquito species require a blood meal, taken from a vertebrate host, to produce eggs. Mosquitoes take blood meals from mammals, birds, amphibians, reptiles, and fishes. Crocodilians are known hosts for female mosquitoes. In the southeastern USA, DNA of *Alligator mississippiensis* (American alligator) has been recovered from the blood meals of mosquito species in the genera *Aedes*, *Coquillettidia*, *Culex*, and *Mansonia* (Rodrigues and Maruniak 2006. J. Am. Mosq. Control Assoc. 22:557–560; Unlu et al. 2010. J. Med. Entomol. 47: 625–633). Here, we document the first known interactions between *Crocodylus acutus* and *Aedes taeniorhynchus* (Black Saltmarsh Mosquito).

We made observations on two adult *C. acutus* along Main Park Road in Everglades National Park, Florida, USA. The first observation (UF-Herpetology 179706) occurred at 0050 h on 15 April 2017 at the Noble Hammock canoe launch, Miami-Dade County (25.235°N, 80.819°W, WGS 84; elev. < 1 m). The second observation (UF-Herpetology 179707) occurred at 0010 h on 18 April 2017 on the road shoulder 0.12 km northeast of the Buttonwood Canal, Monroe County (25.1502°N, 80.921°W, elev. < 1 m). Both *C. acutus* were motionless and photographed using a 400 mm telephoto lens. Numerous mosquitoes were visible on and around each crocodile. Mosquitoes were observed feeding between scutes and from the eyes, mouth and ears of the crocodiles (Fig. 1). The pavement surrounding the crocodiles was littered with live blood-engorged mosquitoes that, presumably, had fed on the crocodiles to repletion (Fig. 2). Dead, crushed mosquitoes were visible under the eyes and on the mandibles of the Buttonwood Canal individual. Mosquitoes were identified as *Aedes taeniorhynchus* based on morphological characters that could be seen in photographs. None of the photographed mosquitoes appeared to be any species other than *Ae. taeniorhynchus.*

Mosquito species vary in their host use patterns and the use of crocodilian hosts has not been previously documented for *Ae. taeniorhynchus*. Few mosquito species are generalists and most specialize on endo- or ectothermic hosts, or only certain vertebrate classes. Although *Ae. taeniorhynchus* is known to feed on large reptiles on the Galapagos Islands (Bataille et al. 2012. Infect. Genet. Evol. 12:1831–1841), in the Everglades and other continental locations, the species feeds predominantly on mammals, and to a lesser extent, birds (O'Meara and Edman 1975. Biol. Bull. 149:384–396). Given the high abundance of both *Ae. taeniorhynchus* and crocodilians in the Everglades, it is surprising that such congregations of host-seeking, feeding, and engorged mosquitoes have not previously been documented on crocodiles or alligators in southern Florida. It is possible that the two crocodiles we encountered were searching for an oviposition site. A crocodile nest was observed at the Noble Hammock canoe launch on 18 April 2017, subsequent to our observations of the adult crocodile at the same location. When moving over land, or while depositing eggs in a nest, crocodilians are exposed to mosquitoes. *Aedes taeniorhynchus* feed primarily at night, which may explain why similar congregations of *Ae. taeniorhynchus* have not been observed on crocodilians that leave the water to bask in the sun. At night, *Ae. taeniorhynchus* may accumulate at a crocodile during the time it takes for a female crocodile to locate a suitable nesting site and oviposit.

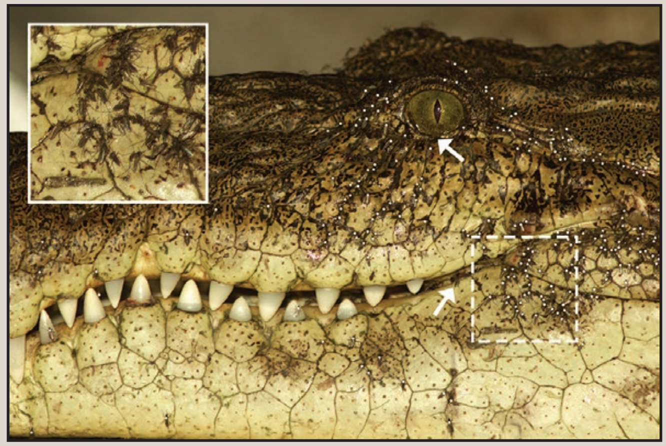

Fig. 1. *Aedes taeniorhynchus* mosquitoes feeding from the head of *Crocodylus acutus* (American Crocodile) on 18 April 2017 in Everglades National Park, Monroe Co., Florida, USA. White dots indicate the positions of at least 206 individual mosquitoes in the foreground, but note many others out of focus in the background. White arrows point to mosquitoes crushed by the eyelids or between the jaws of the crocodile. The area inside the hashed-line box is magnified in the top-left inset to show feeding mosquitoes.

Fig. 2. Engorged *Aedes taeniorhynchus* mosquitoes underneath the head of an adult *Crocodylus acutus* observed on 15 April 2017 in Everglades National Park, Miami-Dade Co., Florida USA. Feeding *Ae. taeniorhynchus* are visible on the teeth and lower mandible of the crocodile.

Representative photographs were deposited in the digital archives of the Division of Herpetology, Florida Museum of Natural History, University of Florida.

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## SQUAMATA — LIZARDS

***AGAMA PICTICAUDA*** **(Peters's Rock Agama). REPRODUCTION**. *Agama picticauda* is native to western Africa, but has become established in Florida (Nuñez et al. 2016. Bull. Florida Mus. Nat. Hist. 54:138–146). At 1050 h on 13 July 2018, we collected an adult female *Agama picticauda* (SVL = 119 mm, 55 g) in a parking lot in Port Charlotte, Florida, USA (26.96405°N, 82.07310°W; WGS 84). Upon necropsy we found a mass of ectopic eggs in the lizard's coelom. The largest of the four ectopic eggs was 18 × 14 mm. Both ovaries and oviducts were intact, with seven total shelled oviductal eggs (17 × 11 mm) and intact follicles. The *A. picticauda* and egg mass were accessioned into the Florida Museum of Natural History (FLMNH UF 185457). Despite previous documentation of retained eggs in chelonians, particularly in captive individuals (Mans and Foster 2014. Can. Vet. J. 55:569–572), this is the first reported evidence of a lizard with ectopic eggs.

Fig. 1. Ectopic egg mass found in adult female *Agama picticauda* with intact oviducts from Port Charlotte, Florida (FLMNH UF 185457).

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***AGAMA PICTICAUDA*** **(Peters's Rock Agama). CANNIBALISM.** On 13 July 2018, we collected an adult female *Agama picticauda* (SVL = 115 mm; 45 g) with glue traps in a parking lot in Port Charlotte, Florida, USA (26.96363°N, 82.07251°W; WGS 84). The *A. picticauda* population in this location is isolated by major highways and dispersal is likely limited. During dissection, two partially digested neonate *A. picticauda* were removed from the stomach; both were missing limbs and had SVLs between 35 mm and 50 mm. The female *A. picticauda* and stomach contents were accessioned into the Florida Museum of Natural History (FLMNH UF 185470).

*Agama picticauda* is native to western Africa, and was first documented (as *A. agama)* in Charlotte County, Florida, in 2004 (Enge et al. 2004. Florida Sci. 67:303–310; Nuñez et al. 2016.

Fig. 1. Female *Agama picticauda* from Charlotte County, Florida, with stomach contents removed, revealing two partially digested juvenile conspecifics. Specimen is accessioned into the Florida Museum of Natural History (UF 185470).

Bull. Florida Mus. Nat. Hist. 54:138–146). This is the first case of *A. picticauda* consuming young in non-native populations in Florida. Cannibalism in lizards is generally rare, but has been documented in both in the wild and in captivity (Polis and Myers 1985. J. Herpetol. 19:99–107). In wild native lizards, cannibalism has been reported in high-density island populations (Mateo and Pleguezuelos 2015. Zool. Anz. 259:131–134). Cannibalism of juvenile *A. agama* by adult males (the larger sex) occurs in its native range (Cloudsley-Thompson 1981. J. Arid Environ. 4:235–245), though the *Agama* species reported may represent *A. picticauda* based on recent molecular analyses (Leaché et al. 2014. Mol. Phylogenet. Evol. 79:215–230). The female we observed was slightly above average size for female *A. picticauda* previously documented near this area (Enge et al. 2004, *op. cit.*) and in other areas of Florida (Claunch, unpubl. data). This instance of cannibalism in non-native *A. picticauda* may be attributed to female size and concentration of individuals in a generally isolated area.

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***AMEIVA AMEIVA* (Giant Ameiva). PREDATION.** Species of the *Ameiva ameiva* group have one of the widest geographic distributions among Neotropical lizards, occurring in most of South America east of the Andes south to Bolivia, also present in northern Colombia, Panama, extreme southern Costa Rica, Trinidad, Tobago, Isla de Providencia, St. Vincent, Grenada, and The Grenadines (Harvey et al. 2012. Zootaxa 3459:1–156). The species is generally abundant where it occurs and appears to reach high densities in both natural and anthropically altered environments (Silva et al. 2003. Bol. Mus. Bio. Mello Leitão 15:5–15). Snakes (Ávila and Ferreira 2006. Herpetol. Rev. 37: 82–83; Mafei et al. 2009. Herpetol. Notes 2: 235–237; Barão-Nóbrega et al. 2016. Herpetol. Rev. 47: 292), other lizards (Meza et al. 2002. Am. Midl. Nat. 148:146–154; Rodrigues et al. 2015. Rev. Bras. Zoociências 16:123–127), mammals (Yensen and Tarifa 2003. Mamm. Species 727:1–8), and crabs (Da Silva et al. 2016. Herpetol. Rev. 47:292) are described as predators of *A. ameiva*, however, some of these authors (Rodrigues et al. 2015, *op. cit.*) have noted the great difficulty in recording and quantifying these events in nature, since visual records are infrequent. In this note, we report a predation event of *Leopardus pardalis* on *Ameiva ameiva* in the Cerrado (Tropical Savanna ecoregion) of Mato Grosso do Sul, Central-West region of Brazil.

The event was recorded at 1646 h on 18 March 2015 (air temperature = 26°C) on Farm Dona Amélia, Nova Andradina (22.16693°S, 53.46143°W; WGS 84). The image record comes from a project designated to monitoring medium to large mammals. Nine automatic cameras were randomly distributed on the legal reserve area (= 20% of the area in a property—80% in the Amazon—be left in forest or its native vegetation, Brazilian Federal Legislation n. 12.651/2012) of the farm from October 2014 to December 2016, comprising a sampling effort of 26 months (5764 camera days). The cameras were fixed on trees or wooden stakes at a height of 45 cm from the ground and distributed at distances of 600 m from each other; they were employed along natural trails used by mammals and were revisited within a period of 30 days for maintenance (battery replacement and download photos). All cameras were programmed to operate continuously (24 h/day) and to take pictures at intervals of 15 seconds.

Fig. 1. *Leopardus pardalis* preying upon an *Ameiva ameiva.*

This is the first photographic record of *L. pardalis* consuming *A. ameiva* (Fig. 1). The presence of the lizard in the diet of *L. pardalis* was expected. The Giant Ameiva is diurnal (Vitt and Colli 1994. Can. J. Zool. 72:1986–2008) and was probably taken during the day, although it may have been discovered while it was sleeping at night. Although the *L. pardalis* is primarily active around twilight and at night (Murray and Gardner 1997. Mamm. Species 548:1–10), it may also be active during the day (Pérez-Irineo and Santos-Moreno 2014. Rev. Biol. Trop.: 62:1421–1432). This record adds to the known prey items of this opportunistic feeder and confirms its habit of consuming relatively small vertebrate prey. Pedro Barbosa Lopes permitted research to be conducted at Fazenda Dona Amélia.

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***AMEIVULA NIGRIGULA*. PREY.** *Ameivula nigrigula* is a recently described species of the *Ameivula ocellifera* group found in the Caatinga lowlands of Bahia, Brazil (Arias et al. 2011. Zootaxa 3022:1–21). Until now, there has no information about their predators, except for the unique record of cannibalism in a *A. nigrigula* (Travassos et al. 2017. Herpetol. Rev. 48:631). Here, we report not only a new predatory observation for *A. nigrigula*, but also the first case of a spider preying on any species of the *A. ocellifera* group.

FIG. 1. *Ameivula nigrigula* being consumed by *Lasiodora* sp., Bahia, Brazil.

On 30 November 2017, we observed an adult *Lasiodora* sp. preying on a juvenile *A. nigrigula* in a semiarid area of Itaguaçu da Bahia municipality, in the state of Bahia, Brazil (10.95781°S, 42.38490°W; SAD 69). When first observed, the specimen of *A. nigrigula* was approximately 50% digested, initiated by the head (Fig. 1). Our survey was part of the faunistic monitoring program of UFV Assuruá (license INEMA nº 8598).

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***ANDINOSAURA OCULATA* (Tropical Lightbulb Lizard). PREDATION.** Predation of lizards by birds has been well documented and appears to be a common phenomenon in the neotropics (Poulin et al. 2001. J. Trop. Ecol. 17:21–40). It has been suggested that various raptors are significant sources of predation of lizards (e.g., Ferguson-Lees and Christie 2007. Raptors of the World. Hougton Mifflin Company. Boston, Massachusetts.. 320 pp.; Köning and Weick 2008. Owls of the World. Yale University Press, New Haven, Connecticut. 528 pp.). *Andinosaura oculata* is small lizard, 88 mm max SVL (Kizirian 1996. Herpetol. Monogr. 10:85–155) endemic to northwestern Ecuador, and is found mainly in montane cloud forest in the Choco region (Kizirian, *op. cit.*). Its natural history is poorly known and information about predators is unknown.

On 1 July 2016 at 1654 h during fieldwork at Mindo Reserve, province of Pichincha, Ecuador (0.081977°S, 78.764208°W, WGS 84; 1432 m elev.), we found a *Glaucidium jardinii* (Andean Pygmy Owl) perched on a tree 15 m high and holding an adult *Andinosaura oculata* in its talons. *Glaucidium jardinii* typically feeds on other birds (Ridgely and Greenfield 2001. The Birds of Ecuador: Field Guide. Cornell University Press, Ithaca, New York. 740 pp.). This is the first record of predation on *A. oculata* and any other lizard by Andean Pygmy Owl.

We are grateful to Michelle Vela for field assistance and Gabriela Echeverría Vaca for her help with the bird identification.

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FIG. 1. *Andinosaura oculata* being preyed upon by *Glaucidium oculata* in Mindo Reserve, Pichincha, Ecuador.

***ANOLIS AQUATICUS* (= *NOROPS AQUATICUS*) (Water Anole). UNDERWATER BREATHING.** Many lizard species use water to escape from threats. Some lizard species swim, either remaining at the surface or diving. Others may use foot-slapping to run over water, surface tension to stay afloat (Hernández-Vázquez 2018. Herpetol. Rev. 49:535), or a combination of the two (Nirody et al. 2018. Curr. Biol. 28:1–6). *Anolis aquaticus* (= *Norops aquaticus*) is a mid-sized semi-aquatic lizard (SVL = 52–77 mm) found in Costa Rica and Panama (Márquez and Márquez 2009. Boletín Técnico Serie Zoológica 8:50–73). *Anolis aquaticus* uses a combination of surface swimming and diving when threatened, jumping from the banks and boulders of its riparian habitat into streams. Once in the water, *A. aquaticus* may swim for a short distance (up to a few meters), or may be carried farther downstream by the current. Anecdotes and my own observations suggest that diving and remaining underwater in an extended dive is an effective antipredator strategy employed by *A. aquaticus*.

Observations on the diving behavior of *A. aquaticus* were made opportunistically in the field in conjunction with other research on this species during June, July, and August of 2015,

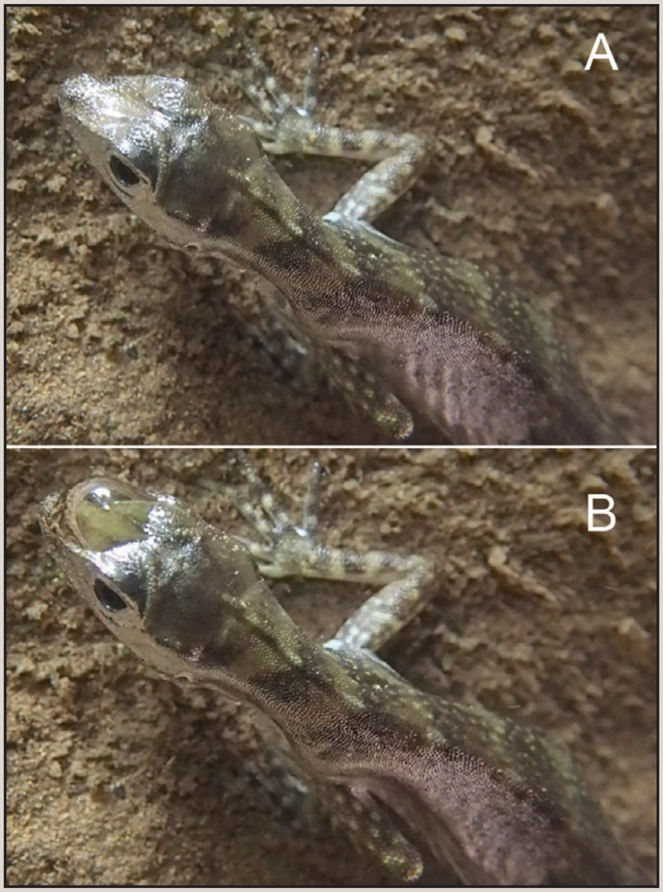


Fig. 1. (A) Inhalation and (B) exhalation of an air bubble by a diving *Anolis aquaticus*.

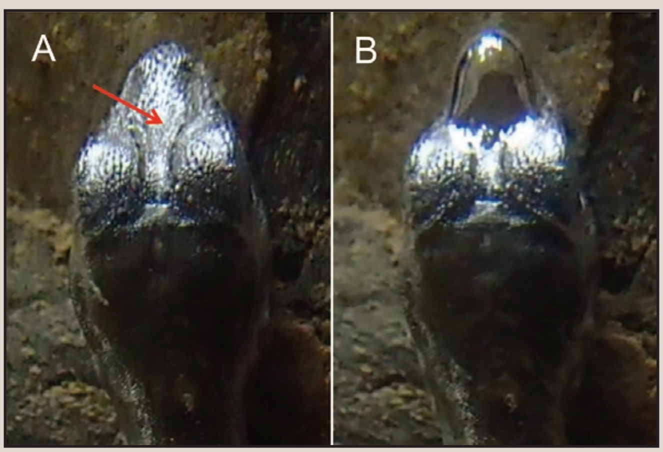


Fig. 2. Dorsal view of an *Anolis aquaticus* head during underwater (A) inhalation, with approximate center of the forthcoming air bubble indicated by the red arrow, and (B) exhalation. Note the edges of the air bubble clinging to the anterior portions of ridges above the eyes.

2016, and 2018 in Coto Brus, Puntarenas, Costa Rica. During this time, I estimate ca. 600 *A. aquaticus* individuals were located and/or processed at three different sites, many of which attempted a water escape upon our field crew's approach. I consequently observed numerous dives with long durations, with the longest recorded dive being ca. 16 min (adult male *A. aquaticus*, July 2015; the subject resurfaced when physically disturbed by the field crew). All diving observations were made in the field following minimal or no handling and manipulation, between 0900 and 1600 h. Once perched underwater, *A. aquaticus* moved infrequently when being observed by our field crew or when filmed, and they tended to select underwater perches that were not in direct line of a strong current.

Fig. 3. An adult *Anolis aquaticus* photographed during a dive with an air bubble exhaled to its greatest extent.

While filming *A. aquaticus* dives, I observed that all subjects appeared to respire while underwater: their midsections expanded (Fig. 1A) and contracted (Fig. 1B), while an air pocket near their nostrils shrunk and grew, respectively. The air pocket's "bubble" was centered within a depression in the snout that was posterior to the nostrils (Fig. 2A), and the bubble's edges clung to ridges along the eyes and either side of the snout (Fig. 2B). The bubble portion of the air pocket was connected continuously to a thin film of air that extended around the anole's head, eyes, and ears and, in some instances, possibly farther down the body. Air bubble size was proportionally large, with the exhaled air bubble being about as tall as the height of the head (Fig. 3). Most air pockets were recycled, being inhaled and exhaled repeatedly, though a few lost contact with the body's surface. Apparent respiration was occasionally accompanied by an adjustment of the head and throat that resembled a "swallowing" motion. For a video of *A. aquaticus* underwater breathing, please visit https://youtu.be/gDwqWAv1RO4.

Though untested, it is possible that *A. aquaticus* use recycled air from the air pockets clinging to their body surfaces to enable them to respire underwater. This method of respiration would be similar to bringing a "scuba tank" for extended dives. As *A. aquaticus* dives might last a considerable length of time, as can the dives of other semi-aquatic anoles such as *A. oxylophus*, the benefit of such an adaptation is clear. However, although I note that a given air pocket is inhaled and exhaled repeatedly, it is unknown whether *A. aquaticus* extracts any useable amount of oxygen by repeatedly recycling this air. An alternative explanation may be that inhalation and exhalation is simply a carried-over reflex from this lizard's terrestrial physiology. That said, a carried-over reflex for underwater inhalation seems intuitively maladaptive for the majority of air-breathing organisms, and therefore I propose the "scuba tank" explanation and encourage further study.

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***ANOLIS INSIGNIS* (Decorated Anole). PREDATION ATTEMPT.** *Anolis insignis* is one of five giant anole species in Costa Rica (Savage 2002. The Amphibians and Reptiles of Costa Rica: A Herpetofauna between Two Continents, between Two Seas. University of Chicago Press, Chicago, Illinois, 954 pp.; Poe and Ryan 2017. Amphib. Rept. Conserv. 11:1–16). It occurs in the Cordillera Central and Cordillera de Tilarán, at elevations of 500–2000 m inside secondary mature forests and primary forest , where it is an uncommonly observed canopy species (Savage 2002, *op. cit.*; Poe and Ryan 2017, *op. cit.*). Here, we report a predation attempt on *A. insignis* by an Azure-hooded Jay *Cyanolyca cucullata* (Corvidae: Aves).

Our observation was made in Las Gemelas waterfalls, Valverde Vega, Alajuela Province, Costa Rica (10.25°N, 84.26°W, WGS 84; 1200 m elev.), on 3 March 2018 at 1053 h. The observation site near the Gata River is a mature secondary premontane rainforest with a high density of ferns, orchids, bromeliads, and mosses. The forest is surrounded by land used for cattle grazing. The observation started when RJ heard an Azure-hooded Jay calling loudly from the lower branches of the canopy. He observed two jays attacking an *A. insignis* on a liana 10 m above the ground (Fig. 1). The anole was perched along the liana facing the jay and with the dewlap displayed. The jays focused their attack at the base of the anole's tail, whereupon the anole turned and attacked the jays with mouth open and dewlap displayed (Fig. 1). The anole also tried to keep the tail turned toward its head or hanging down to avoid attack. After 12 attacks from the jay, the anole dropped to the ground, where it remained static with the mouth open and the dewlap displayed. Meanwhile, one jay pecked 30 times at the right foreleg over a 45-sec interval. Then the jay pecked 19 times at the tail base over a 39-sec interval. Our observations took approximately 15 min, at which time the anole still alive without any visible injuries although one jay continued pecking at the anole's tail base.


Fig. 1. Azure-hooded Jay (*Cyanolyca cucullata*) attacking an *Anolis insignis* at the sub-canopy liana, Alajuela Province, Costa Rica, on 3 March 2018. Yellow arrow indicates position of the head and extended dewlap of the anole. Black arrow is pointing the tail. A) The jay was attacking near the tail, but the anole responded by reorienting to face the jay. B) The anole is moving forward in defensive display. C) The jay again directs its attack toward tail from another position. D) The anole advances toward the jay with open mouth and dewlap displayed. (Photos were obtained from a video made with a cell phone).

The Azure-hooded Jay is a member of the corvid family (dos Anjos 2009. *In* del Hoyo et al. [eds.], Handbook of the Birds of the World. Volume 14. Bush-shrikes to Old World Sparrows, pp. 494–640. Lynx Edicions, Barcelona, Spain), that inhabits cloud forest and forest edges between 800 and 2100 m elev., from eastern Mexico to the Caribbean slope of Panama and occurs locally across Pacific slope of Costa Rica and Panama (Stiles and Skutch 1989. A Guide to the Birds of Costa Rica. Cornell University Press, Ithaca, New York, 632 pp.). Azure-hooded Jays often move in flocks of 3–10 individuals looking for food (invertebrates and small fruits) at all forest levels, from the ground to canopy (Stiles and Skutch 1989, *op. cit.*). This is a first report of attempted predation of *A. insignis*, as well as the first indication that Azure-hooded Jays might include vertebrates in their diet.

We thank Adrian García for identifying the anole, and Victor Acosta for the comments on an early draft of this manuscript. LS thanks Vicerrectorpia de Investigación, Universidad de Costa Rica for support (Colecciones del Museo de Zoología 11-B6-773).

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***ANOLIS SAGREI* (Brown Anole). ENVIRONMENTALLY CUED HATCHING.** Environmentally cued hatching (ECH), in which embryos adjust timing of hatching in response to changing risks, is widespread but uncommon in oviparous animals (Warkentin 2011. Integr. Comp. Biol. 51:14–25). One type of ECH is early hatching, in which embryos hatch early in response to increased predation risk (Warkentin 2011, *op. cit.*). Early hatching has been documented in lizards, including in two species of anoles (Doody et al. 2011. Int. Comp. Biol. 51:49–61). An egg of *Anolis equestris* hatched explosively when handled (Hernandez et al. 2017. Herpetol. Rev. 48:841), and eggs of *A. sagrei* hatched in response to being immersed in water (Losos et al. 2003. Oecologia 137:360–362). However, in the latter case, hatching may have been confounded by handling (in response to vibrations). Herein, we report a case of early hatching in response to handling (a likely predator cue) in *A. sagrei*.

At ~1400 h on 25 August 2017 we found eggs and eggshells of *A. sagrei* in between stacked bricks (log concrete edger®) in a backyard in St. Petersburg, Florida, USA (27.72876°N, 82.63675°W). For details on the nest sites see Doody et al. (2017. Herpetol. Rev. 48:841). We found seven intact eggs and 34 hatched eggshells. Invertebrates near the eggs included pillbugs (Armandillidiidae), slugs (Gastropoda), and ants (Hymenoptera). Eggs were incubated in moist soil under ambient conditions.

Beginning on 26 August, one of us (JSD) handled each egg for five minutes daily, rolling it between the thumb and pointer finger, in an attempt to induce hatching via vibrations. On 28 August, one egg hatched explosively in hand after 15 sec of rolling; the hatchling immediately leaping from the egg across and off the hand and onto the ground. On 15 September, a second egg hatched after rolling it for 45 sec; this hatchling hatched within 4 sec, and began running immediately across the hand. Hatchlings were confirmed as *A. sagrei* (the only other anole species in the area, *A. carolinensis*, is easily distinguishable from *A. sagrei*).

Our crude experiment confirmed explosive hatching in response to handling in *A. sagrei*. It is likely that vibrations were the cue, and that early (induced) hatching in *A. sagrei* embryos is an evolved response to reduce predation risk in the egg (Doody et al. 2011, *op. cit.*). There are now three anole species with confirmed early hatching (*A. carolinensis*, *A. equestris*, and *A. sagrei*). It is possible that early hatching is ubiquitous in anoles; further taxonomic surveys for early hatching are needed. Also, more robust laboratory experiments are needed to determine the window of hatching competency (how early *A. sagrei* and other anole embryos can hatch, compared to spontaneously hatching embryos).

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***ANOLIS SAGREI* (Cuban Brown Anole) and *ANOLIS CAROLINENSIS* (Green Anole). TWINNING.** Twinning in oviparous species is rare (Tucker and Janzen 1997. Copeia 1997:166–173). Little is known about what conditions might produce twins or the downstream fitness consequences. Presumably, twin embryos share egg provisioning and therefore could be at a developmental disadvantage. Here we describe the first documented instances of twin hatchlings in *Anolis* lizards, which generally have single-egg clutches.

In August 2017, we collected 318 *Anolis sagrei* eggs from a captive colony at Auburn University and 12 *A. carolinensis* eggs from New Orleans, Louisiana, USA. *Anolis sagrei* eggs were incubated at a constant temperature of 28°C at varying egg densities as part of a study examining the effects of egg aggregation (1, 4, or 9 eggs per container). *Anolis carolinensis* eggs were incubated individually under fluctuating diel conditions at an average of 27°C. On 5 September and 15 September 2017, we found two hatchlings had emerged from one egg for both *A. carolinensis* and *A. sagrei*, respectively (Fig. 1). The *A. sagrei* twinning event came from an egg in the single egg treatment, so there was no possibility of the second offspring emerging from a different egg.

Twin offspring were substantially smaller than their non-twin counterparts. For *A. sagrei*, the twin lizards were approximately 23% shorter (non-twin SVL: 18.4 ± 0.72 mm; twin SVL: 14.4 and 13.8 mm each) and 49% lighter (non-twin mass: 0.18 ± 0.01 g; twin mass: 0.09 g each) than hatchlings from single-offspring eggs. Similarly, *A. carolinensis* twins were approximately 16% shorter (non-twin SVL: 24.5 ± 0.72 mm; twin SVL: 20 and 21 mm each) and 37% lighter (non-twin mass: 0.31 ± 0.03 g; twin mass: 0.18 and 0.21 g) than non-twin eggs. All values reported are mean ± 1 SD. Both sets of twins were fully developed with no apparent abnormalities.

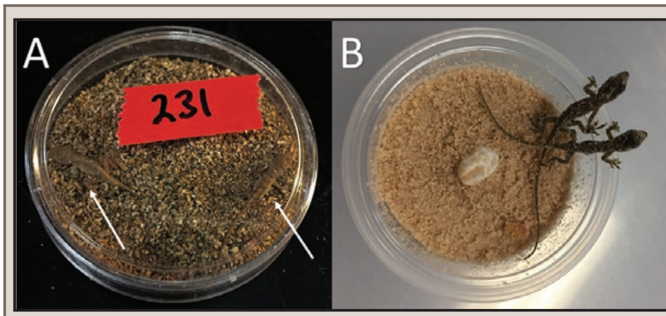

Fig. 1. Twin hatchling (A) *Anolis sagrei* and (B) *A. carolinensis* shortly after emerging from a single egg (center).

The low rate of twinning (0.3% for *A. sagrei*; not reported for *A. carolinensis* due to low egg numbers) should suggest strong selection against these events. Indeed, there can be strong directional selection on offspring size (Cox et al. 2011. Evolution 65:220–230), such that larger offspring are often more successful. Because egg size (and therefore offspring size) is limited by pelvic girdle size (Sinervo and Licht 1991. Science 252:1300–1302), provisioning enough resources into one egg to supply two offspring is unlikely; twin lizards should always be smaller and less likely to survive than their non-twin conspecifics.

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***ANOLIS SAGREI* (Brown Anole). PREDATION.** *Anolis sagrei*, native to Cuba and the Bahamas, was discovered in the Florida Keys in 1887 (Garman 1887. Bull. Essex Inst. 19:25–50). This species is now well established throughout Florida and has displaced the native *A. carolinensis* in human-altered habitats (Campbell 2000. Analyses of the Effects of an Exotic Lizard [*Anolis sagrei*] on a Native Lizard [*Anolis carolinensis*] in Florida, Using Islands as Experimental Units. Ph.D. dissertation, University of Tennessee). *Anoilis sagrei* has a diverse diet: plant nectar, insects, spiders, isopods, gastropods, and lizards, including other anoles (Campbell and Gerber 1996. Herpetol. Rev. 27:200; Henderson and Powell 2009. Natural History of West Indian Reptiles and Amphibians. University of Florida Press, Gainesville, Florida. 520 pp.; Krysko and Wasilewski 2012. Herpetol. Rev. 43:477–478). This species, however, has not yet been observed to prey upon the various introduced *Hemidactylus* geckos within its range. Here we report observations of *A. sagrei* predation on *H. turcicus* and *H. mabouia*.

The first observation occurred at 1530 h on 12 October 2017 in developed habitat in Gainesville, Florida (29.61510°N, 82.33604°W; WGS 84). We found an adult *A. sagrei* consuming a juvenile *H. turcicus*, the most common species of *Hemidactylus* in the region. The gecko had visible internal injuries from the interaction. We observed the predation event for a few minutes as the *A. sagrei* bit down and repositioned the *H. turcicus* several

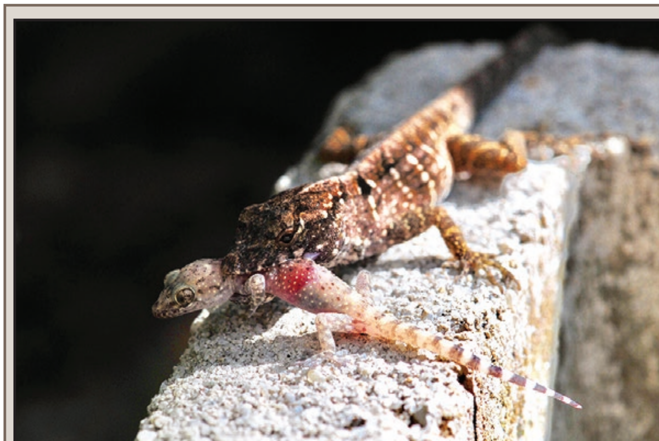
PHOTO BY EMILY BENOIT

Fig. 1. Predation of *Hemidactylus turcicus* by *Anolis sagrei.*

PHOTO BY TIMOTHY BENOIT

Fig. 2. Predation of *Hemidactylus mabouia* by *Anolis sagrei*.

times. We then left the area in the interest of not disturbing the anole as it finished its meal (Fig. 1).

The second observation occurred at 1659 h on 18 December 2017 on the edge of a parking lot at the Fort Zachary Taylor Historic State Park in Key West, Florida (24.54675°N, 81.81047°W; WGS 84). An *A. sagrei* was discovered eating a juvenile *H. mabouia*, a common introduced species of gecko for southern Florida. By the time the interaction was observed, the gecko had autotomized its tail and was clinging to a branch, as the anole pulled on its head (Fig. 2).

Photographic evidence, such as what has been provided here, as well as more novel ways of detecting dietary preferences of *A. sagrei* (Kartzinel et al. 2015. Mol. Ecol. Res. 15:903–914), provide vital information in the search for solutions to managing the spread of invasive species.

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***CALOTES VERSICOLOR* (Oriental Garden Lizard). AGONISTIC BEHAVIOR.** The oriental or Eastern garden lizard (*Calotes versicolor*) is widely distributed, including Iran, Afghanistan, Nepal, Sri Lanka, India, southern China, Myanmar, Thailand, Laos, Vietnam, and peninsular Malaysia and Sumatra in Indonesia, where it is commonly associated with human disturbed habitats (Radder 2006. Curr. Sci. 91:1354–1363). Geographic differences in morphology have been observed in Thailand, where they are estimated to occur in all provinces (Prakobkarn et al. 2016. Agriculture and Natural Resources 50:474–482). Little is known of the species' behavior, however. Herein, we present an observation of intra-specific agonistic behavior of *C. versicolor* and subsequent body color change associated with the interaction in rural northeast Thailand.

At 1110 h on 28 January 2018, we observed two *C. versicolor*, which were grey in background body color, fighting in leaf litter (an area about 1 m x 0.5 m), near (< 2 m) a small road less than 4 m wide in Pak Chong, Nakhon Ratchasima Province, Thailand (14.61918°N, 101.41315°E, WGS 84; 341 m elev.). A small patch of disturbed forest occupied (ca. 0.1 km$^2$) the side of the road where the where the pair was fighting, with a small resort with five houses on the opposite side of the road.

We did not observe the start of the interaction, but from a distance of approximately 4 m we recorded agonistic behavior. The pair (sexes unknown) did not appear to be disturbed by our presence, and we were able to video them until 1115 h. The pair circled each other while fighting, primarily biting between the front and hind legs of the body. Pushups and head bobbing behavior were observed with dewlaps extended during pauses in between bouts of circling and biting. Throughout the fighting, both individuals remained grey in body color.

At 1111 h., a third *C. versicolor* (sex unknown) was observed about 3 m away from the combating pair. It then approached to about 1.5 m, remaining in moderately dense shaded undercover vegetation, and appeared to be observing the event. This non- directly participating individual was a dull orange color throughout the entire event. The fighting pair appeared oblivious to this individual. At 1112 h., one of the fighting individuals retreated ca. 0.5 m up a nearby tree while the other remained where the two had previously been fighting. The individual that retreated remained the same grey coloration, while the lizard that lingered at the site rapidly changed from grey to orange.

Color change has been observed in response to mood, mating, and environmental conditions for *C. versicolor* (Cox et al. 1998. A Photographic Guide to Snakes and Other Reptiles of Peninsular Malaysia, Singapore, and Thailand. Ralph Curtis Books, Sanibel, FL. 144 pp.). The breeding season for *C. versicolor* in India is from March to October (Lal et al. 2009. J. Endocrinol. Reprod. 13:13–16); however variation may exist throughout its range. We cautiously suggest that the agonistic behavior we observed was initiated by a territorial dispute, with resources potentially being limited in the primarily agrarian and rural area of observation. Agonistic behavior and particularly the role of color change of *C. versicolor* requires further study throughout its range to fully understand its context within the ecology of this species.

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***CARLIA BOMBERAI*. REPRODUCTION.** *Carlia bomberai* is known from Papua Province, Indonesia, Tanah Merah village (2.4382°S, 133.1350°E; WGS 84) and Saennga Village (2.4727°S 133.1104°E; WGS 84) (Zug and Allison 2006. Zootaxa 1237:27–44). *Carlia bomberai* inhabits leaf litter in primary and secondary hill forest but also occurs in open areas (Zug and Allison, *op. cit.*). In this note I report the first information on the reproductive cycle of *C. bomberai* from a histological examination of gonadal material.

I examined seven *C. bomberai* collected in Indonesia, Papua Province, collected March 2002 and deposited in the Vertebrate Zoology collection (BPBM) of the Bishop Museum, Honolulu, Hawaii as BPBM 21315, 21319, 21321, 21323, 21325, and 21333 from Tanah Merah village; BPBM 21303 from Saennga village. A cut was made in the lower abdominal cavity and the left testis was removed, embedded in paraffin, cut into 5-µm sections and stained by Harris hematoxylin, followed by eosin counterstain. Enlarged ovarian follicles (> 4 mm) or oviductal eggs were counted. Histology slides were deposited at BPBM.

The sample contained two mature males which exhibited sperm formation (spermiogenesis) BPBM 21319, SVL = 50 mm and BPBM 21323, SVL = 49 mm, two mature females BPBM 21303, SVL = 45 mm (two enlarged follicles, 4 mm diameter), BPBM 21333, SVL = 47 mm (two oviductal eggs) and one juvenile female

BPBM 21315, SVL = 34 mm (quiescent, no yolk deposition). Also present were two unsexed juveniles (BPBM 21321, SVL = 33 mm, BPBM 31325, SVL = 31 mm).

My data indicate that *C. bomberai* can produce clutches of two eggs, males of 49 and 50 mm SVL are mature, and mating may occur during March. Examination of additional monthly samples of *C. bomberai* are needed to fully characterize the reproductive cycle.

I thank Molly E. Hagemann (BPBM) for permission to examine *C. bomberai.*

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***CNEMIDOPHORUS RUATANUS*. MATING BEHAVIOR.** *Cnemidophorus ruatanus* (Teiidae), recently resurrected as a full species from *C. lemniscatus* (McCranie and Hedges 2013. Zootaxa 3722:301–306), ranges throughout the Bay Islands of Roatan, Utila, and Cayos Cochinos, Honduras. *C. ruatanus* derives its local name 'shake-paw lizard' from stopping to slowly and deliberately wave a forelimb in a circular motion, two or three times before running forward and repeating this behavior. This species inhabits low elevations, namely gravely or sandy riverbanks, beach vegetation, and open areas to bask (McCranie and Hedges, *op. cit.*).

Mating behavior in *C. ruatanus* and *C. lemniscatus* has not been recorded. Mating behavior has been reported in *C. ocellifer* (Albuquerque et al. 2018. J. Herpetol. 52:145–155), a congener that ranges throughout Brazil, where males have been observed exhibiting an extensive courtship ritual (Ribiero et al. 2011. Biota Neotrop. 11:363–365). Ribiero et al. (*op. cit.*) observed a male *C. ocellifer* exhibiting cloacal-rubbing on the ground as it moved in a figure eight over a cluster of five burrow entrances for 2 min 30 sec, presumably to entice out a female. The male then entered the burrow up to its hind legs to pull the female out. The female exited the burrow after 3 min, and the male climbed onto the female's back and bit her behind the head in a neck-hold while copulating. He released the female after 2 min of subjugation (Ribiero et al., *op. cit.*).


Fig. 1. A) Male *Cnemidophorus ruatanus* (left) holding the tail of a female (right) before mating. B) Male (left, rear) and female (right, foreground) mating.

At 1428 h on 21 June 2018, I observed a male *C. ruatanus* approaching a female to begin courtship, on a short but steep coastal scrub bank at Bando Beach, Utila, Honduras (16.0515°N, 86.5330°W, WGS 84; 0 m elev.). In the following minute, the male placed his forelimbs on the female's tail from behind (Fig. 1A). Although the pair were disturbed by my presence, at 1429 h the female moved 1 m to a flatter, sandy patch, and then stopped. The male followed and continued to walk further up the female's body from behind and stopped with his forearms atop her hindlegs. At 1430 h the male began aggressive mating behavior, biting the female's back just above her left hind leg to pin her down, and then began copulation (Fig. 1B). This lasted 30 sec and the male and female parted ways at 1431 h.

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***CROTAPHYTUS COLLARIS* (Eastern Collared Lizard). CRYPTIC BEHAVIOR.** Males of *Crotaphytus collaris* present a variety of bright and contrasting colors, ranging from bright "yellow to green and blue" in pastel shades, with white dots dispersed widely across the dorsal surface of the lizard (Lemos-Espinal et al. 2015. Anfibios y Reptiles de Sonora, Chihuahua y Coahuila, México / Amphibians and Reptiles of Sonora, Chihuahua and Coahuila, Mexico. Two volumes. CONABIO, Mexico, D.F. 714 + 668 pp.). Collared lizards are diurnal and heliothermic, able to withstand high temperatures while perched on rocks as they engage in displays directed at conspecifics (Jones and Lovich 2009. Lizards of the American Southwest. Rio Grande Publishers. Tucson, Arizona. 567 pp.). However, given their preference for open habitats, they are vulnerable to attack from diurnal predators such as snakes (e.g., *Masticophis* spp.) and raptors (Husak et al. 2005. Ethology 112:572–580). Here we report on a possible case of cryptic behavior.

Fig. 1. Adult male *Crotaphytus collaris* as observed on an Ocotillo branch.

On 9 July 2018 at 1132 h, with an air temperature of 32°C, we observed a male *C. collaris* clasped to a branch of an Ocotillo (*Fouquieria splendens*) (Fig. 1). As this was within the summer rainy season, branches of the Ocotillo were covered in small green leaves. Other scrub elements such as Honey Mesquite (*Prosopis glandulosa*), Thorny Acacia (*Acacia farnesiana*), and Leatherstem (*Jatropha dioica*) also contributed green colors to an otherwise xeric environment. The lizard's color pattern of green and white closely matched the background color of the Ocotillo leaves, and the lizard's position directly against the branch (rather than in an elevated perch or display position) added to the cryptic effect. We were able to approach the lizard to within 1 m before it ran away. Our observation took place in the municipality of Mina, Nuevo Léon, Mexico (26.06266°N, 100.60649°W, WGS 84; 661 m elev.).

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***CYRTODACTYLUS PULCHELLUS* (Malayan Forest Gecko). ENDOPARASITE.** The Malayan forest gecko, *Cyrtodactylus pulchellus* is currently restricted to Penang Island, Peninsular Malaysia (Uetz et al. 2018. The Reptile Database, http://www.reptile–database.org, accessed 23 August 2018). There is, to our knowledge, one report of an endoparasite from *C. pulchellus*. Bursey et al. (2018. Herpetol. Rev. 49:536) reported the nematode *Rhabdochona* sp. In our note we report the presence of an additional species of Nematoda for *C. pulchellus*.

One female *C. pulchellus* (SVL = 111 mm) collected March 2011 from Peninsular Malaysia, Penang State, Pulau Pinang, (Penang Island), Air Terjun Titi, Kerawang (5.40388°N, 100.22333°E, WGS 84; 257 m elev.) and deposited in the herpetological collection of La Sierra University (LSUHC), Riverside, California, USA as LSUHC 10022 was examined. The specimen had been collected by hand, euthanized within 12 h of capture, preserved in 10% formalin, and stored in 70% ethanol. The body cavity was opened by a longitudinal incision, and the digestive tract was removed and opened. The esophagus, stomach, small intestine and large intestine were examined for helminths under a dissecting microscope. Two nematodes were found in the large intestine. They were placed on a glass slide in a drop of lactophenol, a coverslip was added and identification made from this temporary wet mount utilizing Anderson et al. (2009. Keys to the Nematode Paraasites of Vertebrates, Archival Volume. CAB International, Wallingford, Oxfordshire. 463 pp.) and Gibbons (2010. Keys to the Nematode Parasites of Vertebrates, Supplementary Volume. CAB International, Wallingford, Oxfordshire, UK. 416 pp.). Two mature nematodes, one male and one female were found in the large intestine, identified as *Cosmocerca ornata* and subsequently deposited in the Harold W. Manter Parasitology Laboratory (HWML), The University of Nebraska, Lincoln, Nebraska, USA as HWML 110452.

*Cosmocerca ornata* is widespread in amphibians and reptiles and occurs in Europe, Africa, Malaysia, China, India and South America (Baker, 1987. Mem. Univ. Newfoundland, Occas. Pap. Biol. 11:1–325). *Cyrtodactylus pulchellus* represents a new host record for *Cosmocerca ornata*.

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***EUTROPIS CARINATA* (Keeled Indian Mabuya / Common Grass Skink). DIET.** *Eutropis carinata* is known to consume range of invertebrates and small vertebrates (Khan 2018. Photographic Guide to the Wildlife of Bangladesh. Arrannayk Foundation. Dhaka, Bangladesh. 488 pp.). At 1101 h on 20 March 2018, an adult *E. carinata* was observed with a *Leptobrachium smithi* (Smith's Litter Frog)—a species that is active at night—in its mouth at Adampur Reserve Forest, Moulvibazar (24.27694°N, 91.91508°E; WGS 84). It was a sunny day and the first two authors were surveying butterflies following a streamline. The skink was approximately 5 m from the streambed. The skink released the frog several times, only to grasp it again. A second skink approached to with 1 m, whereupon the first skink moved toward dry leaf litter of the streambed carrying its frog prey. The second skink chased them for ca. 2 m but did not pursue any farther. The first skink entered a small hollow beneath tree roots and was lost from view. Total observation time was 6 minutes. Predation on *L. smithi* by *E. carinata* has not been documented until now. These two species are broadly sympatric in many areas of Bangladesh, and further studies are needed to confirm if this predator-prey relationship is common.

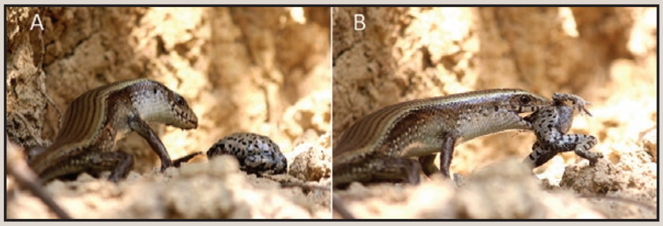


Fig. 1. A) Adult Eutropis *carinata* prepares to bite a *Leptodactylus smithi*. B) The skink grasps the frog just prior to fleeing upon the approach of a second skink.

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***GYMNODACTYLUS DARWINII* (Darwin's Gecko). EGGS and HATCHLINGS.** *Gymnodactylus darwinii* is a small lizard endemic to the Atlantic Rainforest, with a distribution from the state of Rio Grande do Norte to São Paulo (Freire 1998. Pap. Avul. Zool. 40:311–322; Pellegrino et al. 2005. Biol. J. Linn. Soc. Lond. 85:13–26.). Little is known of the reproductive ecology of this species. Females containing oviductal eggs collected in both wet and dry seasons indicate *probably* continuous reproduction (Garda et al. 2014. Zoologia 31:418–425). Here we provide preliminary data on nest site and egg and hatchling sizes for the species.

On 12 September 2016, while conducting herpetological surveys at the Conservation Unit of Tapacurá, municipality of São Lourenço da Mata, metropolitan region of Recife, in Pernambuco State, Northeast, Brazil (91.0826°S; 25.0299°W), we found an egg deposited below a rocky outcrop, on damp earth and surrounded by leaf litter. The egg was collected and placed in a glass container with sand and litter, and maintained in the laboratory at ambient temperature and humidity until hatching. Eight other eggs were also measured from four pregnant females,

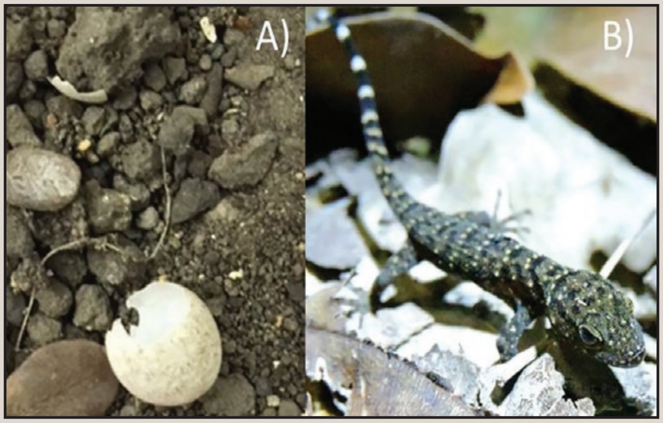


Fig. 1. A) *Gymnodactylus darwinii* egg found in nature and hatched in captivity; B) hatchling *G. darwinii*.

which were captured by hand in the rocky outcrop. These eggs were obtained after we euthanized the animals.

On 1 December 2016 (80 days after collection), a juvenile emerged from the field-collected egg; its measurements were: SVL = 23.0 mm; TL = 25.1 mm; body width = 3.2 mm; body height = 2.4 mm; head width = 4.4 mm; head length = 7.4 mm; head height = 2.7 mm; forearm length = 9.0 mm; and hind limb length = 12.2 mm. Dorsal coloration was dark brown, with black rings and white spots along the medial region from head to snout, while the tail region showed alternating white and black rings (Fig. 1). Ventral coloration was light yellow. The eggs from pregnant females ranged in length from 4.5–7.9 mm and width from 4.1–10.1 mm. By using the formula of volume for an ellipsoid, the eggs showed a mean volume of 63.27 ± 49.5 $mm^3$ (range = 20.06 – 185.17 $mm^3$; N = 16). Clutch size was invariably two eggs per female, matching most gekkonids and phyllodactylids (e.g., Colli et al. 2003. J. Herpetol. 37:694–706).

The hatchling *G. darwinii* (4845) and its eggshell were deposited in the Herpetology Section, Coleção Herpetológica e Paleoherpetológica da UFRPE, Recife, Pernambuco state. To the best of our knowledge, this is the first record of egg sizes, hatchling sizes and incubation period of *G. darwinii*.

We thank the Universidade Federal Rural de Pernambuco and the Unidade de Conservação de Tapacurá for their assistance. Financial support was provided by the Fundação de Amparo a Ciência e Tecnologia de Pernambuco (FACEPE) and the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) scholarship program. Research was conducted with a SISBIO (No 54374-1) Permit approved and granted by the Ethical use of Animals Committee of the Universidade Federal Rural de Pernambuco (CEUA UFRPE 098/2016).

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***INTELLIGAMA LESUEURII* (Australian Water Dragon); *ACRITOSCINCUS DUPERREYI* (Three-lined Skink); *LAMPROPHOLIS GUICHENOTI* (Garden Skink). INTERSPECIFIC COMMUNAL NESTING.** Communal nesting is common and widespread in lizards, but their often secretive nesting habits prevent us from understanding its taxonomic distribution, hindering our ability to explain its evolution (Doody et al. 2009. Quart. Rev. Biol. 84:229–252). Field observations remain critical in this regard. Herein I report a mixed-species communal nest of three lizard species.

On 15 December 2007, while conducting surveys for *Intelligama lesueurii* nests at Blue Water Holes, along Clark Creek in Kosciusko National Park in southeastern Australia (35.62262°S, 148.70427°E, WGS 84; 1153 m elev.), I discovered a nest of *I. lesueurii* in a narrow (ca. 8 cm) crevice in bedrock on an open, north-facing sloping cliff face. The nest was buried under shallow soil (ca. 6 cm), but small amounts of soil on the surrounding rock from the excavating mother served as a clue. While removing and measuring the seven *I. lesueurii* eggs, I discovered two sets of smaller eggs in the nest. There were eight eggs in a single cluster and four smaller eggs in another (looser) cluster; both clusters were among the water dragon eggs, the latter of which were buried in roughly three layers in the soil. Two eggs from each cluster were brought to the laboratory (University of Canberra) and incubated at a constant temperature of 30°C in Thermoline® incubators. Hatching of all eggs occurred within two weeks; the larger eggs were confirmed to be *Acritoscincus duperreyi* and the smaller eggs *Lampropholis guichenoti*. The three clutches of eggs were within the range reported for each species in the literature, suggesting one clutch per species (Pengilley 1972. Systematic relationships and ecology of some lygosomine lizards from southeastern Australia. Ph.D. Thesis, Australian National University, Canberra, Australia; Greer 1982. Rec. Austr. Mus. 64:549–573; Doody et al. 2006. Evol. Ecol. 20:307–330).

Communal nesting has been reported in all three species (reviewed in Doody et al., *op. cit.*), but mixed-species communal nesting has been reported in only *L. guichenoti* (Shea and Sadlier 2000. Herpetofauna 30:46–47). Mixed-species communal lizard nests are rarely reported (Shea and Sadlier, *op. cit.*), but may be more common than realized. If incubation requirements are similar among species, then we might expect mothers to add their eggs to those of other species, if they find them. In theory, mothers can save time and energy and decrease their vulnerability to predators by nesting communally if they find nests early in their search for a nest site vs. spending more time searching for their own nest site (Doody et al., *op. cit.*). Alternatively, in the present case soil for nesting was limited to a few crevices in limestone bedrock; mothers may have had few choices of where to lay their eggs. I suspect that the loosening of the soil by the nesting water dragon mother provided an easy pathway into the soil for the other skink mothers, but I was unable to confirm that the water dragon eggs were deposited first. Importantly, these two scenarios—conspecific copying vs. limited nest sites—are not mutually exclusive, and persistent limited nest sites over many generations at the site may have selected for mothers recognizing and adding their eggs to those of conspecifics or other species, given the similar incubation requirements among species (Doody et al., *op. cit.*).

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***LEPIDODACTYLUS LUGUBRIS* (Mourning Gecko). PREDATION.** *Lepidodactylus lugubris* is a small, parthenogenic species of gecko that has invaded many areas of Central and

South America (Torres-Carvajal and Tapia 2011. Check List 7:470–472). It was first reported in Ecuador in 1966 (Schauenberg 1968. Rev. Suisse Zool. 75:415–417) and had spread to the Galápagos archipelago as early as the 1970s (Phillips et al. 2012. Biol. Invasions 14:461–480) where it has since become established on several of the islands including San Cristóbal (Torres-Carvajal and Tapia 2011. Check List 7:470–472). Here we report the first observation of an attempted predation of *L. lugubris* by the endemic San Cristóbal Mockingbird (*Mimus melanotis*).

At 1450 h on 4 November 2016, we observed a *M. melanotis* attempting to dispatch and prey upon a *L. lugubris* by repeatedly thrashing the gecko against a balcony railing at Universidad San Francisco de Quito (USFQ)-Galápagos, Isla San Cristóbal, Galápagos, Ecuador (0.89558°S, 89.60900°W; WGS 84). As we approached, the *L. lugubri*s autotomized its tail, which the *M. melanotis* quickly consumed before flying away, leaving the moribund gecko behind (HM 167448, HerpMapper - A Global Herp Atlas and Data Hub). Although *Mimus* sp. in other parts of the Galápagos archipelago have been reported to prey upon endemic geckos of the genus *Phyllodactylus* (Ortiz-Catedral 2014. Notornis 61:196–199), interactions with *L. lugubris* have not been previously reported.

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***LIOLAEMUS CHILIENSIS* (Chilean Tree Iguana) and *LIOLAEMUS TENUIS* (Thin Tree Iguana). HABITAT USE.** Species of the genus *Liolaemus* have different strategies to avoid predators, including the use of tree cavities as refuges (Kacoliris et al. 2010. Anim. Biol. 60:157–167). The use of tree cavities should also maximize access to feeding areas, minimize thermoregulation costs, and provide a secure place for breeding (Scott et al. 1976. J. Herpetol. 10:75–84; Mella 2007. Gayana 71:16–26; Kacoliris et al. 2008. Cuad. Herpetol. 22:49–50; Castillo et al. 2015. Multequina 24:19–31). *Liolaemus chiliensis* and *L. tenuis* are arboreal species that usually find shelter in shrubs, under bark, and among rocks (Donoso-Barros 1966. Reptiles de Chile. Universidad de Chile Press. Santiago, Chile. 458 pp.; Mella 2017. Guía de Campo Reptiles de Chile. Tomo: 1 Zona Central. Peñaloza APG Press, Santiago, Chile. 308 pp.). Despite the potential importance of tree cavities as refuges for *L. chiliensis* and *L. tenuis*, their use has not been reported for these two species in temperate forests of southern Chile. Here we document the first records of *L. chiliensis* and *L. tenuis* using tree cavities created by tree-decay processes.

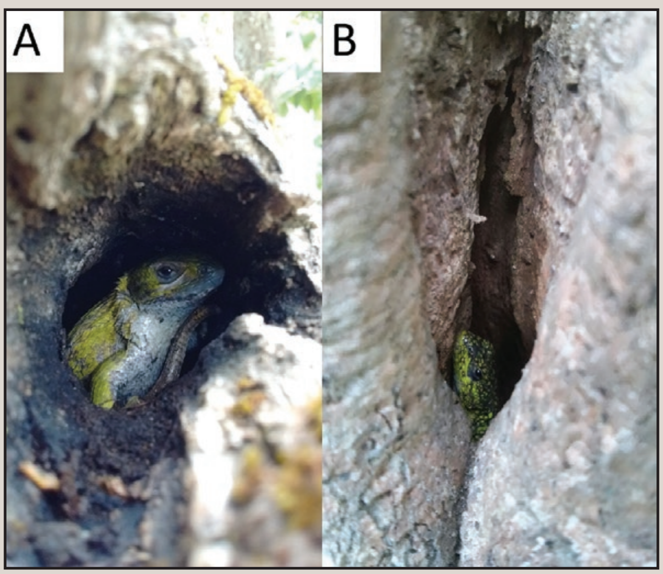


Fig. 1. Lizards reusing tree cavities as refuges in temperate forests, southern Chile: A) *Liolaemus chiliensis* in a *Gevuina avellana* cavity; B) *Liolaemus tenuis* in a *Nothofagus obliqua* cavity.

During three breeding seasons (2015–2018) we searched for refuge and breeding sites of vertebrate species using tree cavities in nine forest stands (> 20 ha) in second-growth temperate Andean forests of the La Araucanía Region, Chile (39.26667°S, 71.80000°W, WGS 84; 271 m elev.). At 1625 h on 25 November 2015, we observed for the first time an individual of *L. chiliensis* in a decay-formed cavity of a *Gevuina avellane* tree, which was reused during the next two years (recorded on 18 November 2016 and 4 December 2017; Fig. 1A). *Liolaemus tenuis* was recorded for the first time at 1230 h on 20 December 2016, in a *Nothofagus obliqua* decay-formed cavity, which was reused on 29 November 2017 by an individual of the same species (Fig. 1B). Our report of tree cavity use provides new information of ecological behavior for these two species, and adds to the assemblage of reptiles that use tree cavities in Andean temperate forests of southern Chile, which also includes *L. pictus* and *Tachymenis chilensis* (Mella 2017, *op. cit.*).

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***OPHISAURUS VENTRALIS* (Eastern Glass Lizard). PREDATION.** *Ophisaurus* are limbless anguid lizards found in the eastern USA and Mexico (Holman 1971. Cat. Amer. Amphib. Rept. 110:1–3). Documented predators of *Ophisaurus* spp. include colubrid, elapid, and viperid snakes (Schmidt 1932. Copeia 1932:6–9; McConkey 1954. Amer. Midl. Nat. 51:133–171; Palis 1993. Herpetol. Rev. 24:59, 62; Palmer and Braswell 1995. Reptiles of North Carolina. Univ. North Carolina Press, Chapel Hill, North Carolina. 412 pp.; Himes 2004. Herpetol. Rev. 35:123–128; Stevenson et al. 2010. Southeast. Nat. 9:1–18), mammals including *Sus scrofa* (feral hogs; Wood and Roark 1980. J. Wildl. Manag. 44:506–511), *Procyon lotor* (raccoons; Stains 1956. Misc. Publ. Mus. Nat. Hist. Univ. Kansas 10:1–76), *Dasypus novemcinctus* (Nine-banded Armadillo; Wirtz 1985. *In* G. G. Montgomery [ed.], The Evolution and Ecology of Armadillos, Sloths, and Vermilinguas, pp. 439–451. Smithsonian Inst. Press, Washington, DC), and *Lynx rufus* (Bobcat; Mitchell et al. 2009. Herpetol. Rev. 40:223–224), and birds, including hawks such as *Buteo jamaicensis* (Red-tailed Hawk; Fitch and Bare 1978. Trans. Kansas Acad. Sci. 81:1–13; McConkey, *op. cit.*) and *Geranoaetus albicaudatus* (White-tailed Hawk; Stevenson and Meitzen 1946. Wilson Bull. 58:198–205), wading birds such as *Eudocimus albus* (White Ibis; Moore et al. 2005. Herpetol. Rev. 36:182) and *Bubulcus ibis* (Cattle Egret; Fogarty and Hetrick 1973. Auk 90:268–280),

Fig. 1. *Ophisaurus ventralis* being eaten by *Turdus migratorius.*

and passerines such as *Lanius ludovicianus* (Loggerhead Shrike; Clarke et al. 2011. Herpetol. Rev. 42:606–607). Here we report predation on *O. ventralis* by a novel passerine avian predator, *Turdus migratorius* (American Robin).

At ca. 1445 h on 26 February 2015, one of us (JM) saw and photographed a juvenile *O. ventralis* being eaten by a *T. migratorius* on private property in Lafayette County, Florida (29.98701°N, 83.19952°W; WGS 84). The *T. migratorius* was feeding in the mulch of a wildflower bed when it captured the *O. ventralis*. It attempted to subdue the *O. ventralis* for ca. 10 min, after which it flew away carrying it (Fig. 1). *Turdus migratorius* eat mostly fruit and invertebrates, but will occasionally feed on small vertebrates, including fish, frogs, salamanders, shrews, skinks, and snakes (Vanderhoff et al. 2016. *In* P. G. Rodewald [ed.], The Birds of North America. Cornell Lab of Ornithology, Ithaca, New York; DOI: 10.2173/bna.462). This is the first report of *T. migratorius* feeding on a lizard of the genus *Ophisaurus*.

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***PEROCHIRUS SCUTELLATUS* (Giant Micronesian Gecko). REPRODUCTION.** *Perochirus scutellatus* is known from Kapingamarangi Atoll (1.06543°N, 154.67707°E, WGS 84), Pohnpei State, Federated States of Micronesia (Zug 2013. Reptiles and Amphibians of the Pacific Islands A Comprehensive Guide, University of California Press, Berkeley. 306 pp.). It may also occur on Ulithi Atoll and possibly Palau (both Caroline Islands, Micronesia) and is the largest gecko in Micronesia, SVL = ca 90–135 mm (Buden and Taborosi 2016. Reptiles of the Federated States of Micronesia, Island Research & Education Initiative, Palikir, Pohnpei. 311 pp.). It is a diurnal forest tree trunk species (Buden 1998. Pac. Sci. 52:250–258). No reproductive data are available on males; females probably produce clutches of two eggs (Zug 2013, *op. cit.)*. In this note I report results of a histological examination of five males of *P. scutullattus*.

Testes of five *P. scutellatus* males from Kapingamarangi Atoll (mean SVL = 109.2 mm ± 7.4 SD, range = 98–118 mm) and deposited in the Vertebrate Zoology collection (BPBM) of the Bishop Museum, Honolulu, Hawaii, USA were examined. My sample consisted of: BPBM 11161 (SVL = 98 mm, March 1986), BPBM 13324 (SVL = 118 mm, July 1996), BPBM 13325 (SVL = 108 mm, July 1996), BPBM 13327 (SVL = 113 mm, July 1996), BPBM 13329 (SVL = 109 mm, August 1996). A cut was made in the lower abdominal cavity and the left testis was removed, embedded in paraffin, cut into 5-µm sections and stained by Harris hematoxylin, followed by eosin counterstain. Histology slides are deposited at BPBM.

The testes of all males exhibited sperm formation (spermiogenesis). Lumina of the seminiferous tubules were lined by groups of sperm or metamorphosing spermatids. The smallest reproductively active male measured 98 mm SVL (BPBM 11161). The presence of male reproductive activity at opposite ends of the year (March–August) suggests *P. scutellatus* may have a prolonged period of reproduction. Examination of additional monthly samples of *P. scutellatus* are warranted to fully characterize the reproductive cycle.

I thank Molly E. Hagemann, (BPBM) for permission to examine *P. scutellatus*.

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***PHRYNOSOMA HERNANDESI* (Greater Short-horned Lizard). SCAVENGED BY HARVESTER ANTS.** Horned lizards are myrmecophages, and many predate harvester ants (Sherbrooke 2003. Introduction to Horned Lizards of North America. University of California Press, Berkeley, California. 176 pp.). In a reversal of roles, we observed harvester ants (*Pogonomyrmex* sp.) scavenging juvenile *Phrynosoma hernandesi* (Fig. 1). We encountered three *P. hernanadesi* carcasses covered by ants on 18 July 2017 at 1400 h MST along an unpaved road near the confluence of Mogollon Creek and the Gila River in southwestern New Mexico (9.3 km N, 4.7 km E Gila, Grant County, New Mexico, USA; 33.0488°N, 108.5344°W; WGS 84). Lizard carcasses were within 2 m of an ant nest, and worker ants appeared to be moving lizard bodies toward the nest, as well as potentially severing appendages of the *P. hernandesi*.

It is unknown whether the harvester ants killed the juvenile horned lizards or merely found their corpses. Harvester ants have been observed scavenging other species of vertebrates, including a Great Basin Rattlesnake (*Crotalus oreganus lutosus*) killed by a motorized vehicle in Nevada and a Common Sagebrush Lizard (*Sceloporus graciosus*) in Idaho, potentially killed by ant stings (Clark and Blom 1991. Southwest. Nat. 36:140–142). Horned lizards can detoxify venom from harvester ants, but high doses of ant venom have been shown to paralyze and kill juvenile

PHOTO BY MARY J. HARNER

Fig. 1. *Pogonomyrmex* sp. scavenging a juvenile *Phrynosoma hernandesi* in southwestern New Mexico.

*Phrynosoma* (Schmidt et al. 1989. Copeia 1989:603–607). A historical note described harvester ants in captivity targeting thin areas in the armor of *Phrynosoma* and "by stinging they drive the horned frog crazy and apparently to death" (Edwards 1896. Science 3:763–765).

Our observation of three juvenile horned lizards engulfed by harvester ants appeared unusual and suggests that further investigation of how these species interact, and under what circumstances and life-history stages their predatory roles may reverse, is warranted.

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***PLESTIODON GILBERTI* (Gilbert's Skink). PREDATION.** *Plestiodon gilberti* is a medium-sized (SVL to 114 mm) diurnal skink distributed through California, southern Nevada, northern Baja California, and northwestern Arizona (Stebbins and McGinnis 2012. Field Guide to Amphibians and Reptiles of California. University of California Press, Berkeley. 538 pp.). Corvid predation on lizards has been well documented; however, lizards and similar prey items constitute a small portion of total diet (Boarman and Heinrich 1999. *In* Poole and Gill [eds.], The Birds of North America. Cornell Lab of Ornithology, Ithaca, New York. https://doi.org/10.2173/bna.476).

On 11 May 2018 at 1441 h at the base of El Capitan in Yosemite Valley (37.7257°N, 119.6365°W; WGS 84), I witnessed a *Corvus corax* (Common Raven) prey upon an adult male *P. gilberti*. Following the skink's death, the raven retrieved the skink's dropped tail, grabbed the full body, then flew away. A video of this interaction is available upon request.

To my knowledge, this is the first reported incident of predation on *P. gilberti* by *C. corax*. The raven's retrieval of the dropped tail and the ineffectiveness of caudal autonomy are also of note.

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***SALVATOR MERIANAE* (Black-and-white Tegu). DIET.** *Salvator merianae* is considered a dietary generalist, whose food items range from plant parts (Castro et al. 2004. Pap. Avul. Zool. 44:91–97) and fungi (Toledo et al. 2004. Herpetol. Rev. 35:173–174) to arthropods and a variety of vertebrates (e.g., Sazima et al. 2013. Herpetol. Notes. 6:427–430). Although widely distributed in South America, there is little information on this species' diet for the semiarid region of the Caatinga. We collected four road-killed *S. merianae* in the March–May period (three in 2015 and one in 2016) in the vicinity of Seridó Ecological Station (6.5789°S, 37.2555°W, WGS 84; 204 m elev.), in Rio Grande do Norte, northeastern Brazil (specimens are now deposited at Laboratório de Ecologia e Conservação da Fauna Silvestre, at Universidade Federal Rural do Semi-Árido). Three *S. merianae* had ingested arthropods (Coleoptera and/or Orthoptera), while the fourth did not present any distinguishable food content. One individual had ingested four *Rhinella granulosa* (Common Lesser Toad) and two other unidentified amphibians. Although its diet was already known to include amphibians (Kiefer et al. 2002. Amphibia-Reptilia 23:105–108; Maffei et al. 2009. Herpetol. Rev. 40:439), this is the first report of *R. granulosa* as a food item of *S. merianae*. Because the tegus were collected in the rainy season, when amphibians are generally more active, this suggests that amphibians might provide an important seasonal food source for *S. merianae* in the semiarid regions including Caatinga.

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***SCELOPORUS INTERNASALIS* (Mail-snouted Spiny Lizard). ANTIPREDATOR BEHAVIOR.** Among reptiles, lizards provide a rich source for studying the ecology, performance, and biomechanics of escape behaviors, given the disparate ecomorphological adaptations that characterize many lizard groups (Pianka and Vitt 2003. Lizards: Windows to the Evolution of Diversity. University of California Press, Berkeley. 333 pp.). These can include highly conspicuous displays, most often involving the tail, when threatened by predators in both natural habitats and laboratory settings (Greene 1988. *In* Gans and Huey [eds.], Biology of the Reptilia, Vol. 16, pp. 1–152. John Wiley and Sons, New York; Hasson et al. 1989. Can. J. Zool. 67:1203–1209;

FIG. 1. *Sceloporus internasalis* perched on a fallen trunk after fleeing from its basking site, displaying undulatory movement of the tail.

Telemeco et al. 2011. Anim. Behav. 82:369–375). They may also deploy flight and/or hiding behaviors that likely decrease the risk of predation (Broom and Ruxton 2005. Behav. Ecol. 16:534–540).

On 4 July 2018 at 1433 h, in the ecological reserve Laguna Bélgica, Ocozocoautla, Chiapas, Mexico (16.88208°N, 93.45688°W, WGS 84; 976 m elev.), I observed an adult *Sceloporus internasalis* basking on a decaying log on the forest floor. When first encountered, the lizard climbed up to a inclined fallen trunk to a height of ca. 2 m. As I moved closer for a photograph, the lizard ran ca. 1 m, stopped, and began undulating its tail from side to side (Fig. 1). Seeing that I was still there, the lizard jumped to another fallen trunk at a height of ca. 10 cm and once stopped, began undulating its tail again. After this, the lizard sought refuge on the back of the trunk and disappeared from my view. Each undulating movement of the tail took ca. 3 seconds and involved the entire tail, as the rest of the body remained motionless. Because there were no other lizards present at the time of observation, I suggest that these behaviors were antipredator displays. Similar evidence have been recorded for Broad-headed Skinks that undulate their tail just prior to eeing (Cooper 1998. Behav. Ecol. 9:598–604; Cooper 1998. Can. J. Zool. 76:1507–1510).

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***SCELOPORUS MALACHITICUS* (Emerald Swift). COLORATION.** Body coloration strongly influences individual fitness in many reptile and amphibian species, and it often varies greatly among individuals. In lizards, individuals can exhibit considerable color variation both between and within populations. Many lizard species also change color on the short-term in response to social cues, temperature, and stress, or can exhibit longer-term changes in conjunction with ontogeny or sexual receptivity.

*Sceloporus malachiticus* is a medium-sized (64–98 mm SVL), viviparous lizard found throughout Central America at premontane to subalpine elevations (Savage 2002. The Amphibians and Reptiles of Costa Rica: A Herpetofauna between Two Continents, between Two Seas. University of Chicago Press, Chicago, Illinois. 934 pp.). Males are vibrantly colored, with bright green dorsa and blue-black badges on their throats and abdomens. Females have duller coloration overall, but may possess male-like blue badges on their abdomens. Inter-population variation in color has been noted, with males from some high altitude populations described as having "dark green above and deep blue … beneath" and those from low altitude populations with "bright green above and lively blue below" (Stuart 1971. Herpetologica 27:235–259). Short-term color changes have also been identified in *S. malachiticus*, with body coloration darkening at lower temperatures. Here, I report atypical throat coloration in *S. malachiticus*.

On 12 June 2018 at approximately 1145 h, an adult male *S. malachiticus* (85 mm SVL) with an orange and blue throat (Fig. 1) was captured by noose near the Biological Station at Las Alturas de Cotón, on the edge of La Amistad International Biosphere Preserve, in Puntarenas, Costa Rica. Orange and blue regions of the throat were separated, with the orange region stretching approximately 11.5 mm from under the tip of the snout toward the back of the jaw and 16 mm wide at its widest point. The blue throat region began abruptly where the orange region ended and was approximately 7.5 mm long and 14.5 mm wide. This individual's abdomen (Fig. 1B) and dorsum (Fig. 1C) were blue and green, respectively, as is typical for this species. No noticeable changes in body coloration were observed during


Fig. 1. Male *Sceloporus malachiticus* with orange throat coloration: A) dorsal view, B) throat, and C) ventral view.

or following handling. After measurement and photography, I released the individual at its site of capture.

Other male *S. malachiticus* (ca. N =10) captured at this site in 2018 and in a previous year (2015) lacked orange throats. Almost all formal descriptions of *S. malachiticus* indicate that males are blue and/or blue-black throated, although Stuart (1971) notes that some *S. malachiticus* individuals had "a chin with a dirty yellowish hue." This suggests that throat color variability in male *S. malachiticus* may still be more widespread than most published reports represent. In conjunction with scattered evidence for variability in the extent of the area covered by the blue throat badges in both males and females, and similar variability in the area covered by the blue and/or black abdominal badges in males, this observation contributes to our understanding that the overall hue and coverage of coloration in *S. malachiticus* is highly variable. Notably, male throat coloration in *S. malachiticus* is likely to be highly visible during territorial and courtship displays. How coloration relates to social and/or sexual signaling in *S. malachiticus* is yet to be fully examined, but it seems probable that such throat coloration could play a substantial role in communication.

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***TAKYDROMUS DORSALIS* (Sakishima Grass Lizard). PREDATION.** *Takydromus dorsalis* is an arboreal lizard species that occurs in the Yaeyama Islands, Ryukyu Archipelago, Japan (Goris and Maeda 2004. Guide to the Amphibians and Reptiles of Japan. Krieger, Malabar, Florida. 285 pp.). Known predations include snakes (Mori and Moriguchi 1988. Snake 20:98–113) and a wild cat (Sakaguchi and Ono 1994. Ecol. Res. 9:167–174). *Anguilla marmorata* (Giant Mottled Eel) is a large eel that feeds on small fish, shellfish, and crustaceans (Abe 1987. Illustrated Fishes of the World in Colour. Hokuryukan, Tokyo. 1029 pp.). Here, I report the first record of predation on *T. dorsalis* by *A. marmorata*.

Fig. 1. *Takydromus dorsalis* regurgitated from *Anguilla marmorata.*

On 11 September 2015, at 1445 h, I collected an *A. marmorata* (TL ca. 350 mm) in a small stream at the foot of Mt. Komi, Iriomote Island, Okinawa Prefecture, Japan (24.34°N, 123.91°E, WGS 84; 20 m elev.). I kept the eel in a plastic bag until that night, when I found a dead *T. dorsalis* (SVL = 63 mm; tail length [broken] = 16 mm; KUHE 59794) and pieces of a crab in the plastic bag (Fig. 1). The tail of the lizard was broken, but the body was fresh and not digested. . *Takydromus dorsalis* is arboreal and diurnal; in contrast, *A. marmorata* is aquatic and nocturnal. Thus, it is possible that the lizard was attacked by the eel when the lizard jumped into the stream to escape from some other predator, because escape behavior to water is common in arboreal lizard species (Pinto et al. 2017. Herpetol. Rev. 48:662).

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***TRIOCEROS ELLIOTI* (Montane Side-striped Chameleon). REPRODUCTION.** *Trioceros ellioti* is a viviparous species inhabiting high, moist savanna (1000–2800 m elev.) in western Kenya, parts of Uganda, Tanzania, Rwanda, Burundi, south Sudan, and Democratic Republic of Congo (Spawls et al. 2018. Field Guide to East African Reptiles. Bloomsbury, London. 624 pp.). Information on *T. ellioti* captive reproduction including litter sizes of 2–18 is in Neças (1999. Chameleons: Nature's Hidden Jewels. Edition Chimaira, Frankfurt am Main. 348 pp.). Leptien (1989. Salamandra 25:21–24) reported captive *C. ellioti* stored sperm. In this note I present additional information on *T. ellioti* reproduction including monthly events in the testis and ovarian cycles from a histological examination of museum specimens.

A sample of 50 *T. ellioti* specimens collected in 1967 and 1969 and deposited in the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA was examined. The sample consisted of 14 adult males (mean SVL = 65.7 mm ± 6.6 SD, range = 55–75 mm), 32 adult females (mean SVL = 68.1 mm ± 6.7 SD, range = 58–83 mm), one subadult female (SVL = 53 mm) and three unsexed subadults (SVLs = 30, 31, 42 mm). *Trioceros ellioti* dates and localities are: LACM 35144, 35145 Uganda, Bwindi Impenetrable National Park (1.0499 °S, 29.7166°E, WGS 84) March, 1967; LACM 38759–38768, 38770, 38772 38773, 38775–38783, 38785–38791 Uganda, Semeliki National Park, Bundibugyo District, Bwamba Forest (0.7511°N, 30.0203°E, WGS 84) June, July 1967; LACM 39100–39110 Uganda, Bugoma Forest, Holma District (1.2876°N, 30.9647°E, WGS 84) December 1967; LACM 60790–60797 Kenya, Lotongot, Samburu District (1.7386°N, 35.6196°´E, WGS 84) September 1969.

Table 1. Monthly stages in the ovarian cycle of 31 adult *Trioceros ellioti* females from Kenya and Uganda. One female * not shown in table from December (LACM 39108, SVL = 60 mm) exhibited early yolk deposition.

| Month | N | Enlarged follicles > 4 mm | Oviductal eggs | Embryos |
|---|---|---|---|---|
| March | 1 | 0 | 1 | 0 |
| June | 20 | 6 | 11 | 3 |
| July | 2 | 0 | 1 | 1 |
| September | 1 | 0 | 1 | 0 |
| *December | 7 | 0 | 5 | 2 |

A cut was made in the lower abdominal cavity and the left testis or ovary was removed, embedded in paraffin, cut into 5-µm sections and stained by Harris hematoxylin, followed by eosin counterstain. Histology slides were deposited at LACM.

All examined *T. ellioti* males were undergoing sperm formation (spermiogenesis). The lumina of the seminiferous tubule were lined by groups of sperm or clusters of metamorphosing spermatids. The smallest reproductively active male measured 55 mm SVL (LACM 60796) and was from September. Males undergoing spermiogenesis by month were: March (N = 1), June (N = 7), September (N = 4), December (N = 2).

Reproductively active *T. ellioti* females were present in all months examined (Table 1). The smallest reproductively active females measured 58 mm SVL: LACM 38768 (7 oviductal eggs); LACM 38789 (10 oviductal eggs); LACM 38791 (14 oviductal eggs). One slightly smaller female (LACM 60793, SVL = 53 mm) was not reproductively active and was considered a subadult. Mean litter size (N = 31) was 10.1 ± 2.1 SD, range = 6–14. Linear regression analysis indicated the relation between female size (SVL) and litter size was not significant ($r = 0.33$, $P = 0.071$).

From the above, it is apparent *T. ellioti* has a prolonged reproductive cycle and has potential for production of multiple litters. While the number of litters produced in wild populations is not known, captive *T. ellioti* females can produce up to five litters in one year. Also, the ability to store sperm (Leptien 1989, *op. cit.*) will facilitate production of multiple litters.

I thank G. Pauly (LACM) for permission to examine *T. ellioti*.

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***URANOSCODON SUPERCILIOSUS* (Diving Lizard). REPRODUCTION.** *Uranoscondon superciliosus* is a medium-size arboreal lizard, endemic to the Amazon Biome in Bolivia, Brazil, Colombia, French Guiana, Peru, Suriname and Venezuela (Avila-Pires 1995. Lizards of Brazilian Amazonia. Zool. Verh. Leiden 299:1–706; Ribeiro 2015. Zootaxa. 3983:1–110). It is commonly found in igapo and varzea forests, and also occurs in riparian habitat along streams in terra firme forest (Howland et al. 1990. Can J. Zool 68:1366–1373; Vitt et al. 2008. Guide to the Lizards of Reserva Adolpho Ducke, Central Amazonia. Attema Design Editorial Ltda, Manaus, 180 pp.). The species has an extended breeding period, with oviposition from July through December, and its clutch size varies from


Fig. 1. Reproductive aspects of *Uranoscondon superciliosus* from UFAM, Manaus, Brazil. A) Female laying eggs in a sandy soil substrate; B) detail of nest with the deposited eggs; C) embryo in stage 39 of development; D) hatchling of *U. superciliosus* following 99 days of incubation.

3–16 eggs (Howland et al., *op. cit.*; Brandt and Navas 2017. PLoS ONE 6:1–7). Although *U. superciliosus* is a common lizard in Amazonia, many aspects of its reproductive biology are unknown, such as oviposition behavior and duration of embryo development. Here we show new data related to the oviposition and incubation period, nest dimensions, clutch and embryonic development, as well as morphometrics of hatchlings from Brazilian Central Amazonia.

On 21 May 2018 at 1404 h, during our regular caiman radio-telemetry fieldwork, we found a female of *U. superciliosus* laying eggs (Fig. 1) in the middle of a trail (1 m width) covered with a fine sandy soil substrate, 17.3 m away from a small stream (igarapé). This trail generally is used for tracking, bike, and motorcycle activities. The site is located in a 711-ha urban forest fragment at Federal University of Amazonas (UFAM), Manaus, Brazil (03.09978°S, 59.96886°W, WGS 84; 62 m elev.), which represents around 84% of the Área de Proteção Ambiental (APA) UFAM. On 20 July 2018, 59 days after oviposition, we opened the nest and measured the eggs. The dimensions of the nest were 7 x 7.5 cm wide at a depth of 6.5 cm. We found eight eggs, the first 2.0 cm below the surface. Eggs were 17.4–19.5 mm wide (mean = 17.9 ± 0.07 mm) and 26.8–30.7 mm long (mean = 28.9 ± 0.15 mm), with a mass of 5–6 g (mean = 5.75 ± 0.5 g). One of the eggs was opened revealing a late-stage embryo (SVL = 25.4 mm; tail length = 41.5 mm; 1 g). A few days later (16 August 2018), we returned to the nest site and transported the seven remaining eggs with the nest substrate to the Zoology Laboratory at UFAM. On 30 August, six hatchlings emerged with the following measurements: SVL = 41–42.7 mm (mean 42.1 ± 0.6 mm); tail length = 75–81.9 mm (mean 78.7 ± 2.3 mm); and mass = 2.5 g. Hoogmoed (1973. Biogeographica 4:1–419) found different oviposition sites of *U. superciliosus* in Surinam: 3.6 m above ground in a tree hollow, and in a ground burrow (similar to the oviposition site that we found at UFAM).

Egg size and mass n the present study were bigger than those described for a population along the Xingu River in Brazil (21.3 x 11.2 mm and 1.37 g wet mass) (Howland et al., *op. cit.*). However, these differences might be attributed to the fact that Howland's sample was obtained from formalin-fixed specimens (Howland et al., *op. cit.*). The oviposition period of *U. superciliosus* reported here corresponds to the end of the rainy season in Central Amazonia, and is earlier than suggested by Howland et al. (*op. cit.*), and should continue until the end of the dry season. In Surinam, this species probably reproduces throughout the year (Hoogmoed 1973, *op. cit.*), but more data are necessary to determine whether this reproductive pattern is geographically widespread. We classified the 59-day old embryo at stage 39, following the table of post-ovipositional development for another tropidurid species, *Tropidurus torquatus* (Py-Daniel et al. 2017. Anat. Rec. 300:277–290). This stage is characterized by the presence of egg tooth, pigmentation becoming more distinct along the dorsal surface, and claws fully formed. The incubation period for our sample was 99 days, slightly shorter than published estimates, of 101–105 days (Avila-Pires, *op. cit.*). From these data we can infer that the earlier stages of development (from 28–39) last approximately 59 days and the final stages (40–42, just before hatching) can last 40–46 days. Our work increases the knowledge of *U. superciliosus* natural history in an urban area of Central Amazonia and provides the first record of the ovipositional development for the species.

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***XENOSAURUS GRANDIS*** **(Knob-scaled Lizard). EYE COLOR VARIANT.** *Xenosaurus grandis* is a medium-sized lizard (to 120 mm snout–vent length) endemic to Guatemala and Mexico (Lemos-Espinal et al. 2012. Family Xenosauridae in Mexico. ECO / Serpent's Tale, Rodeo, New Mexico. 106 pp.). The diagnostic coloration is dark brown or black edged with crossbands on a brown ground color, a V-shaped nape blotch, venter usually with distinct dark spots or bars, and red eyes (Lemos–Espinal et al., *op. cit.*).

At 0025 h on 11 October 2015, in the Matzinga municipality of Tlilapan, Veracruz, Mexico (18.8046°N, 97.0950°W, WGS 84;

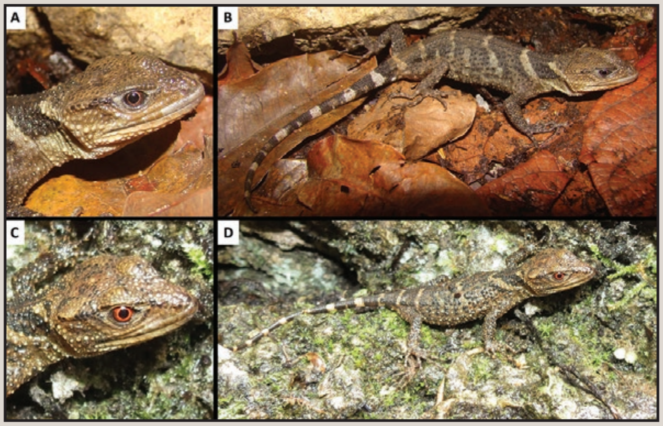


Fig. 1. A–B) Juvenile *Xenosaurus grandis* with uncommon eye color variant (brown); and, C–D) juvenile *X. grandis* with typical eye coloration (red).

1189 m elev.), we found a population of *X. grandis* in a patch of secondary vegetation. We observed 12 individuals (3 adult males, 7 adult females, and 2 juveniles). All individuals displayed the characteristic morphology and coloration patterns previously reported, with the exception of one subadult individual with brown eyes (Fig. 1). We did not collect the lizard, but deposited a photo voucher in the Unversity of Texas at Arlington Collection of Vertebrates Digital Collection (UTADC-9171). This note represents the first report of the brown eye color variant in *X. grandis*.

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## SQUAMATA — SNAKES

***AGKISTRODON PISCIVORUS* (Northern Cottonmouth). REPRODUCTION / COPULATION FOLLOWING PARTURITION.** Pitviper courtship, copulation, and combative behaviors are well documented (Burkett 1966. Univ. Kansas Publ. Mus. Nat. Hist. 17:435–491; Martin 1984. Copeia 1984:772–774); however, to our knowledge, these behaviors have not been recorded at parturition sites immediately following birth. We observed the following during a long-term study of *Agkistrodon piscivorus leucostoma* in northeastern Texas.

On 1 September 2017, at 1110 h, we radio-tracked a female *A. p. leucostoma* to a pile of woody debris and litter where parturition had occurred the previous day. This female had been accompanied by another telemetered male since 28 August 2017. On 2 September 2017 at 0932 h we observed the accompanying male courting the same female at her parturition site. The male exhibited rapid tongue flicking (92 flicks/min), chin pressing, and body rubbing. This courting behavior continued until 0951 h when the male mounted the female, had a successful tail search and cloacal apposition, and started breeding her directly next to one of the female's neonates. At 1029 h the female very slowly retreated under the pile of woody debris and litter while the male continued to mount the female and make sporadic convulsive head movements. Observations on this copulating pair stopped at 1040 h. On 2, 3, and 5 September 2017 we observed 4 other similar instances of either courtship, copulation, or both within 5 days after a female's birth at her parturition site. On 5 September 2017 at 1224 h we also observed two male *A. p. leucostoma* in a combative dance 4.3 m away from a female's parturition site just 2 days after she had birthed. This combative dance continued past 1320 h when we ceased observations.

Female parturition could be a copulation inducing event for cottonmouths within our study sites, as we never observed courting, copulatory, or agonistic behaviors before a participating female's parturition in any of our 40 telemetered snakes. Gravid female *A. p. leucostoma* may be receptive shortly after parturition in the fall, resulting in males finding females at their parturition sites and copulating there. Other past research has found *A. piscivorus* to mate in the late summer/early fall (Graham et al. 2008. Gen. Comp. Endocrinol. 159:226–235), which coincides with their birthing season (Hill and Beaupre 2008. Copeia 2008:105–114).

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***ARGYROGENA FASCIOLATA* (Banded Racer). REPRODUCTION / CLUTCH SIZE.** *Argyrogena fasciolata* is a common colubrid snake occurring in India and also reported from Sri Lanka,

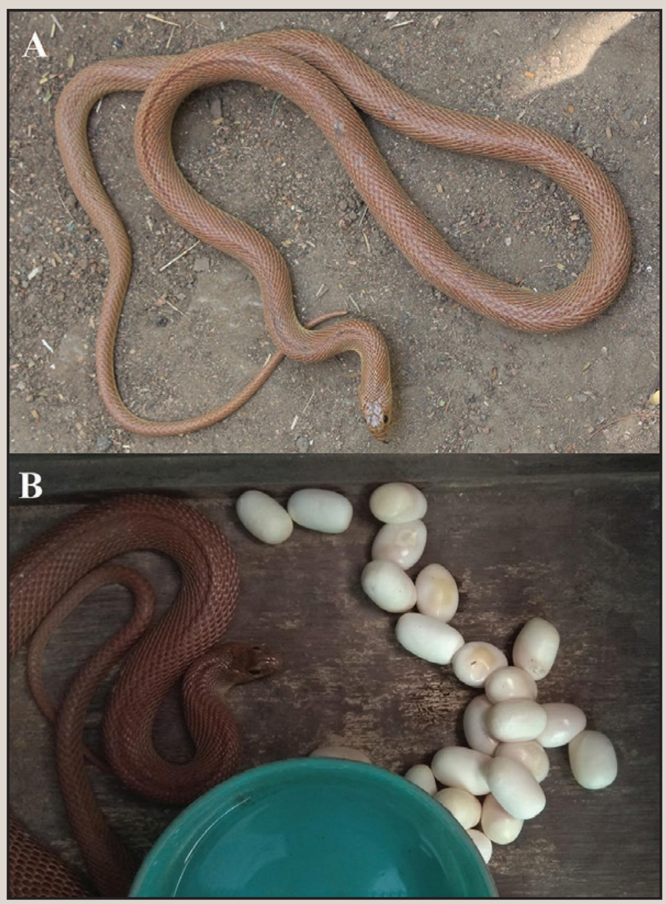


Fig. 1. A) Female *Argyrogena fasciolata*; B) *A. fasciolata* with clutch of 22 eggs.

Pakistan, Nepal and Bangladesh (Uetz et al. 2018. The Reptile Database. http://www.reptile-database.org; accessed 20 September 2018). Though a wide-ranging species of South Asia, scant information is available about its natural history and reproduction. *Argyrogena fasciolata* is known to lay a clutch of up to six eggs (Whitaker and Captain 2004. Snakes of India, The Field Guide. Draco Books, Chennai, India. 495 pp.); however, a large female (total length = 180 cm) from Bhavnagar, Gujarat had 23 embryos (Vyas 1987. J. Bombay Nat. Hist. Soc. 84:227–231). Herein, we report a maximum clutch size in this species.

One female *A. fasciolata* (Fig. 1A; SVL = 109.3 cm) was rescued at ca. 1030 h on 20 March 2018, from a suburban residential complex in Surat, Gujarat, India (21.1530°N, 72.7719°E; WGS 84). Within two hours of rescue, it laid 22 white leathery eggs (Fig. 1B; mean length = 29.5 mm ± 1.9 SD, range = 26.8–34.7 mm; mean diameter = 19.7 mm ± 1.4 SD, range = 16.5–22.4 mm). The eggs were kept separate in a pot with coco peat and sandy clay in dark place at room temperature, but none of them survived due to fungal infection. Twenty-two is the new maximum confirmed clutch size for *A. fasciolata* at oviposition.

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***BOTHROCOPHIAS MICROPHTHALMUS*** **(Small-eyed Toad-headed Pitviper). DIET.** During an ongoing investigation of *Bothrocophias microphthalmus* natural history we examined stomach contents and recorded several notable observations related to diet in the field. We examined the stomach contents of seven *B. microphthalmus* specimens (MECN 600, 2235, 7030, 9238, 9359, 10206, 12351) from the Museo Ecuatoriano de Ciencias Naturales in Quito, Ecuador. Museum specimens were obtained from five sites on the eastern Andean slopes of Ecuador. Stomach contents of three additional specimens were analyzed in the field, turning up nothing more than leaf matter in one snake's digestive track. We found prey organisms in the stomach of only one of the seven museum specimens, an individual collected in the Río Anzu region of Ecuador. Two species of amphibians (Fig. 1) were found—a mostly intact *Hypsiboas almendarizi*, consumed posterior first, and the anterior extremities of a *Hypsiboas lanciformis*.

One dietary observation was recorded in the field. A young, emaciated *B. microphthalmus* (total length ca. 30 cm) was observed at 1907 h on 25 November, 2015 striking at a flying insect (ca. 3–5 cm long), which appeared to be some member of the order Blattodea or Orthoptera. The snake, ostensibly catching the insect, then contorted its neck as though swallowing. This observation was made in low light, at a distance of approximately 5 m, and the snake's stomach contents were not inspected. We suspect this snake was acting out of desperation to obtain this unusual prey item, although other species of pitvipers are known to depredate insects and other invertebrates (Mengak 2009. Nat. Hist. Series 1–3; Arsovski et al. 2014. Ecologica Montenegrina 1:6–8; Hamanaka et al. 2014. Bull. Herpetol. Soc. Japan 167–181; Shi et al. 2017. Amphibia-Reptilia 38:517–532).

The only previously reported prey items taken by *B. microphthalmus* are *Marmosops noctivagus* (White-bellied Slender Mouse Opossum), an unspecified species of tegu, and a treefrog. However, other members of the genus *Bothrocophias* have been documented consuming a variety of vertebrate animals, including rodents, treefrogs, other snakes, and various lizards (Prado and Hoge 1947. Mem. Inst. Butantan 20:283–296; Cisneros-Heredia et al. 2006. Herpetozoa 19:17–26; Bernarde et al. 2008. Herpetologica 39:353). The confirmed prey items consumed by *B. microphthalmus* are nocturnal, however, in the present study we observed individuals actively foraging and in ambush position during the day. Of 27 wild *B. microphthalmus* observed, 13 were in ambush position, herein defined as a stationary posture with the head atop or in front of the snake's coil, and the body immediately posterior to the head winding back and forth such that the snake can spring forward at any moment. Of those 13 snakes, we encountered 11 during the day; however, six snakes were observed in ambush position during both the day and night. More dietary data are needed, however, given the wide range of prey items taken by other members of the genus and our observations of *B. microphthalmus* ambush behavior, we conjecture that these snakes are opportunistic hunters that likely feed on a diversity of organisms.

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PHOTO BY JUAN PABLO REYES


Fig. 1. *Hypsiboas almendarizi* (top) and *Hypsiboas lanciformis* (bottom) recovered from the stomach of a *Bothrocophias microphthalmus.*

***BOTHROPS ALTERNATUS*** **(Urutu). ARBOREAL HABITAT USE.** *Bothrops alternatus* is a widely distributed viperid species, occurring in central, southeastern, and southern Brazil, to Paraguay, Uruguay, and Argentina (Campbell and Lamar 2004. Venomous Reptiles of the Western Hemisphere. Comstock Publishing Associates, Ithaca, New York. 870 pp.). *Bothrops alternatus* has a well-known natural history, presenting nocturnal habits and exclusively terrestrial macrohabitat use (Martins et al. 2001. J. Zool. 254: 29–538; Marques et al. 2016. Serpentes do Cerrado: Guia. Holos, Ribeirão Preto. 284 pp.).

At 1700 h on 4 March 2018, we encountered a newborn male *B. alternatus* (CHFURG 5777; SVL = 260 mm, tail length = 40 mm, head length = 22 mm, 16.6 g), coiled in a sit-and-wait position


FIG. 1. A–B) Juvenile *Bothrops alternatus* exhibiting arboreal habitat use over vegetation.

over tangled vegetation (Fig. 1) composed of *Schinus polygamus* (Sapindales: Anacardiaceae) and *Daphnopsis racemosa* (Sapindales: Thymelaeaceae) trees, ca. 90 cm above the ground, at Rio Grande (32.0350°S, 52.0986°W, WGS 84; elev. 0 m), Pampa biome, Rio Grande do Sul, southern Brazil. This represents the first known record of arboreal habitat use by *B. alternatus*; we believe that the juvenile may have been foraging for *Boana pulchella*, which we encountered in the same bush. We thank William Krack Matzenauer for identifying the aforementioned plant species.

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***BOTHROPS MOOJENI* (Caiçaca, Brazilian Lancehead). HABITAT.** *Bothrops moojeni* is a medium-sized snake in the family Viperidae, found in riparian forests in the Cerrado Biome of Brazil (Nogueira et al. 2003. J. Herpetol. 37:653–659). Arboreal habitat use has been recorded in juveniles of the species (Nogueira et al., *op. cit.*) but it is unusual among adults (Sawaya et al. 2008. Biota Neotrop. 8:127–149). Here we report an encounter of a *B. moojeni* in ambush position in arboreal habitat in the Cerrado of central Brazil.

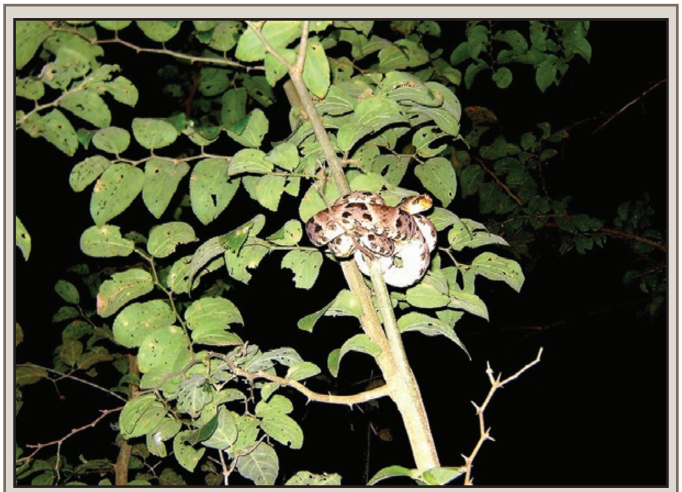

FIG. 1. *Bothrops moojeni* at 250 cm high in a tree.

At 2315 h on 22 March 2012, during an active search within gallery forest in the municipality of Barro Alto, state of Goiás, Brazil (15.066117°S, 49.013217°W, WGS 84; 1130 m elev.), an adult male (total length = 70.0 cm) *B. moojeni* was sighted at the top of a tree at a height of 250 cm (Fig. 1). The snake may have been attracted to a Sherman trap placed in the tree, which was impregnated with the smell of small mammals.

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***BUNGARUS CAERULEUS* (Common Krait). COLORATION and DIET.** We encountered a leucistic *Bungarus caeruleus* at Patharakali area of Bhadrak district, Odisha, India (21.0847°N 86.5223°E, WGS 84; elev. 19 m) on 20 September 2018 at 1715 h. The krait (ca. 104 cm total length) was found feeding on an *Argyrogena fasciolata* (Banded Racer; ca. 100 cm total length) in the backyard of a house. The *B. caeruleus* bit the live prey behind the neck and it struggle for ca. 3 min. until subdued by venom. The prey was swallowed headfirst over the course of 9 min.

Snakes, lizards, frogs, and small mammals are common diet items of kraits (Whitaker and Caption 2004. Snakes of India. Macmillan India Ltd., New Delhi. 354 pp). Cannibalism and scavenging are also known in this species (Smith 1913. J. Bombay Nat. Hist. Soc. 23:373; Mohapatra 2011. Herpetol. Rev. 42:436–


FIG. 1. Leucistic *Bungarus caeruleus* feeding on an *Argyrogena fasciolata.*

437; Deshmukh et al. 2016. ICRF Reptiles and Amphibians 23:169–170; Chowdhury 2017. Herpetol. Rev. 48:856–857 pp; Debata 2017. Herpetol. Rev. 48:857). To our knowledge, this is the first report of *B. caeruleus* feeding on *A. fasciolata* in nature.

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***CEMOPHORA COCCINEA* (Scarletsnake). FORAGING BEHAVIOR.** *Cemophora coccinea* is a nocturnal and semi-fossorial snake generally restricted to the southeastern United States. The species may be locally abundant in some regions (Nelson and Gibbons 1972. Copeia 197:582–584) and typical habitats include hardwood, mixed, or pine woodlands as well as contiguous open areas with sandy or rich well-drained soil (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Press, Washington, D.C. 680 pp.). *Cemophora coccinea* feed largely on the eggs of other reptiles and have been observed piercing through eggs that are too large to swallow whole (Ernst and Ernst 2003, *op. cit.*); herein we describe five observations of *C. coccinea* inside newly deposited nests (i.e., nests deposited within the past 24 h) of the federally-threatened *Caretta caretta* (Loggerhead Sea Turtle) in a manner consistent with predatory behavior.

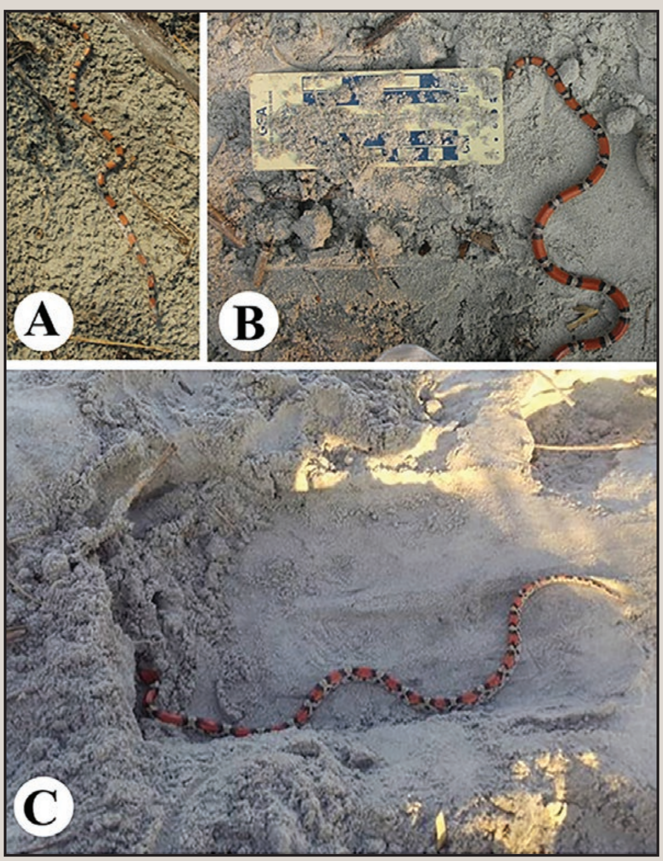


Fig. 1. Three different *Cemophora coccinea* found in freshly deposited *Caretta caretta* nests on St. Catherines Island, Georgia, USA, on 19 June 2011 (A), 21 June 2011 (B), and 16 June 2017 (C).

Fig. 2. A *Cemophora coccinea* found burrowing in a freshly deposited *Caretta caretta* nest on Jekyll Island, Georgia, USA, on 22 July 2016.

On 19 and 21 June 2011, during an ongoing sea turtle monitoring program, two different adult *C. coccinea* were found within the subterranean egg chambers of separate *C. caretta* nests on St. Catherines Island, Georgia. An additional observation of a *C. coccinea* within a *C. caretta* egg chamber on St. Catherines Island was made on 16 June 2017 (Fig. 1). An adult male *C. coccinea* (SVL = 442 mm, Tail Length = 81 mm, 39.5 g) was found burrowing in a *C. caretta* egg chamber on Jekyll Island, Georgia, at 0633 h on 22 July 2016 (Fig. 2). This nest was deposited directly along the beach's wrack line and was 13 m landward from the previous nights' high tide line and 0.4 m landward from the primary vegetation line. Finally, an adult *C. coccinea* was found on 2 July 2018 burrowing 28 cm below the surface sand in a *C. caretta* nest on Ossabaw Island, Georgia. Although we did not confirm that the snakes we observed inside the egg chamber of *C. caretta* nests were engaging in predatory behavior, we believe this is the most likely explanation. In addition to these observations, we have seen *C. coccinea* within barrier island dunes on several occasions, though we know little of their ecology in these habitats or their relationship to the sea turtles that also use them.

Field research was carried out under Georgia Department of Natural Resources Scientific Collecting Permit (#29-WJH-16-24, CN 14265), issued to Terry M. Norton.

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***CERROPHIDION TZOTZILORUM* (Tzotzil Montane Pitviper). DIET.** *Cerrophidion tzotzilorum* is a small New World pitviper endemic to the high elevations (2050–2500 m elev.) of the Central Plateau of Chiapas, Mexico (Campbell and Lamar 2004. The Venomous Reptiles of the Western Hemisphere. Comstock Publishing Associates, Ithaca, New York. 870 pp.; Jadin et al. 2012. Zool. Scripta 41:455–470). Little is known regarding the diet of the species due to its restricted range and the



Fig. 1. Undescribed *Stenopelmatus* sp. Burmeister, 1838 (Orthoptera: Stenopelmatidae) preyed upon by *Cerrophidion tzotzilorum* (UIMNH 93941).

rarity of specimens (Jadin 2007. Southwest. Nat. 52:437–438). Consequently, only *Sceloporus variabilis* (Rosebelly Lizard), *Scincella incerta* (Stuart's Forest Skink), and an orthopteran (Acrididae) have been documented as prey of *C. tzotzilorum* (Jadin, *op. cit.*). We examined the stomach contents of three *C. tzotzilorum* specimens within the University of Illinois Museum of Natural History Herpetology Collection (UIMNH), which were previously misidentified as *C. godmani* (Godman's Montane Pitviper).

Of the three *C. tzotzilorum* specimens, two contained prey remains. Both specimens were collected by W. F. Burley, J. Fawcett, and T. H. Fritts 16 km southeast of San Cristóbal de las Casas along Hwy 190 in Chiapas, México (16.64°N, 92.54°W, WGS 84; 2375 m elev.) during 1966. The first specimen, a male *C. tzotzilorum* (UIMNH 93940; SVL = 269 mm; total length = 203 mm), was collected on 7 July 1966 and contained the remains of two undescribed Jerusalem crickets (Orthoptera: Stenopelmatidae: *Stenopelmatus*) in its stomach. We found two heads, an abdomen, a pronotum, mandibles, and fragments of the legs. The other specimen (UIMNH 93941; SVL = 320 mm; total length = 363), also a male, was collected on 1 August 1966. The same undescribed Jerusalem cricket species (*Stenopelmatus* sp.) was also found in the stomach of this snake. In this instance, the orthopteran body was complete with a head to abdomen length of 38.53 mm (Fig. 1). All prey remains were deposited in the Illinois Natural History Survey Insect Collection (INHS Insect Collection 839001 and 839002).

Orthopterans represent the most frequent prey item taken by *Cerrophidion godmani s.s.*, representing 46.1% of their diet (Campbell and Solórzano 1992. *In* Campbell and Brodie [eds.], Biology of the Pitvipers, pp. 223–250. Selva, Tyler, Texas). Furthermore, Jerusalem crickets (*Stenopelmatus* spp.) comprise approximately half (49.6%) of the orthopterans taken by *C. godmani* – 22.9% of the total prey base (Campbell and Solórzano 1992, *op. cit.*). It appears *Stenopelmatus* may also be an important food source for *C. tzotzilorum* and is likely consumed during all life stages as observed in *C. godmani* (Campbell and Solórzano 1992, *op. cit.*).

We thank Sam W. Heads for examining the orthopteran prey and aiding in their identification. Equally, we acknowledge W. F. Burley, J. Fawcett, and T. H. Fritts for collecting the specimens and contributing novel data to the natural history of *Cerrophidion tzotzilorum*.

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***CONIOPHANES SCHMIDTI* (Schmidt's Black-striped Snake). DIET.** *Coniophanes schmidti* is a medium-sized terrestrial snake (350–410 mm SVL) endemic to the Yucatán Peninsula, with crepuscular and nocturnal habits (Lee 2000. A Field Guide to the Amphibians and Reptiles of the Maya World. Cornell University Press, Ithaca, New York. 402 pp.). The diet of this species is poorly known, but it has been suggested to feed mostly on anurans and lizards (Lee 2000, *op. cit.*). In Belize, an adult individual was found with a bird egg in its stomach, and another was seen feeding on an *Incilius valliceps* (Common Toad) (Platt et al. 2016. Mesoamerican Herpetol. 3:162–170), whereas specimens from Chetumal, Mexico were found with undigested parts of arthropods, parts of a banded gecko (*Coleonyx elegans*) and one reptile egg (probably *Norops sagrei*) in their guts (Köhler et al. 2017. Mesoamerican Herpetol. 4:527–542).

On 17 July 2018, at night, we found a road-killed adult (385 mm SVL) *C. schmidti* near Tres Garantías, Quintana Roo, Mexico (18.2209°N, 89.0391°W; WGS 84). After dissection in the laboratory, a partially digested body of *Trachycephalus typhonius* was found in the stomach (Fig. 1). We identified the frog by comparing the size and characteristics of its posterior appendages with those of preserved specimens of arboreal frogs deposited in the herpetological collection of El Colegio de la Frontera Sur, Unidad Chetumal. To our knowledge, this represents the first record of an arboreal frog preyed on by *C. schmidti*.

The snake is housed in the above-mentioned herpetological collection (ECO-CH-H-4433) and was collected under permit #SGPA/DGVS/002491/18 issued by SEMARNAT to Fausto R. Méndez de la Cruz, with an extension to JRCV. We thank John

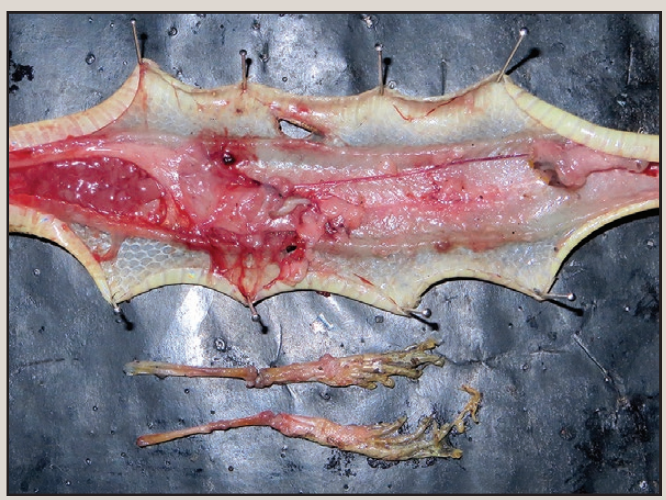

Fig. 1. Partially digested body remains of *Trachycephalus typhonius* (below) removed from the stomach of a *Coniophanes schmidti* (above).

D. Willson and Andrew M. Durso for kindly reviewing a draft of this note.

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***CROTALUS ADAMANTEUS* (Eastern Diamond-backed Rattlesnake). GROWTH RATE.** *Crotalus adamanteus* is endemic to the southeast United States and inhabits inland sandhill habitat as well as the coastal plain and barrier islands. There are few published data on growth rates of pre-reproductive *C. adamanteus*. Based on Means (2017. Diamonds in the Rough: Natural History of the Eastern Diamondback Rattlesnake. Tall Timbers Press, Tallahassee, Florida. 389 pp.) and populations from Little Saint Simons Island, Georgia, USA and Tall Timbers, Tallahassee, Florida, USA, the average size of neonates is SVL = 34.7 cm with a mass of 43.0 g, and adults reach ca. SVL = 120–140 cm. This growth is achieved over multiple years, with the fastest growth occurring in the first year and snakes reaching maturity at around four years of age (Means 2017, *op. cit.*).

The population of *C. adamanteus* on Jekyll Island, Georgia, USA, has been monitored since 2011. Through this study we have learned that *C. adamanteus* using the marsh habitat are highly successful at foraging (unpubl. data). On 9 September 2015, a litter of 15 rattlesnakes was found (three neonates were observed deceased) with their mother, a telemetered snake that we have confirmed to use the marsh habitat. All neonates were measured and marked with passive integrative transponder (PIT) tags. At the time of capture, one of the male neonates had a mass of 42.8 g (SVL = 33.9 cm; tail length = 3.5 cm). On 20 September 2016, just over one year later, this snake was recaptured less than 0.5 m from his mother. The snake's new mass at 12 months of age was 700.0 g (SVL = 86.0 cm; tail length = 9.0 cm) (Fig. 1); additionally, this snake had six rattle segments. A radiograph of the snake confirmed that this snake was the same individual and not an act of cannibalism of the yearling by another individual.

To our knowledge, this is the fastest growth rate reported for *C. adamanteus*. The snake had gained 657.2 g, an approximately 15-fold (1536%) increase in mass, and had almost tripled in SVL, with a gain of 52.1 cm over one year. In a captive study of head-started neonate *C. horridus*, individuals gained an average of 35.23 g/month (Conner et al. 2003. Herpetol. Rev. 34:314), substantially less that our wild *C. adamanteus* (54.77 g/month).

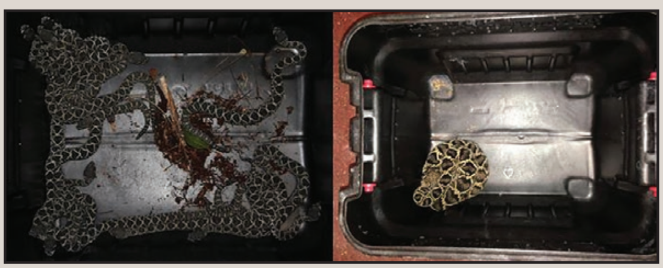

FIG. 1. Left: Litter of *Crotalus adamanteus* captured on 9 September 2015 on Jekyll Island, Georgia, USA, including the neonate male of interest. Right: male *C. adamanteus* recaptured one year later, on 20 September 2016.

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***CROTALUS DURISSUS* (Neotropical Rattlesnake). PREDATION.** The Crab-eating Fox (*Cerdocyon thous*) is a medium-sized canid that feeds on a variety of animals, including snakes (Bueno and Motta-Junior 2004. Rev. Chil. Hist. Nat. 77:5–14; Gatti et al. 2006. Mammalia 70:153–155). Studies in Brazil revealed the consumption of snakes of the families Colubridae and Viperidae by *C. thous* (Rocha et al. 2004. Rev. Bras. Zool. 21:871–876; Rocha et al. 2008. Rev. Bras. Zool. 25:594–600; Bianchi et al. 2014. Acta Theriol. 59:13–23), but it is not usually possible to identify these prey animals to species level (Olmos 1993. Mammalia 57:126–130; Motta-Junior et al. 1994. Mammalia 58:156–159). Here we report a specimen of *Crotalus durissus* (Viperidae) found in feces of *C. thous*.

On 14 June 2018 we found scales of a snake in a *C. thous* fecal sample (Fig. 1) that we identified as *C. durissus* by comparison to reference material for the locality, deposited in the Herpetological Collection of the Universidade Federal de Sergipe [CHUFS], and later confirmed with a specialist. The material was collected in strictly protected conservation area, Grota do Angico Natural Monument (9.65°S, 37.67°W; WGS 84), located in the municipalities of Poço Redondo and Canindé de São Francisco, Sergipe, Brazil. The area is located in the Caatinga biome and characterized by hyper-xerophyllous deciduous forest (Dias and Bocchiglieri 2016. Mammalia 80:281–291). Other animals have been recorded feeding on rattlesnakes, such as other snakes (e.g., Germano 1997. Herpetol. Rev. 28:90; Enderson 1999. Sonoran Herpetol. 12:72–73), mammals such as opossums and felids (Almeida-Santos et al. 2000. Curr. Herpetol. 19:1–9; Vanderpool 2005. Herpetol. Rev. 36:191–192), and raptors (Holycross et al. 2001. Southwest. Nat. 46:363–364). This is the first occurrence of *Crotalus durissus* predation by *Cerdocyon thous*.

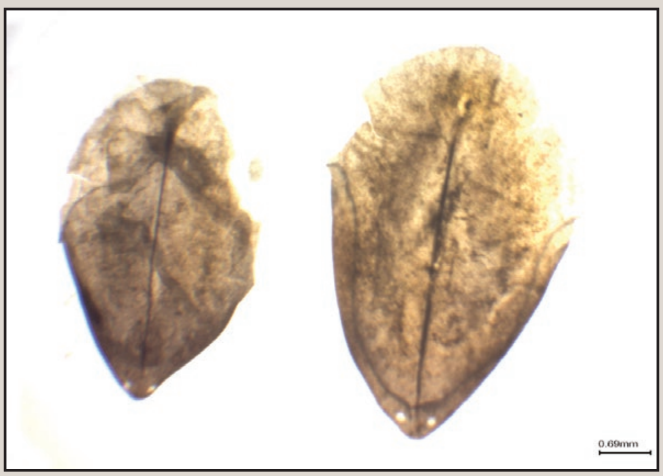

FIG. 1. Scales of *Crotalus durissus* found in *Cerdocyon thous* feces.

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***CRYPTELYTROPS MACROPS*** **(Big-eyed Viper). DEFENSIVE TAIL DISPLAY.** More than 26 species of snakes have previously been identified to display conspicuous defensive tail movement when confronted by threat of predation (Greene 1973. J. Herpetol. 7:143–161). Herein, we present the first in-depth direct behavioral response observation of defensive tail display for *Cryptelytrops macrops*.

On 8 August 2018, at 0820 h, an adult *C. macrops* was observed on a small (< 3 m width) paved road in rural Pak Chong, Nakhon Ratchasima Province, Thailand (14.61918°N, 101.41315°E, WGS 84; 341 m elev.). Body plan and presence of postocular white stripe suggested the individual to be an adult male (Strine et al. 2015. Amphibia-Reptilia. 36:1–12). Upon our approach, the *C. macrops* vibrated the tip of its tail rapidly against the ground. Duration of continuous defensive tail movement exceeded 30 sec without pause during the longest bout, with the tip of the tail making contact with the ground more than 25 times in 5 sec. Interestingly, the head was extended while displaying defensive tail movement (Fig. 1). After several minutes, the viper appeared agitated and struck multiple times. The viper struck with the head drawn into the body and then rapidly extended the head and neck for the strikes (Fig. 2). After the observation was considered summarized (< 5 min.), the viper was allowed to freely move off the road.

Previous study has observed comparatively few instances of arboreal snakes demonstrating defensive tail display. The tails of *C. macrops* are brown or reddish- brown, which contrasts sharply with the green dorsal body coloration and suggests defensive tail display may serve as a diversion or warning behavior for the species.

Fig. 1. Adult male *Cryptelytrops macrops* performing defensive tail display (tail raised in mid- motion).

Fig. 2. Adult male *Cryptelytrops macrops* demonstrating typical defensive response with head tucked in just before throwing neck and head rapidly forward for several strikes, following the tail display.

We thank Suranaree University of Technology for supporting our ongoing research studying the ecology of venomous snakes living in human-dominated landscapes.

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***DIADOPHIS PUNCTATUS*** **(Ring-necked Snake). PREDATION.** *Diadophis punctatus* are small, secretive snakes that are widely distributed across North America, usually inhabiting woodlands, open spaces near woodlands, or stabilized dunes (Harding 1997. Amphibians and Reptiles of the Great Lakes Region. University of Michigan Press, Ann Arbor, Michigan. 378 pp.; Ernst and Ernst 2002. Snakes of the United States and Canada. Smithsonian Institution Press, Washington, D.C. 661 pp.). They are vulnerable to predation by a diversity of larger vertebrates, including some fish (e.g., *Salmo trutta*; Ernst and Ernst, *op. cit.*).

At 1000 h on 19 July 2018, in Lake Superior, 8.85 km off the coast of Shelter Bay, AuTrain Township, Michigan, USA (46.53917°N, 86.86278°W; WGS 84), I caught a *Salvelinus namaycush* (Lake Trout) whose stomach contents later revealed two *D. punctatus* (Fig 1.; Image Number 1296 in the UMMZ Division of Reptiles and Amphibians Digital Image Database). This is the first report of *D. punctatus* being preyed upon by *S. namaycush*. Large predatory salmonids may eat small snakes with some regularity.

I thank David Mifsud, James Harding, and José G. Martínez-Fonseca for species identification and helpful discussion, and Paul Muelle for field assistance.


Fig. 1. Stomach contents of *Salvelinus namaycush*, including two *Diadophis punctatus*.

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***DIADOPHIS PUNCTATUS*** **(Ring-necked Snake). DIET.** *Didadophis punctatus* is a small colubrid species that ranges from southeastern Canada across the United States, reaching the Transmexican Volcanic Belt in central Mexico. In Chihuahua, it can be found throughout the Sierra Madre Occidental (Lemos-Espinal et al. 2015. Anfibios y Reptiles de Sonora, Chihuahua y Coahuila, México. CONABIO, México. 714 pp.). This species feeds on a wide range of prey, including salamanders, anurans, lizards, earthworms, and small squamates (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian

Fig. 1. Preserved specimen of *Diadophis punctatus* and *Thamnophis* sp. prey regurgitated after capture.

Fig. 1. *Dolichophis caspius* measuring 203 cm in total length captured in the vicinity of Burgas city, southeastern Bulgaria, and its habitat.

Books, Washington, DC. 680 pp.), including snakes in the genus *Thamnophis* (O'Donnell et al. 2007. Toxicon 50:810–815). On 18 June 2018, at 1230 h, an adult *D. punctatus* (SVL = 39.8 cm; tail length = 10.2 cm; preserved mass = 18 g; Fig. 1) was found under a rock on a hill in pine-oak forest in southwestern Namiquipa, Chihuahua, Mexico (28.78455°N, 107.46266°W; WGS 84). The snake was collected and held in a plastic container. Approximately one hour later, we found that it had regurgitated a small *Thamnophis* (total length = 9.4 cm; preserved mass = 2 g; Fig. 1). Due to partial digestion of the specimen, the specific identity of the prey could not be determined, but based on Lemos-Espinal et al. (*op. cit.*) and knowledge of snake diversity of the area, it is likely to be *T. cyrtopsis* or *T. eques*. Both specimens, *D. punctatus* (CH-155) and *Thamnophis* sp. (CH-164) are deposited at the scientific collection of the Natural Resources Department of the Facultad de Zootecnia y Ecología of the Universidad Autónoma de Chihuahua. We thank Eric Centenero Alcalá for his help and assistance in writing this note.

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***DOLICHOPHIS CASPIUS* (Caspian Whipsnake). MAXIMUM SIZE.** *Dolichophis caspius* is the longest snake in Bulgaria and to date, only two individuals with a total length > 200 cm have been captured in Bulgaria (Stojanov et al. 2011. Die Amphibien und Reptilien Bulgariens. Chimaira, Frankfurt am Main. 586 pp.). One of the specimens was a female measuring 202 cm total length, captured at Gorno Lukovo village in the Eastern Rhodopes (41.3657°N, 26.0852°E; WGS 84) and the other specimen had a total length of 204 cm, but there is no information concerning the geographic location of the capture and the sex of the snake (Naumov 2007. *In* Biserkov [ed.], A Field Guide to Amphibians and Reptiles of Bulgaria. Green Balkans, Sofia. 196 pp.). At 1836 h on 17 August 2017, in the vicinity of Burgas city in southeastern Bulgaria (42.4459°N, 27.4718°E; WGS 84), we captured a large male *D. caspius* (total length = 203 cm; tail length = 53 cm). We were able to measure the snake precisely by immobilizing it with the help of four people; the snake was not anesthetized during the procedure (Fig. 1). This is the longest specimen with exact geographic location reported to date for Bulgaria.

The longest specimens of *D. caspius* were reported from the islands of Samos (total length = 205 cm) and Lesvos (total length = 208 cm) and both were identified as males (Cattaneo 2003. Boll. Mus. Civ. Stor. Natur. di Ven. 544:95–116). Different measurement techniques may affect length measurements of snakes (anesthesia, freshly dead, or preserved in different chemicals) and lead to a degree of inaccuracy, so the lengths are not necessarily precise (Cundall et al. 2016. Herpetologica 72:227–234). However, in some sources (Speybroeck et al 2016. Field Guide to the Amphibians and Reptiles of Britain and Europe. Bloomsbury Natural History. 432 pp.), *D. caspius* is reported to reach total lengths of 250 cm. We were not able to find any evidence in the literature for animals of such size. We propose that such lengths might be reached by *D. jugularis* (see Cattaneo 2012. Natur. Sicil. 1:77–103). For a long time, *D. caspius* and *D. jugularis* were not recognized as separate species (see Arnold et al 1979. Field Guide to the Reptiles and Amphibians of Britain and Europe. Collins Field Guide. 320 pp.), despite the striking differences between them (Zinner 1972. PhD Dissertation. Hebrew University, Jerusalem. 83 pp.). However, *D. jugularis* is not a part of the Bulgarian fauna. Presumably, in modern times, *D. caspius* rarely attains total lengths of over 200 cm in nature.

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***ERYTHROLAMPRUS AESCULAPII* (False Coral Snake). REPRODUCTION, DIET and DEFENSIVE BEHAVIOR.** *Erythrolamprus aesculapii* (Dipsadidae) is a medium-sized snake belonging to the tribe Xenodontini. This species is terrestrial, oviparous, diurnal, opistoglyphus and eats snakes (Marques et al. 2017. Serpentes da Caatinga. Ponto A editora, Cotia. 240 pp.). It occurs over much of South America (Uetz et al. [eds.]. 2018. The Reptile Database, http://www.reptile-database.org; accessed 9 October 2018).

Between 2012 and 2016, 10 specimens of *E. aesculapii* were captured alive and 4 specimens were found dead in the Ritápolis National Forest (an 89.5-ha protected area) and the surrounding


Fig. 1. A) *Erythrolamprus aesculapii* defensive behaviors: CHUFJF 1585 exhibiting dorsoventral flattening, exposing the hemipenes, and hiding the head; B) CHUFJF 1582 displaying the tail; C) CHUFJF 1587 biting. *Erythrolamprus aesculapii* reproduction and diet: D) CHUFJF 1578 and 1584 with oviductal eggs; E) regurgitated *Atractus pantostictus* (CHUFJF 1884); F) CHUFJF 1581 with *A. pantostictus* (CHUFJF 1888) stomach contents; G) *A. pantostictus* (CHUFJF 1889).

area, in municipalities of Ritápolis and São João del Rei, State of Minas Gerais, in southeastern Brazil. The specimens presented great variation in defensive behaviors (Fig. 1) including exposing the hemipenes, hiding the head, displaying the tail, pressing with the tip of the tail, biting, rotating, head triangulation, forming a ball, cloacal discharge, sudden movements, and dorsoventral flattening. Two of these specimens found along a dirt road in the buffer zone of the protected area (21.05850°S, 44.27440°W, WGS 84; 874 m elev.) were gravid females that each contained three well-developed oviductal eggs (Fig. 1). One specimen was found on 27 June 2013 (CHUFJF 1584; total length = 76.3 cm, tail length = 8.6 cm; egg lengths = 25.45, 25.45, and 27.55 mm; egg widths = 8.80, 8.04, and 7.86 mm; egg volumes = 1803.51, 1426.78, and 1472.53 mm³) and the other was found alive on 12 June 2014 (CHUFJF 1578; total length = 73.8 cm, tail length = 7.5 cm, mass = 87 g; egg lengths = 38.75, 48.10, and 38.44 mm, egg widths = 13.40, 11.72, and 12.81 mm; egg volumes = 6148.45, 5681.87, and 5641.62 mm³). Additionally, two specimens contained prey items. The first, captured on 19 October 2015 (total length = 43.5 cm; tail length = 4.1 cm, 18 g), in a fragment of savannah in the buffer zone of the Ritápolis National Forest (21,08130°S, 44,27390°W, WGS 84; 874 m elev.) regurgitated an *Atractus pantostictus* (Fig. 1) that had been ingested tail first (CHUFJF 1884, total length = 38.0 cm). The second (CHUFJF 1581; total length = 56.9 cm; tail length = 7.0 cm, 63 g), captured on 15 April 2015 in riparian forest edge in the Ritápolis National Forest (21,05337°S, 44,27318°W, WGS 84; 896 m elev.), also contained an *A. pantostictus* that had been ingested tail first (CHUFJF 1888, Fig. 1). *Atractus pantostictus* is a small snake belonging to the tribe Dipsadini; it is fossorial and nocturnal (Marques et al. 2015. Serpentes do Cerrado. Holos Editora, Ribeirão Preto. 251 pp.) and is common in the Ritápolis National Forest and this surrounding area.

The snakes are housed in the herpetological collection of the Universidade Federal de Juiz de Fora (CHUFJF), Minas Gerais, Brazil. Collection permit was authorized by Instituto Chico Mendes de Conservação à Biodiversidade (ICMBio 31727).

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***ERYTHROLAMPRUS VITTI*. DIET AND BEHAVIOR.** The natural history of most Ecuadorian reptiles is unknown, and the information available is mostly restricted to species from lowland rainforest (Duellman 1978. Univ. Kansas Publ. Mus. Nat. Hist. 65:1–352; Yánez-Muñoz, et al. 2017. Cuad. Herpetol. 31:41–47). Here we report an observation of predation by *Erythrolamprus vitti*, an endemic colubrid snake of the western foothills of the northern Ecuadorian Andes and southern Colombia, between 1070 and 2071 m elev. (Dixon 2000. Copeia 2000:482–490; Torres-Carvajal et al. 2009. Herpetol. Rev. 40:356–357; Uetz and Hošek 2018. www.reptile-database.org; accessed 18 Sep 2018). *Erythrolamprus vitti* is thought to be nocturnal and arboreal (Dixon, *op. cit.*). Only one diet item has been reported, the amphibian *Osornophryne occidentalis* (Torres-Carvajal et al., *op. cit.*).

At 1346 h, on 14 January 2015, in Santa Cecilia community (0.75751°N, 78.32538°W, WGS 84; 1754 m elev.), Ibarra canton, Imbabura Province, Ecuador, an *E. vitti* was recorded on video preying upon an *Andinosaura oculata*, a lizard endemic to the western slopes of the Ecuadorian Andes (Kirizian 1996. Herpetol. Monogr. 10:85–155). The predation event occurred on a path located in an area of grassland, surrounded by forest. When found, the snake was biting the right side of the lizard's body and was loosely coiled around it as it struggled (Fig. 1A). After 5 min, the snake reduced its jaw movements and began to uncoil and raise its head, perhaps in response to disturbance by the human observers (Fig. 1B). Four minutes later the snake shifted position and began ingestion of the lizard from its head (Fig. 1D), which took an additional 4 mins (Fig. 1E, F).

With this report we add reptiles (lizards) to its diet and note that *E. vitti* hunts actively during the day in open terrestrial habitats.

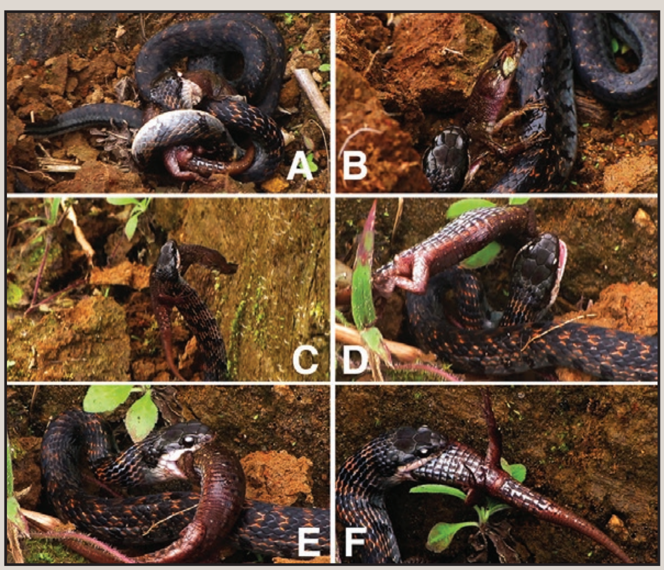


Fig. 1. Sequence of predation by *Erythrolamprus vitti* on *Andinosaura oculata.*

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***HELICOPS ANGULATUS*** **(Amazonian Water Snake). DIET.** For most species of aquatic snakes, a diet based on fishes and amphibians is expected, since these snakes inhabit aquatic and semi-aquatic systems where fishes and amphibians are frequently encountered (Harding 1997. Amphibians and Reptiles of the Great Lakes Region. University of Michigan Press, Ann Arbor. 378 pp.; Gibbons and Dorcas 2004. North American Watersnakes: A Natural History. University of Oklahoma Press, Norman. 438 pp.). *Helicops angulatus* is a common aquatic snake in Atlantic forest and Amazonian environments of northern and northeastern Brazil (França et al. 2006. Occ. Pap. Sam Noble Oklahoma Mus. Nat. Hist. 17:1–3; Infante-Rivero et al. 2008. Herpetotropicos 4:39–39). Herein, we report predation on two novel frog species by this snake in the eastern Brazilian Amazon.

On 20 July 2018, at around 2015 h, one of us (RTP) collected an adult *H. angulatus* in a semi-urbanized area in the municipality of Laranjal do Jari, Amapá State, Brazil (0.85664°N, 52.52878°W; WGS 84). In the laboratory, the snake (SVL = 51 cm; 49 g) was dissected, revealing two leptodactylid frogs, *Adenomera hylaedactyla* and *Leptodactylus fuscus* (Fig. 1). The snake and frogs are housed at the Herpetological Collection of Universidade Federal do Amapá (CECCAMPOS *H. angulatus*–2691, *A. hylaedactyla*–2704, *L. fuscus*–2705).

*Helicops angulatus* is considered a dietary generalist, consuming aquatic and terrestrial prey (Teixeira et al. 2017. J. Herpetol. 51:215–222), including frogs from the families Aromobatidae, Bufonidae, Hylidae, and Leptodactylidae, such as *Allobates femoralis* (Costa-Campos et al. 2017. Herpetol. Notes 10:665–667), *Leptodactylus natalensis* (Albuquerque et al. 2013. Herpetol. Rev. 44:522–523), *Rhinella mirandaribeiroi, R. marina*, *Pseudis paradoxa*, *Boana boans*, and *Scinax ruber* (Teixeira et al. 2017, *op. cit.*).

Fig. 1. Stomach contents of a *Helicops angulatus*, consisting of an *Adenomera hylaedactyla* and a partly digested *Leptodactylus fuscus*, from the municipality of Laranjal do Jari, Amapá State, Brazil.

We thank ICMBio for granting collecting permits (#48102-2). FPS is grateful to CNPq for the scientific initiation fellowship (#134760/2018-2).

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***HETERODON PLATIRHINOS*** **(Eastern Hog-nosed Snake). MARINE HABITAT USE.** *Heterodon platirhinos* occurs across the eastern United States and is known to use forested, open canopy, or edge habitats (Vanek and Wasko 2017. Herpetol. Conserv. Biol. 12:109–118), as well as mixed grasslands in the western portion of its range. Although *H. platirhinos* can be considered a habitat generalist, here we report an unusual occurrence of marine habitat use by this species.

At 1605 on 31 March 2017, during a patrol, two of the authors (AK and BAE) observed a female *H. platirhinos* in East Matagorda Bay, Texas, USA (28.71148°N, 95.88625°W; WGS 84). Upon observation, the snake was seemingly in good health and body condition (Fig. 1). This individual was subsequently captured, measured (total length 50.8 cm; SVL 40.6 cm), and returned to the mainland. This observation occurred 371 m from the nearest land, and 691 m from the mainland shore. Although a salinity measurement was not taken at the site of observation, the average salinity of East Matagorda Bay is 19.0 ppt (Ward and Armstrong 1980. U.S. Fish and Wildlife Service, Biological Services Program, Washington, D.C. FWS/OBS-81/52).

Fig. 1. Photo of *Heterodon platirhinos* captured > 300 m from shore in East Matagorda Bay, Texas, USA. The individual appeared to be in good health and good body condition.

Several other species, such as *Natrix maura* (Galán 2004. Herpetol. Rev. 35:71), *N. tesselata* (van der Meijden and Chiari 2006. Herpetol Rev. 37:94), and *Python molurus bivittatus* (Chung et al. 2016. Herpetol. Rev. 47:153), have been observed in marine habitats. However, these observations have occurred either on land near saline waters, in tidal pools, between terrestrial habitats (i.e., indicating dispersal), or at short distances (e.g., ≤ 2 m) from the shoreline. Although there are several examples in the scientific literature of primarily terrestrial or freshwater adapted species using, or being found in the vicinity of, marine habitats (Murphy 2012. Intergr. Comp. Biol. 52:217–226), our observation offers an extreme example of this behavior that greatly exceeds the scale of previously reported occurrences.

More specifically, *H. platirhinos* has been observed swimming a few feet past the swash zone near to shore in marine areas, although only short durations (e.g., ≤ 5 min) in seawater have been recorded (Rodgers 1985. Herpetol. Rev. 16:111). To our knowledge this is the first account of a *H. platirhinos* in a marine environment for longer than a short duration and at a substantial distance from land. This observation indicates that *H. platirhinos* can tolerate marine conditions for longer periods than originally thought; however, the duration of how long a reptile species such as *H. platirhinos* would be able to persist in these conditions still remains unknown. Nonetheless, this observation adds to knowledge of the species natural history, general ecology, and range of environmental tolerance.

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***HETERODON PLATIRHINOS* (Eastern Hog-nosed Snake). BEHAVIOR AND HABITAT.** *Heterodon platirhinos* occurs in a variety of habitats in eastern North America but is most abundant in dry areas with well-drained, sandy soils, open vegetative cover, and proximity to water (or abundance of amphibian prey) (Platt 1969. Univ. Kansas Publ. Mus. Nat. Hist. 18:253–420). On the Atlantic coast of the United States, barrier beach and dune ecosystems often contain high densities of *H. platirhinos* because of abundant prey and expanded niche opportunity as a result of reduced snake fauna (Stewart and Rossi 1981. Am. Midl. Nat. 106:282–292; Scott 1985. Brimleyana 12:51–55; Buchanan et al. 2017. J. Wildl. Manage. 81:509–520). Although predominantly a terrestrial snake, *H. platirhinos* will occasionally swim (Platt, *op. cit.*); however, few records exist of this species swimming or otherwise utilizing saline aquatic habitats. Here, we provide two records of *H. platirhinos* using saline aquatic habitats in coastal South Carolina, USA.

On 24 June 2018, at 1300 h, while boating the Atlantic Intracoastal Waterway (ICW) one of us (SB) observed an adult (sex not determined) *H. platirhinos* swimming on the water's surface between the towns of Mt. Pleasant (north) and Sullivan's Island (south), in Charleston County, South Carolina (32.767059°N, 079.862961°W; WGS 84). The snake was ca. 50 m from the northern shore of the waterway and swimming in a westward direction amidst significant boat traffic. This location in the ICW is bounded to the north by tidal marsh, east by tidal marsh edge and open waterway, south by Sullivan's Island, and west by Charleston Harbor. The snake was captured (Fig. 1A), given a veterinary examination, and allowed to hydrate in


Fig. 1. A) Adult *Heterodon platirhinos* found swimming across the Atlantic Intracoastal Waterway in Charleston County, South Carolina, USA; B) a second adult *H. platirhinos* found on ocean beach just above the reach of breaking waves on Sullivan's Island, South Carolina; C) the same snake with sand on its head, suggesting recent digging in wet beach substrate, and D) being passed by beachgoers.

freshwater overnight before being released at the edge of the marsh, just north of its capture location.

On 1 July 2018 at 1405 h, one of us (AP) observed another adult (sex not determined) *H. platirhinos* on the ocean beach of Sullivan's Island, South Carolina (32.75405°N, 079.84792°W; WGS 84), ca. 2 km SE of the location where the first snake had been observed the week before. The snake was situated on top of wet sand, just above the reach of breaking waves (Fig. 1B). Sand on the snake's head suggested the animal had been recently digging into the beach substrate (Fig. 1C). AP watched the snake from distances of 3–20 m for approximately 1 h, as numerous beachgoers walked by the animal (Fig. 1D). Before terminating the observation, AP approached within 2 m of the snake and found the animal to be almost completely buried in wet sand.

To our knowledge, the occurrence of *H. platirhinos* swimming in sea water has only been reported three times previously, and our observations suggest this behavior may be more geographically widespread and commonplace among coastal populations than was previously recognized. La Vie (1920. Copeia 82:39) observed a small *H. platirhinos* swimming in the surf on a New Jersey beach in July 1919. The snake swam along the shore for some time, until finally coming ashore where it was killed by the author. Allen (1932. Am. Mus. Novit. 542:1–20) reported a *H. platirhinos* taken from the water ca. 500 m from the shore of Biloxi Bay (Mississippi) in November 1929. More recently, Rodgers (1985. Herpetol. Rev. 16:111) frequently observed *H. platirhinos* resting on the beach of Assateague Island (Maryland and Virginia) during summer and fall months just above the reach of breaking waves as well as swimming in the ocean surf just beyond the swash zone. Snakes remained in the water up to 5 min, usually swimming parallel to shore, and exited by "body surfing" on incoming waves. While the advantages of spending time in the surf are unclear, both La Vie (*op. cit.*) and Rodgers (*op. cit.*) speculated that resting on wet beach sand during hot weather may be a thermoregulatory behavior.

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***HIEROPHIS CASPIUS* (Caspian Whip Snake). DIET.** *Hierophis caspius* is the largest snake in the Caucasus. Its diet includes a variety of vertebrates including other snakes (Dorward 2014. Herpetol. Notes 7:165–166). On 13 August 2018, on the shore of a pond in the vicinity of Baltiysky village, Stavropol Krai, Russia (43.88620°N, 44.3406487°E, WGS 84; 192 m elev.) we observed a large adult male *H. caspius* (total length = 177 cm) holding an adult *Natrix tessellata* (Dice Snake) in its jaws. Unfortunately, this snake was killed by fishermen. This is the first recorded case of a *H. caspius* preying on *N. tessellata*, although it has been previously noted to prey on *Natrix natrix* (Grass Snake) (Bannikov et al. 1977. Guide to Amphibians and Reptiles of the USSR Fauna. Moscow, Prosveshchenie. 414 pp. [in Russian]; Cattaneo 2001. Bollettino del Museo Civico di Storia Naturale di Venezia 52:155–181). Additionally, the closely related species *Hierophis schmidti* (Schmidt's Whip Snake) has been observed preying on *N. tessellata* in Turkmenistan (Atayev 1985. Reptiles of the Mountains of Turkmenistan. Ashgabat, Ylym. 345 . [in Russian]).

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***HYPSIGLENA CHLOROPHAEA* (Desert Nightsnake). PREDATION.** On 27 May 2017, at 0741 h, at Lower Whitmore Camp along the Colorado River (River Mile 188.5) inside the Grand Canyon, Arizona, USA (36.14274°N, 113.20213°W, WGS 84; 488 m elev.), an adult *Hypsiglena chlorophaea* (~ 40 cm SVL) was observed being actively consumed by an adult *Hadrurus arizonensis* (Giant Hairy Scorpion; Fig. 1). Upon discovery, the scorpion had the already dead snake firmly gripped in its right pedipalp. Closer inspection revealed the scorpion to be actively consuming the snake at the anterior end, with portions of the snake's rostral skin and underlying musculature already removed. After several minutes of observation and photography, the scorpion was left undisturbed to continue its meal. The ultimate outcome of this interaction is unknown.

It was unclear whether this was an instance of active predation or simply scavenging, as the initial encounter was not observed. Additionally, the snake was noted to have a wound on the distal third of the body, of a size that could have proven fatal (Fig. 1). Observation failed to elucidate whether this wound was inflicted by the scorpion, or if the snake had been injured and possibly killed by another animal or environmental event and then picked up and scavenged by the scorpion. Given the size difference between the two animals, the second explanation seems the most plausible.

Fig. 1. Adult *Hypsiglena chlorophaea* being consumed by *Hadrurus arizonensis*.

Although predation on *H. chlorophaea* by a black widow spider (*Latrodectus mactans*) (Ervin and Carroll 2007. Herpetol. Rev. 38:468) and on *H. jani* by another scorpion species (Hibbitts 1992. Herpetol. Rev. 23:120) has been reported, this is the first report of predation/scavenging of *Hypsiglena* by *H. arizonensis*. However, predation of other snake species by *Hadrurus* is relatively common. In fact, in a review of arthropod predation of vertebrates (McCormick and Polis 1982. Biol. Rev. 57:29–58), it was reported that as much as 10% of the diet of *Hadrurus* may consist of snakes from the genus *Leptotyphlops*, at least in some insect-depauperate habitats. *Hadrurus* have also been reported preying upon lizards of masses comparable to that of *Hypsiglena*. Thus, predation on this and other small snake species by scorpions from the genus *Hadrurus* is perhaps not uncommon.

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***INDOTYPHLOPS BRAMINUS* (Brahminy Blind Snake). DIET.** *Indotyphlops braminus* is one of the most widely distributed snake species, probably native to the Southeast Asia (Wallach 2009. Hamadryad 34:34–61). The species is fossorial in nature, inhabiting moist soil and is a specialized feeder on ants, termites, and their eggs (Mizuno and Kojima 2015. J. Zool. 297:220–224). Reports of *I. braminus* feeding by decapitating termite prey by Mizuno and Kojima (*op. cit.*) have prompted much interest in its feeding traits, but little is known about its natural history. During

Fig. 1. Orthopteran prey regurgitated by an *Indotyphlops braminus*. Note that the prey appears to be broken into smaller segments.

my study in Gujarat, India, I encountered the feeding behavior of *I. braminus* in the wild.

On 4 September 2014, between 1700 and 1800 h, four individuals of *I. braminus*, along with other snake species, were encountered at an active construction site located at Halol (22.508611°N, 73.457222°E, WGS 84; 96 m elev.) in Gujarat, India. Three individuals out of four regurgitated prey following capture. The prey materials identified included off-white eggs of hymenopterans, and an orthopteran that appeared to be a cricket (Fig. 1). It was surprising to notice that the prey was broken into smaller pieces (Fig. 1), although it is unclear whether this happened prior to, or following, ingestion. Based on the available literature, I believe that this is the first observation of *I. braminus* feeding on an orthopteran and suggests that prey-breaking behavior might also be used to feed on these prey.

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***LEPTOPHIS AHAETULLA* (Giant Parrot Snake). ATTEMPTED PREDATION.** Ambush-foraging snakes usually use crypsis and sometimes venom to catch and subdue large prey. In contrast, snakes that invest more energy into active foraging tend to feed on small- to medium-sized but abundant prey, with venom playing a secondary role, if it is present at all (Vitt and Caldwell 2008. Herpetology: An Introductory Biology of Amphibians and Reptiles. Elsevier Academic Press, San Diego, California. 720 pp.). However, this may change in harsh environments or during periods of resource scarcity. *Leptophis ahaetulla* is a medium-sized, rear-fanged, mildly venomous colubrid snake distributed from southern Mexico to northern Argentina and Uruguay. This species forages actively, mostly for hylid treefrogs that are 3–10% of snake snout–vent length (Henderson et al. 1977. J. Herpetol. 11:231–232; Henderson 1982. Amphibia-Reptilia 3:71–80; Albuquerque et al. 2007. J. Nat. Hist. 41:1237–1243). Herein, we describe a predation attempt by *L. ahaetulla* on a large adult *Hypsiboas crepitans* (Emerald-eyed Treefrog).

At 1245 h on 12 July 2005, we found an *L. ahaetulla* attempting to subjugate a large adult *H. crepitans* on the floor of a building on the bank of the Araguaia River in northwestern Goiás state, central Brazil (12.91675°S, 50.51251°W, WGS 84; 216 m elev.), in a mosaic of agricultural pasture lands and preserved landscapes within the Cerrado ecoregion, which is marked by a severe dry season. The *L. ahaetulla* had seized the *H. crepitans* by the head and was perhaps trying to exhaust the treefrog, while the frog defended itself vigorously, pressing its forelimbs against the snake's neck and jumping. The struggling pair moved 12 m over 15 min before the *L. ahaetulla* dropped the *H. crepitans* and fled. The *H. crepitans* was injured and later died, perhaps due to the venom.

In our observation, the *L. ahaetulla* spent a large amount of energy on a failed predation attempt. The prey appeared to be substantially larger than is typical for actively foraging species, although it is unclear whether the failure of this predation attempt was due to large prey size or our intervention. Unsuccessful predation on frogs and amphisbaenians has been reported for other species of snakes (Caramaschi and Niemeyer 2012. Herpetol. Notes 5:429–430; Fong et al. 2013. Herpetol. Notes 6:73–75). Because this observation took place at the peak of the dry season when prey were less abundant or active, the ability of *L. ahaetulla* to be more selective in searching for easier-to-subdue prey items might have been limited. Extreme seasonality and periods of resource scarcity might act as a selective pressure for prey-subjugation adaptations, as snakes armed with venom would be more successful at subduing large prey.

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***LEPTODEIRA ANNULATA* (Banded Cat-eyed Snake). DIET and REPRODUCTION.** *Leptodeira annulata* is a medium-sized snake belonging to the tribe Imantodini that occurs in Panama, Colombia, Venezuela, French Guiana, Guyana, Brazil, Bolivia, Paraguay, Peru, Argentina, Trinidad, Tobago, Isla Margarita, and Ecuador (Uetz et al. [eds.] 2018. The Reptile Database, http://www.reptile-database.org; accessed 18 September 2018). This species is terrestrial and arboreal, oviparous, nocturnal, and opistoglyphous (Marques et al. 2015. Serpentes do Cerrado. Holos Editora, Ribeirão Preto. 251 pp.). Anurans comprise the majority of prey of this species, but it also eats snakes and small lizards (Cantor and Pizzatto 2008. Herpetol. Rev. 39:470–471).

Here we report the stomach contents regurgitated by a gravid female *L. annulata* (total length = 76.2 cm; tail length = 9.0 cm;

Fig. 1. Gravid female *Leptodeira annulata* with regurgitated stomach contents and eight well-developed oviductal eggs.

mass = 83 g), captured on 8 May 2018 in riparian forest edge in the Ritápolis National Forest (21.05586°S, 44.27164°W, WGS 84; 896 m elev.), a small protected area (89.5 ha) in Municipality of Ritápolis, Minas Gerais, Brazil. It regurgitated two lizards and one amphibian that had been ingested headfirst: two *Hemidactylus mabouia*—one adult (total length = 4.5 cm) regurgitated first and one juvenile (total length = 3.1 cm), regurgitated second—and the remains of an amphibian, *Hypsiboas crepitans* (Gladiator Frog), which was regurgitated last (Fig. 1). *Hypsiboas crepitans* is a medium-sized arboreal hylid frog that prefers open areas and occurs in Brazil in the states of Minas Gerais, Rio de Janeiro, Espírito Santo, Bahia, Sergipe, Alagoas e Paraíba (Haddad et al. 2013. Guide to the Amphibians of the Atlantic Forest: Diversity and Biology. Anolis Books, São Paulo. 544 pp.). *Hemidactylus mabouia* is an invasive nocturnal lizard commonly found in anthropic or perianthropic environments in different Brazilian ecosystems (Rocha et al. 2011. Zoologia 28:747–754). The *L. annulata* was dissected and eight well-developed oviductal eggs were found (Fig. 1). Measurements were: average length = 18.93 mm (18.30 mm–19.81 mm), width = 7.98 mm (6.90 mm–8.70 mm), volume = 1066.20 mm³ (828.20 mm³–1281.38 mm³), and total mass = 7.0 g. (0.875 g. / egg). The Relative Clutch Mass (total clutch mass/body mass of mother after regurgitation and without the eggs [61 g]) 11.5%). The snake and prey are housed in the herpetological collections of the Universidade Federal de Juiz de Fora, Minas Gerais, Brazil: *L. annulata* (CHUFJF 1870), *H. mabouia* adult (CHUFJF 1871), *H. mabouia* juvenile (CHUFJF 1872), and *H. crepitans* (CAUFJF 1863). Collection permit was authorized by Instituto Chico Mendes de Conservação à Biodiversidade (ICMBio 31727-5).

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***LIOTYPHLOPS TERNETZII* (Ternetz's Blind Snake). REPRODUCTION.** *Liotyphlops ternetzii* is a small snake belonging to the family Anomalepididae and occurs in Argentina, Paraguay, Uruguay, Suriname, and Brazil (Centeno et al. 2010. Herpetologica 66:86–91; Uetz et al. [eds.]. 2018. The Reptile Database, http://www.reptile-database.org; accessed 3 October 2018). Because of their fossorial habits, they are difficult to find in the wild and basic information on ecology and natural history is scarce (Centeno et al., *op. cit.*). This species is fossorial and diurnal, feeds on arthropods (centipedes, spiders, and insects), and is oviparous (Marques et al. 2017. Serpentes da Caatinga. Ponto A Editora, Cotia. 240 pp.).


Fig. 1. A) Gravid female of *Liotyphlops ternetzii*; B) the same specimen dissected with the three oviductal eggs.

A gravid female *L. ternetzii* (total length = 42.3 cm; tail length = 0.7 cm; 14 g) was captured alive (Fig. 1A) on 10 October 2014 in riparian forest edge in the Ritápolis National Forest (21.05586°S, 44.27164°W, WGS 84; 896 m elev.), a small protected area (89.5 ha) in Municipality of Ritápolis, State of Minas Gerais in southeastern Brazil. The specimen was dissected and three oviductal eggs were found (Fig. 1B). Measurements were: length = 16.45 mm, 13.71 mm and 11.90 mm; width = 5.13 mm, 5.22 and 4.10 mm; volume = 394.83 mm³, 353.50 mm³ and 171.59 mm³. These are the first measurements of eggs and the first record of this species in the protected area of the Ritápolis National Forest. The snake is housed in the herpetological collection of the Universidade Federal de Juiz de Fora, Minas Gerais, Brazil (CHUFJF 1876). The collection permit was authorized by Instituto Chico Mendes de Conservação à Biodiversidade (ICMBio 31727).

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***LYCODON MERIDIONALIS* (Vietnamese Large-toothed Snake). DIET.** *Lycodon meridionalis* is known to occur from southern China to northern Laos and northern Vietnam. It is a terrestrial species and a nocturnal predator (Q. T. Nguyen, pers. comm.). The diet of *L. meridionalis* is virtually unknown. Here we provide a record of *L. meridionalis* feeding on an *Acanthosaura lepidogaster* (Scale-bellied Tree Lizard) at Ba Vi National Park, Hanoi, Vietnam.

At 2038 h on 28 July 2018, in the old French building area of Ba Vi National Park, Hanoi, Vietnam (21.07322°N, 105.35342°E, WGS 84; 801 m elev.), we observed an adult female *L. meridionalis* (SVL = 725.0 cm; tail length = 205.0 cm) on the branches of a tree, about 1.5 m above the ground in the process of consuming an adult male *A. lepidogaster* (Fig. 1). At the time we saw the snake, it was swallowing the head of the *A. lepidogaster* and wrapping two coils around the prey at mid-body. We intervened to capture the snake when it began ingesting its prey. The snake specimen was deposited in the collections of the Vietnam National University of Forestry (VNUF), Hanoi, Vietnam (VNUF RBV 2018.17).

Fig. 1. An adult female *Lycodon meridionalis* consuming an adult male *Acanthosaura lepidogaster* on the branches of a tree, Ba Vi National Park, Hanoi, Vietnam.

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***MASTIGODRYAS MELANOLOMUS* (Salmon-bellied Racer). DEFENSIVE BEHAVIOR / PSEUDOAUTOTOMY.** Deliberate tail loss, or pseudoautotomy, can be defined as intervertebral breakage with no spontaneous separation and no regeneration. Many lizards and some snakes display this defensive behavior (Costa et al. 2014. Can. J. Zool. 92:811–816; Jagnandan et al. 2014. J. Exp. Biol. 217:3891–3897). A review conducted by Crnobrnja-Isailovi et al. (2016. North-West. J. Zool. 12:367–372) showed that most records of pseudoautotomy in snakes have been in the families Elapidae, Lamprophiidae, and Colubridae. Specifically, pseudoautotomy has been reported in three species of *Mastigodryas* (*M. bifossatus*: Dourado et al. 2013. Copeia 2013:132–141; *M. boddaerti*: Roberto 2011. Herpetol. Rev. 42:440; and *M. heathii*: Cadle 2012. South Am. J. Herpetol. 7:16–24). Herein, we report a field observation of pseudoautotomy in *Mastigodryas melanolomus*.

On 5 July 2018, during diurnal surveys (at 1000 h) on María Cleofas Island, within the Islas Marías Biosphere Reserve Archipelago, in the state of Nayarit, Mexico (21.3228°N, 106.2296°W, WGS 84; elev. < 5 m), we observed and captured a juvenile *M. melanolomus* (SVL = 55.7 cm) in tropical deciduous forest. During manipulation, the snake was held by the distal end of the tail, and immediately deliberately detached its tail. The length of the lost tail was 12.1 cm, which represents 15% of the snake's total length. In addition, tail loss was observed in one of three other individuals of this species that were captured and photographed during the previous diurnal surveys at the island; therefore, pseudoautotomy could be a common strategy for this species.

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***MICRURUS ALLENI* (Allen's Coralsnake). DIET.** Although ophiophagy is known in numerous coralsnake species, the diet of *Micrurus alleni* is reported to consist primarily of Marbled Swamp Eels (*Synbranchus marmoratus*) (Roze 1996. Coral Snakes of the Americas: Biology, Identification and Venoms. Kreiger Publishing Company, Malabar, Florida. 328 pp.; Solórzano 2005. Rev. Biol. Trop. 53:227–228; Huertas and Solórzano 2014. Mesoam. Herpetol. 1:160–161). Predation on caecilians (Arias and Chaves 2013. Herpetol. Rev. 44:657–658; Huertas and Solórzano, *op. cit.*) and lizards (Roze, *op. cit.*) has also been reported in this species. However, there are no known reports of predation on snakes.

Fig. 1. *Micrurus alleni* stretched tightly across a stream with its tail anchored and a snake prey item (likely *Coniophanes fissidens*) retreating into a hole.

On 6 August 2018, an *M. alleni* (total length ca. 76 cm) was found in Piedras Blancas National Park on the "Waterfall Trail" behind the Esquinas Rainforest Lodge in La Gamba, Costa Rica (8.69535°N, 83.20621°W, WGS 84; ca. 100 m elev.). This individual was stretched tightly across a small stream with its caudal end wrapped around an interconnected network of thin tree roots and rocks (Fig. 1). Upon closer examination, it was determined that the *M. alleni* had the tail of another snake in its mouth and that this second snake had largely retreated into a small hole at the edge of the stream (Figs. 1, 2). This prey species had smooth, light brown scales with darker margins and a slightly lighter belly (Fig. 2). Based on known species diversity in the area (Franzen and Kollarits 2018. Pocket Guide to the Amphibians and Reptiles of La Gamba, Costa Rica. Laurenti-Verlag, Bielefeld, Germany. 120 pp.), this prey item was likely *Coniophanes fissidens* (Brown Debris Snake), although the rest of the specimen was never seen to confirm this identification.

Upon arrival and first sighting at 0835 h, the prey item was alive and resisting, with tail movement and obvious attempts to pull itself fully into a hole. At 0855 h, the prey appeared to have died and the *M. alleni* began attempting to pull the prey from the hole. These attempts continued with the *M. alleni* unlocking its tail from its original anchoring point at 0901 h and moving it around in all directions trying different anchoring points in an attempt to pull the prey out of the hole. At 0921 h, the *M. alleni* released the tail of the prey, only to strike again at the end of the tail at 0922 h. It then proceeded to chew up the length of the


FIG. 2. Closeup of (A) the snake prey's tail in the jaws of the *M. alleni* and (B) the dorsal aspect of the head of the *M. alleni*.

prey's tail to the point it entered the hole. We briefly left at 0946 h; upon our return at 1023 h, the *M. alleni* was no longer present and the prey item was no longer visible.

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***MICRURUS BERNADI* (Saddled Coralsnake). THERMAL ECOLOGY.** We explored the thermal ecology of the *Micrurus bernadi*, based on nine individuals collected by hand in cloud forest in Acahuales, vicinity of Pahuatlan, northeastern Puebla, Mexico (20.4167°N, 98.1833°W, WGS 84; 1790 m elev.) during the summers of 2009–2011. Immediately upon capture, we measured body temperature ($T_b$), air temperature ($T_a$; shaded, 1 cm above substrate where individual first seen), and substrate temperature ($T_s$; shaded, touching the substrate where individual first observed) to nearest 0.2°C with a quick-reading cloacal thermometer. We transported all captured snakes to the laboratory to measure preferred body temperature ($T_p$) on a thermal gradient (16–45°C, see details in Lara-Reséndiz et al. 2015. J. Therm. Biol. 48:1–10). All individuals were subsequently released at their capture sites.

Mean (± 1 S.E.) $T_b$ was 28.13 ± 0.29°C, and mean $T_p$ was 28.78 ± 0.26°C. Mean $T_a$ was 22.20 ± 1.00°C, and mean $T_s$ was 24.69 ± 0.65°C. Body temperature increased with $T_a$ ($r^2$ = 0.66, P = 0.008; $T_b = 22.92 + 0.23T_a$), but body temperature was not related to $T_s$ ($r^2$ = 0.19, P = 0.24). Body size had no effect on $T_b$ ($r^2$ = 0.114, P = 0.33). Mean $T_p$ was higher than mean $T_b$ (paired t-test: $t_8$ = 2.99, P = 0.017).

Our results show that *M. bernadi* has a $T_b$ that varies with $T_a$ but not $T_s$. Mean $T_p$ was about 0.65°C higher than mean $T_b$, suggesting that individual *M. bernadi* may need to actively thermoregulate in the field to reach their $T_p$, at least during the time and season that we studied. To our knowledge, these are the first published observations on temperature relationships of a coral snake in the genus *Micrurus*. It is our hope that these observations will lead to additional studies on the thermal relationships of coral snakes.

This research conformed with all laws and regulations in place in Mexico at the time the research was conducted.

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***MICRURUS NIGROCINCTUS* (Central American Coralsnake). PREDATION.** Coral snakes and their mimics are rarely preyed upon by birds (DuVal et al. 2006. Biotropica 38:566–568). Turquoise-browed Motmots (*Eumomota supersiliosa*) and Great Kiskadees (*Pitangus sulfuratus*), which feed on snakes and other reptiles (Remsem et al. 1993. Condor 95:178–192; Sandoval et al. 2008. Wilson J. Ornithol. 120:214–217), avoid models with the patterns of coral snakes or their mimics (Smith 1975. Science 187:759–760; Smith 1977. Nature 265:535–536). However, predation on coral snakes by birds has been reported several times, especially by Laughing Falcons (*Herpetotheres cachinans*), which may be the main avian predators of these snakes (Howell 1957. Condor 59:73–111; Wetmore 1965. Birds of the Republic of Panama Part 1. Smithsonian Institution Press, Washington D.C. 605 pp.; Skutch 1999. Trogons, Laughing Falcons, and other Neotropical Birds. Texas A&M University Press, College Station, Texas. 240 pp.; DuVal et al. 2006, *op. cit.*; Table 1). Other birds that predate or attempt to predate coral snakes (Table 1) include Red-legged Seriemas (*Cariama cristata*; Pueta 2002. Herpetol. Rev. 33:215), White-whiskered Puffbirds (*Malacoptila panamensis*; Smith 1969. Copeia 1969:402), and Loggerhead Shrikes (*Lanius ludovicianus*; Stoddard 1978. Bull. Tall Timbers Res. Stat. 21:1–175). Here we report, to the best of our knowledge, the first record of predation of *M. nigrocinctus* by a Lesson's Motmot (*Momotus lessonii*).

The observation occurred at Rosa Blanca Hotel gardens, Heredia province, Costa Rica (10.0453°N, 84.1627°W, WGS 84; 1182 m elev.), on 2 October 2010, at 0900 h. The motmot was perched on the ground with the *M. nigrocinctus* (still alive) in its bill (Fig. 1). The motmot was hitting the coral snake repeatedly against the ground for approximately 3 min and then flew into a patch of dense vegetation, where it was impossible to observe whether the motmot ate the *M. nigrocinctus* or not.

Both *M. nigrocinctus* and *M. lessonii* are common in thickets, cattle pastures, gardens, and coffee plantations in the Central Valley of Costa Rica (Savage 2005. The Amphibians and Reptiles of Costa Rica: A Herpetofauna between Two Continents, between Two Seas. University of Chicago Press, Chicago, Illinois. 934 pp.;

Table 1. Bird species reported to prey upon coral snakes.

| Coral snake species | Avian predator species (Family) | Reference |
|---|---|---|
| *Micrurus nigrocinctus* | *Momotus lessonii* (Momotidae) | This study |
| | *Malacoptila panamensis* (Bucconidae) | Smith 1969, *op. cit.* |
| | *Hepetotheres cachinnans* (Falconidae) | Parker, 1990[1]; DuVal et al. 2006, *op. cit.* |
| *Micrurus diastema sapperi* | *Hepetotheres cachinnans* (Falconidae) | Enamorado Guzmán and Arévalo Orrego 1992[2] |
| *Micrurus dissoleucus* | *Malacoptila panamensis* (Bucconidae) | Smith 1970, *op. cit.* |
| *Micrurus frontalis pyrrhocryptus* | *Cariama cristata* (Cariamidae) | Pueta 2002, *op. cit.* |
| *Micrurus fulvius* | *Buteo jamaicensis* (Accipitridae) | Brugger 1989[3] |
| | *B. lineatus* (Accipitridae) | Jackson and Franz 1981[4] |
| | *Falco sparverius* (Falconidae) | Jackson and Franz 1981[4] |
| | *Hepetotheres cachinnans* (Falconidae) | Ferguson-Lees and Christie 2001[5] |
| | *Lanius ludovicianus* (Laniidae) | Stoddard 1978 |
| *Micrurus lemniscatus carvalhoi* | *Hepetotheres cachinnans* (Falconidae) | Sazima and Abe 1991[6] |
| *Micrurus pyrrhocryptus* | *Hepetotheres cachinnans* (Falconidae) | Di Giacomo 2005[7] |
| *Micrurus* sp. | *Hepetotheres cachinnans* (Falconidae) | Brattstrom 1955[8]; Howell 1957, *op. cit.* |

[1]Parker 1991. *In* Burnham et al. (eds.), The Breeding Biology and Diet of Laughing Falcons (*Herpetotheres cachinnans*) in Pristine and Modified Tropical Forest Habitats, pp.115–120. The Peregrine Fund, Boise, Idaho; [2]Enamorado Guzmán and Arévalo Orrego 1992. *In* Whitacre and Thorstrom (eds.), The Breeding Biology and Diet of Laughing Falcons (*Herpetotheres cachinnans*) in Pristine and Modified Tropical Forest Habitats, pp.193–200. The Peregrine Fund, Boise, Idaho; [3]Brugger 1989. Copeia 1989:508–510; [4]Jackson and Franz 1981. Herpetologica 37:213–228; [5]Ferguson-Lees and Christie 2001. Raptors of the World. Houghton Mifflin, New York. 992 pp.; [6]Sazima and Abe 1991. Studies on Neotropical Fauna and Environment 26:159–164; [7]Di Giacomo 2005. *In* Di Giacomo and Krapovickas (eds.), Birds of the El Bagual Reserve, pp. 201–465. Asociación Ornitológica del Plata, Buenos Aires, Argentina; [8]Brattstrom 1955. Evolution 9:217–219.

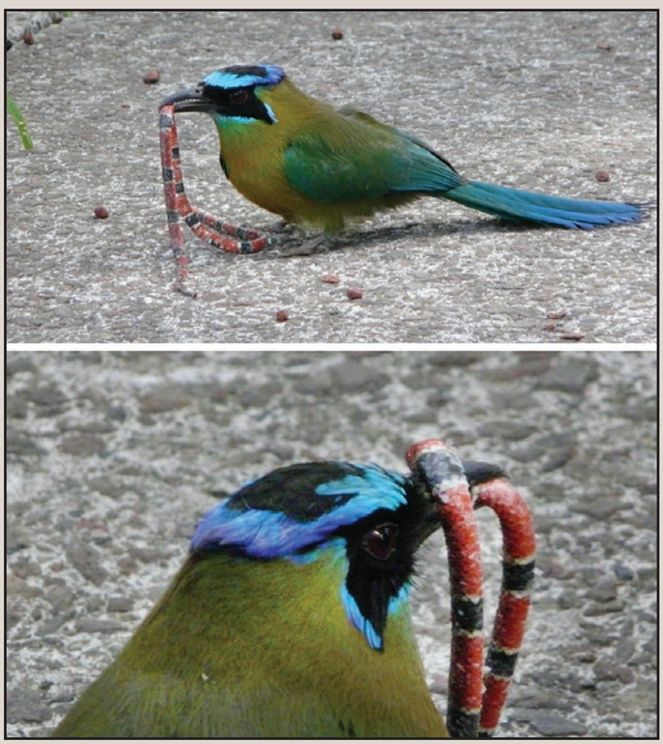

Fig. 1. Lesson's Motmot (*Momotus lessonii*) holding a *Micrurus nigrocinctus* at Hotel Rosa Blanca, Santa Barbara, Heredia province, Costa Rica.

Stiles and Skutch 1989. A Guide to the Birds of Costa Rica. Cornell University Press, Ithaca, New York. 632 pp.). Lesson's Motmots feed on a wide range of vertebrate prey, including lizards, frogs, hummingbirds, seedeaters, bats, mice, and shrews (Chacón-Madrigal and Barrantes 2004. Wilson Bull. 116:108–110; García-C and Zahawi, 2006. Wilson J. Ornithol. 118:261–263.; Sandoval et al. 2008, *op. cit.*; Reid and Gutiérrez 2010. Zeledonia 14:68–72). In contrast to experiments where the closely-related Turquoise-browed Motmot was shown to avoid coral snake models (Smith 1975, *op. cit.*), our observation showed that Lesson's Motmots are willing to prey upon coral snakes.

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***MYERSOPHIS ALPESTRIS*** **(Myers' Mountain Snake). REPRODUCTION.** *Myersophis alpestris* (Lamprophiidae: Cyclocorinae) is a rarely observed species endemic to Luzon Island, Philippines (Leviton et al. 2018. Proc. California Acad. Sci., Ser. 4 64:399–568). Only three specimens of this species have ever been collected: University of Kansas Biodiversity Institute, Lawrence, Kansas (KU) 203012 and 203013, the holotype and paratype, respectively, collected in 1961; and KU 308684, collected in 2007. Information about the species' reproductive biology has never been reported.

We used high-resolution x-ray computed-tomography (CT) to examine the skeletal anatomy of the holotype of *M. alpestris* (KU 203012), an adult female (SVL = 60.7 cm) collected by Edward Taylor on 23 May 1961, near Banaue, Ifugao Province, Luzon, Philippines (1980 m elev.). The scan revealed that the individual was gravid with nine eggs (Fig. 1; avg. length = 23.97 mm, avg. diameter = 11.15 mm). Earlier descriptions of the *M. alpestris* holotype did not mention its reproductive status (Taylor 1963. Copeia 1963:429–433; Leviton 1983. Philipp. J. Sci. 112:195–223). We also visually examined the other *M. alpestris* specimens (KU 203013 and 308684), but we did not attempt to obtain any

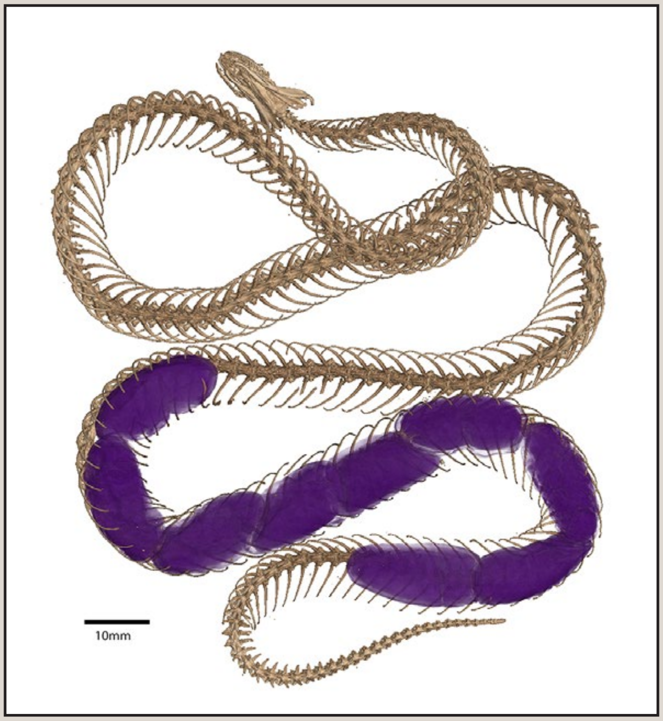


Fig. 1. Computed tomography reconstruction of *Myersophis alpestris* (KU 203012) in ventral view showing skeleton (brown) and nine eggs (purple).

additional reproductive information from these two individuals, because they were not mature. Oviparity has been reported for other cyclocorine species, including *Cyclocorus lineatus* (3–6 eggs) and *Oxyrhabdium modestum* (8 eggs) (Taylor 1922. The Snakes of the Philippine Islands. Department of Agriculture and Natural Resources, Bureau of Science, Manila. 312 pp. + 37 pl.; Leviton 1965. Philipp. J. Sci. 94:519–533; Smith 1993. Asiat. Herpetol. Res. 5:96–102; see also Phenix et al. 2011. Herpetol. Rev. 42:614), but our study of the *M. alpestris* holotype provides the first information on reproductive mode and clutch size for *Myersophis*.

CT tomograms and models are available via MorphoSource (doi:10.17602/M2/M53482). This work was supported by the oVert Thematic Collections Network, NSF DBI-1701714 and DBI-1701932.

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***OLIGODON CINEREUS*** **(Günther's Kukri Snake). DIET.** Apart from a few well-known guilds of snakes that specialize on centipedes as prey, there are relatively few documented records of generalist snake species preying on these formidable invertebrates. In one instance under laboratory conditions, *Sistrurus miliarius* was seen to prey upon *Scolopendra viridis* (Farrell et al. 2018 J. Herpetol. 52:156–161). At ca.1815 h on 9 August 2018, we found a dead male *Oligodon cinereus* killed by locals in the Basista area of Guwahati city, Assam, India

Fig. 1. *Oligodon cinereus* with centipede prey, from Guwahati city, Assam, India.

(26.08721°N, 91.78062°E, WGS 84; 200 m elev.). The snake was in a good condition. Upon dissection, the snake was found to contain a minimally digested *Scolopendra subspinipes* in its gut (Fig. 1). To our knowledge this is the first record of a snake in the genus *Oligodon* preying upon a centipede.

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***OPHEODRYS AESTIVUS AESTIVUS*** **(Northern Rough Greensnake). AQUATIC FORAGING.** The following reports an observation of an adult female *Opheodrys aestivus* foraging in an aquatic setting. Duellman (1949. Herpetologica. 5:144) and Richmond (1952. Herpetologica 8:38) observed *O. aestivus* in aquatic habitats. Plummer (1981. J. Herpetol. 15:425–432; 1993. J. Herpetol. 27:254–260; 1997. Herpetol. Monogr. 11:102–123) and Goldsmith (1984. Southwest. Nat. 29:445–452) extensively described use of vegetation in edge habitats near bodies of water by *O. aestivus* but did not observe foraging in aquatic habitats. Plummer (1981, *op. cit.*) also studied the diet of *O. aestivus* at a site in Arkansas and found that odonates constituted a small percentage of evaluated stomach contents, though he did not report the life-stage of the prey items.

On 7 July 2018 at 1118 h, a female *O. aestivus* was observed through binoculars swimming between clumps of aquatic vegetation and branches of dead tree tops above the waterline in a Coastal Plain pond in Middle Township, Cape May County, New Jersey, USA (39.12039°N, 74.80902°W, WGS 84; 6 m elev.). The snake inspected eight different clusters of exposed branches and vegetation clumps ca. 30 m from the nearest shoreline and was observed on three occasions eating prey items. The snake swam rapidly through the open water sections of the pond. When the swimming snake made physical contact with either vegetation or branches, it would then slowly search for potential prey after a period of stillness. Two of the three prey items were not identified due to distance and obscured location, but the first item taken was an odonate naiad perching exposed on a branch, presumably about to undergo the final molt into the adult stage. After approximately 65 min, the snake swam to shore from a cluster of exposed branches near the center of the pond, where it appeared to rest for 15 min in an *Eleocharis palustris* (Common Spike-Rush) patch before climbing into a

Fig. 1. Telephoto image of *Opheodrys aestivus* after swallowing an odonate naiad in a Coastal Plain pond in New Jersey, USA.

dense clump of pond-side *Smilax* sp. (Greenbrier) growing over *Liquidambar styraciflua* (Sweetgum) saplings. The temperature during the observation was a fairly constant 22.7ºC, with fair skies and an ENE wind of 27.8 km/h.

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***OXYBELIS FULGIDUS* (Green Vinesnake). DIET AND HABITAT.** *Oxybelis fulgidus* is distributed from Mexico to Argentina (Heimes 2016. Herpetofauna Mexicana Volume I: Snakes of Mexico. Edition Chimaira. Frankfurt am Main, Germany. 572 pp.). The diet of this species is known to be primarily composed of lizards, birds, and some small mammals (Rodrigues et al. 2005. Herpetol. Rev. 36:325–326; Endo et al. 2007. Herpetol. Rev. 38:209; Scartozzoni et al. 2009. South Am. J. Herpetol. 4:81–89; Figueroa and Rojas Valerio 2011. Herpetol. Bull. 118:41–42; Viana et al. 2014. Herpetol. Rev. 45:518–519; Sosa-Bartuano and Rodríguez-Beitía 2015. Mesoamerican Herpetol. 2:527–528; Jorge and Vaz-Silva 2016. Herpetol. Rev. 47:670–671; Cherry et al. 2017. Mesoamerican Herpetol. 4:650–652, and citations therein; Díaz-Gamboa et al. 2017. Mesoamerican Herpetol. 4:437–438; Silva Pena et al. 2017. Herpetol. Rev. 48:216–217, and citations therein). Herein, we report another bird species in the diet of *O. fulgidus* from southern Mexico.

At 1045 h on 3 February 2017, one of us (CRP) found an adult *O. fulgidus* that had just caught a *Catharus occidentalis* (Russet Nightingale-Thrush) in a pine-oak forest at Cerro Sol (16.15172°N, 97.00255°W, WGS 84; 1250 m elev.), Municipio de San Jerónimo Coatlán, Oaxaca, Mexico. The snake was hanging on a branch (ca. 1 m from the ground) of an oak tree (*Quercus* sp.) grasping the bird by the head (Fig. 1). The bird, a species endemic to Mexico, was screaming in discomfort and making strong and rapid movements with its wings and legs in a desperate attempt to free itself. The snake remained immobile for approximately 16 min, until the bird finally stopped resisting and died. Then, the snake engulfed most of the head, and proceeded to climb higher in the tree to an area with more foliage where it was almost impossible to observe. Although *O. fulgidus* has been reported to feed on a number of bird species throughout its range, this observation represents only the second bird species known in its diet in Mexico (Díaz-Gamboa et al. 2017, *op. cit.*), and the third species in the family Turdidae (Figueroa and Rojas Valerio 2011, *op. cit.*; Viana et al. 2014, *op. cit.*). This snake is known to live in tropical deciduous forests, evergreen seasonal forests, tropical lowland and mountain rainforests, and short-tree savannas, from sea level to 1600 m elevation (Savage 2002. The Amphibians and Reptiles of Costa Rica: A Herpetofauna between Two Continents, between Two Seas. University of Chicago Press, Illinois. 934 pp.; Heimes 2016, *op. cit.*); therefore, this observation also adds a new habitat (pine-oak forest) used by this species.



Fig. 1. An adult *Oxybelis fulgidus* feeding on a freshly caught Russet Nightingale-Thrush (*Catharus occidentalis*) at Cerro Sol, Municipio de San Jeronimo Coatlán, Oaxaca, México.

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***OXYBELIS FULGIDUS* (Green Vine Snake). DIET.** *Oxybelis fulgidus* is a fast and agile, arboreal, and diurnal snake widely distributed in the Americas, occurring from Mexico to Argentina (Solórzano 2004. Snakes of Costa Rica: Distribution, Taxonomy, and Natural History. Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica. 791 pp.). This species has been considered an opportunistic sit-and-wait predator but might also actively forage. It feeds principally on lizards and birds, but small mammals are also consumed (Scartozzoni et al. 2009. S. Am. J. Herpetol. 4:81–89; Fraga et al. 2012. Herpetol. Rev. 43:495–496). Herein, we provide a new instance of predation on a bird by *O. fulgidus*.

On 23 September 2018 at 1022 h, I observed an adult *O. fulgidus* preying on a *Rhamphocelus carbo* (Silver-beaked Tanager; Fig. 1) in an area of rainforest vegetation at the Paragominas, Para State in southern Amazonia, Brazil (03.73143°S, 48.29012°W; WGS84). The snake was ca. 1.8 m above the ground in the branches of a 5-m tall bush. The female bird was ingested headfirst. This note represents the first time that *R. carbo* has been reported in the diet of *O. fulgidus*.

I am grateful to Elias Santos (from IFT) who took the photo, and OTCA for the course *Conservación de la Biodiversidad*

Fig. 1. *Oxybelis fulgidus* from Centro de Manejo Florestal Roberto Bauch (IFT), Paragominas, Pará, Brazil ingesting a *Rhamphocelus carbo*.

*a través del Manejo Forestal Ecológicamente Responsable en Bosques Productivos de la Amazonia*. John D. Willson and Andrew M. Durso provided valuable suggestions on the manuscript.

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***SPILOTES SULPHUREUS* (Amazon Puffing Snake). DIET.** Snakes in the genus *Spilotes* (Colubridae) occur in disturbed rural areas, secondary and primary forests (Cunha and Nascimento 1993. Bull. Mus. Para. Emilio Goeldi 9:1–191; Martins and Oliveira 1998. Herpetol. Nat. Hist. 6:78–150) in the Amazon Rainforest, Atlantic Forest, and Caatinga biomes. Studies of the feeding habits of these species have revealed the consumption of birds (eggs, nestlings, domestic and native birds) (Beebe 1946. Zoologica 31:39–42; Rivas and Kane 2003. Herpetol. Rev. 34:72; Alves et al. 2005. Herpetol. Rev. 36:459; Bernarde and Abe 2010. Biota Neotrop. 10:167–173; Zuluaga-Isaza et al. 2015. Herpetol. Rev. 46:649), bats (Rufino and Bernardi 1999. Herpetol. Rev. 30:103–104), insects and fruits (Cisneros-Heredia 2005. Herpetol. Rev. 36:326–327), and rodents (Cunha and Nascimento 1993, *op. cit.*). *Spilotes sulphureus* is an arboreal snake that is widely distributed in Brazil, Ecuador, Peru, the Guianas, and Trinidad (Andrade et al. 2017. Check List 13:1–3).

In the present note, we report a new prey item for *S. sulphureus* based on opportunistic observation in nature of an adult specimen from the U.C. Wildlife Refuge Mata do Junco (10.32°S, 37.03°W; WGS 84), a fragment of Atlantic Forest in Capela municipality, state of Sergipe, Brazil. The snake (SVL = 2200 mm; tail length = 540 mm) was observed capturing an adult male rodent, *Phyllomys pattoni* (Echimyidae, head–body length = 151 mm; tail length = 148 mm) in a tree, ca. 3 m above ground on 9 August 2013. During predation, the snake fell from the tree and finished ingesting the rodent. The snake was then captured and deposited, along with its prey, at the Herpetological and Mammals Collection of the Federal University of Sergipe (CHUFS 4449 and CMUFS 0034).

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***VIPERA BERUS* (European Adder). COMMUNAL SHELTER.** Snakes are generally considered to be solitary (Aubret and Shine 2009. Aust. Ecol. 34:210–217), although many studies provide evidence for social interactions (Burghardt 1983. Z. Tierpsychol. 61:89–101; Gregory 2004. Herpetologica 60:178–186; Clark 2007. Behav. Ecol. 18:487–490; Clark et al. 2012. Biol. Lett.

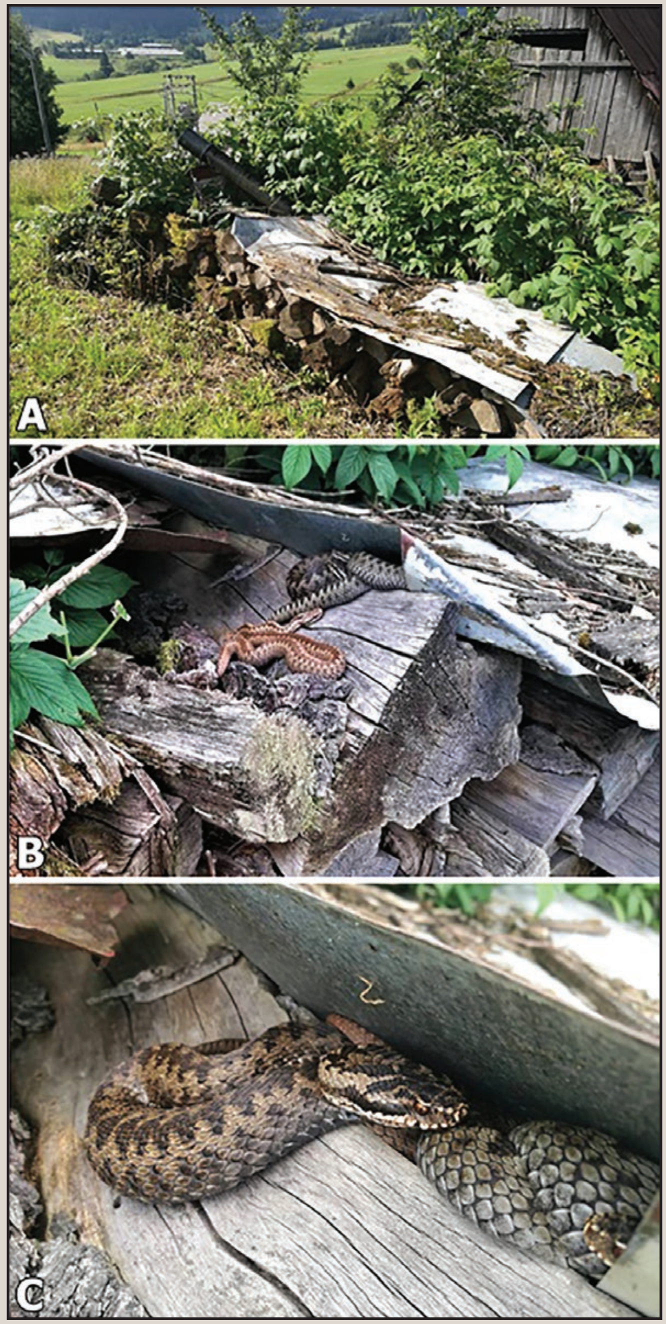


Fig. 1. A) Pile of wood covered with metal as a shelter of *Vipera berus* in Veké Borové, Slovakia. B–C) Several individuals observed sharing one shelter.

8:523–525). Conspecifics sharing shelter during the active season is infrequently documented (Blais and Lashway 2018. Herpetol. Rev. 49:357–358). Such aggregations are not common in *Vipera berus* (Prestt 1971. J. Zool. 164:373–418; Herczeg et al. 2007. Herpetol. J. 17:58–61) with the exception of particular periods of life, such as hibernation, basking after hibernation, shedding, and mating (Prestt 1971, *op. cit.*; Andrén 1985. Amphibia-Reptilia 6:203–206; Schiemenz 1987. Die Kreutzotter *Vipera berus*. A. Ziemsen Verlag, Wittenberg Lutherstadt. 108 pp.; Völkl and Biella 1988. Zool. Abh. Staatl. Museum Tierkde. Dresden 44:19–23). Herein, we report a case of shelter sharing *V. berus* during active season.

Our observation comes from the village of Veké Borové (49.2011°N, 19.5123°E, WGS 84; 859 m elev.) in northern Slovakia. Typical habitat here is submontane meadows with scattered trees and a man-made shelter consisting of piles of wood covered by metal (Fig. 1A). The shelter was visited six times between 23 July and 2 August 2018, during both morning and afternoon hours. During each visit, one to four individuals of *V. berus* were observed. Exact dates and time of observation are on 23 July at 1519 h with four individuals present, on 27 July at 0922 h and 1519 h, two and three individuals, on 29 July at 1011 h and 1718 h, two individuals in both observations and on 2 August at 1720 h, a single individual. Both adult males and females were present. One melanistic individual was observed. Most individuals were found on the top of the wood, under the metal (Fig. 1B).

A lack of appropriate natural shelters and suitable conditions for thermoregulation are possible explanations for the observed behavior. The structure of artificial shelter also enables snakes to immidiately take refuge in the wood piles (Fig. 1C) or bask with only some bodyparts exposed to the sun. Basking close to shelter is a known anti-predator strategy in *V. berus* (Palmer 2011. Herpetol. Bull. 117:25–27; Hodges and Seabrook 2016. Herpetol. Bull. 137:13–18). Active season aggregations of 2–6 (max. 13) gravid females are known from Saxony, Germany (Schiemenz et al. 1996. *In* Günther [ed.], Die Amphibien und Reptilien Deutschlands, pp. 710–728. Gustav Fischer Verlag, Jena; Völkl and Thiesmeier 2002. Beiheft der Zeitschrift für Feldherpetologie 5:44) and up to 800 individuals have been found hibernating together (Nilson et al. 2005. *In* Joger and Stümpel [eds.], Handbuch der Reptilien und Amphibien Europas. Volume 3/IIB: Schlangen [Serpentes] III, pp. 213–292. AULA-Verlag, Wiesbaden).

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***XENOCHROPHIS CERASOGASTER* (Painted Keelback). DIET.** *Xenochrophis cerasogaster* is an aquatic snake with a patchy distribution in Pakistan, India, Nepal, Bangladesh, and possibly Bhutan (Purkayastha et al. 2013. Hamadryad 36:149–156; Uetz et al. 2018. www.reptile-database.org; accessed 6 July 2018). Little information is available on the feeding habits and diet of *X. cerasogaster*. Reports include shrimps and fish in its diet, while captive snakes were reported to feed on small fishes, tadpoles, and frogs (Wall 1907. J. Bombay Nat. Hist. Soc. 18:101–129; Minton 1966. Bull. Amer. Mus. Nat. Hist. 134:27–184). In these reports, no specific identities of the prey items were mentioned. Here I report three records including four individuals of *X. cerasogaster* hunting and feeding on the freshwater fish *Trichogaster lalius* (family Osphronemidae) and a *Channa* sp. (family Channidae) being regurgitated by another individual of *X. cerasogaster*.

Fig. 1. *Xenochrophis cerasogaster* feeding on a *Trichogaster lalius*.

All observations were made in Newtown, North 24 parganas (22.60360°N, 88.47709°E; WGS 84), West Bengal, India. On 6 August 2015 at 0800 h, two adult *X. cerasogaster* were found ca. 2 m apart actively hunting in a densely vegetated narrow water canal. One individual was observed feeding consecutively on four individuals of *T. lalius* and another one captured a *T. lalius* during my 60-min observation (Fig. 1). On 8 August 2015 at 0730 h, four individuals of *X. cerasogaster* were observed in the same canal but only one was observed hunting, again for *T. lalius*. The third incident was recorded on 29 October 2015 at 1620 h, when an adult *X. cerasogaster* was found biting a *T. lalius* trapped in a fishing net and subsequently feeding on it. In all the above-mentioned observations, the larger fishes took ca. 5–7 mins for the snakes to completely swallow while the smaller fishes took ca. 1–2 mins. The fish *T. lalius* is distributed across northern India, Pakistan, and Bangladesh (Menon 1999. Check List: Fresh Water Fishes of India. Rec. Zool. Surv. India, Misc. Publ., Occas. Pap. 175, 366 pp.) and grows to a maximum length of 88 mm (Rahman 1989. Freshwater Fishes of Bangladesh. Zoological Society of Bangladesh, Department of Zoology, University of Dhaka. 364 pp.).

On 17 November 2014 at ca. 0900 h, an adult female *X. cerasogaster* was found with a mouth injury in a dry water body. It later regurgitated a *Channa* sp. measuring 125 mm in length. The exact identity of the fish could not be determined as it was in a partially digested state but an informal survey of the local fish fauna revealed the presence of *Channa punctata*, *C. gachua*, and *C. striata* from the area. Although *X. cerasogaster* had been known to feed on fishes, this note documents the identity of fish species being consumed by this snake in the wild.

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