NATURAL HISTORY NOTES

GYMNOPHIONA — CAECILIANS

***CAECILIA ABITAGUAE* (Abitagua Caecilian). FEEDING.** *Caecilia abitaguae* is a large caecilian native to the eastern slope of the Andes in Ecuador (Taylor and Peters 1974. Univ. Kansas Sci. Bull. 50:333–346) and nothing is known about its feeding habits (O'Reilly 2000. *In* Schwenk [ed.], Feeding, Form, Function and Evolution in Tetrapod Vertebrates, pp. 149–166. Academic Press, New York). In this note we describe the attempted predation by a large (ca. 1.5 m) *C. abitaguae* on a giant earthworm (Glossoscolecidae: *Chibui bari*). At 1500 h (after ca. 3 h of rain) on 11 February 2009, we encountered the caecilian along a path leading into Sumaco Galeras National Park in the eastern part of Napo Province, Ecuador (0.6472°S, 77.5836°W, WGS 84; 1562 m elev.). The caecilian had bitten the worm about one-third of the way anterior to the worm's posterior end (Fig. 1A). The caecilian arched its back exposing its venter, and then began to pull the worm backwards as the observers cleared away leaves to expose the entire caecilian. It is not clear if the arching behavior is a normal part of prey manipulation or was done in response to the observers. The diameter of the worm appeared to be greater than that of the caecilian (Fig. 1B). The worm remained relatively passive during the encounter showing only minor twisting movements (Fig. 1C). The caecilian pulled the worm backwards as if trying to pull it into a burrow. Whether this was typical behavior or an attempt to hide from the observers is not known. Caecilians have been known to shear prey apart using the edges of their burrows (Duellman and Trueb 1986. Biology of Amphibians, McGraw-Hill, New York. 670 pp.), so this may have been normal prey handling behavior. Eventually the caecilian released the worm and crawled away through the leaf litter. The worm then crawled along the trail and was picked up and examined but showed no signs of injury. Release of the potential prey was thought to be a response to disturbance by the observers. Video footage of this encounter is available at the following website <https://www.youtube.com/watch?v=KRNLfAboB1Q>.

James and Bonnie Olson graciously provided access to Wildsumaco Wildlife Sanctuary. Santiago R. Ron provided collaborative support. Clifford Keil identified the earthworm.

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Fig. 1. A) *Caecilia abitaguae* biting giant earthworm along trail at 1700 m elev. in eastern Napo Province, Ecuador on 11 February 2009. B) Diameter of worm appears larger than the head of the caecilian. C) The worm has twisted but the caecilian did not relinquish its grasp.

CAUDATA — SALAMANDERS

***AMPHIUMA MEANS* (Two-toed Amphiuma) and *SIREN LACERTINA* (Greater Siren). PREDATION.** *Amphiuma means* and *Siren lacertina* are large aquatic salamanders that reside in slow

Fig. 1. Adult *Amphiuma means* partially consumed by a *Buteo lineatus.*

Fig. 2. Adult *Siren lacertina* being consumed by a *Buteo lineatus.*

moving to still wetlands along the Atlantic and Gulf Coastal Plains of the United States. Due to their secretive behavior and the habitats in which they reside, much of their natural history is poorly known, including their predators (Petranka 2010. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington D.C. 592 pp.). At 0818 h on 7 November 2015, we witnessed an adult *Buteo lineatus* (Red-shouldered Hawk) eating an adult *A. means* in Audubon's Corkscrew Swamp Sanctuary, Collier Co., Florida, USA (26.3968°N, 81.5941°W; WGS 84). The *B. lineatus* was sitting in a tree then flew off and dropped the half-eaten *A. means* (Fig. 1). In addition, a series of trail camera pictures taken at the sanctuary at 1610 h on 23 August 2015, (26.3858°N, 81.6026°W; WGS 84), showed a similar *B. lineatus* eating an adult *S. lacertina* (Fig. 2).

It is possible these might be two cases of kleptoparasitism (feeding by food theft), possibly from an *Ardea alba* (Great Egret), as has been similarly reported from Lake Placid, Highlands Co., Florida, USA (Kilham 1984. Colon. Waterbirds 7:143–145). However, in both cases reported here, no other birds were seen in the vicinity. Therefore, it is likely these were actual predation events. This is based on several observations of *B. lineatus* diving into shallow water at the edge of wetlands in other locations in South Florida but with no prey captured during these events. Additionally, the diet of *B. lineatus* has been found to contain as much as 46% amphibians in their southern range (Strobel and Boal 2010. Wilson J. Ornithol. 122:68–74).

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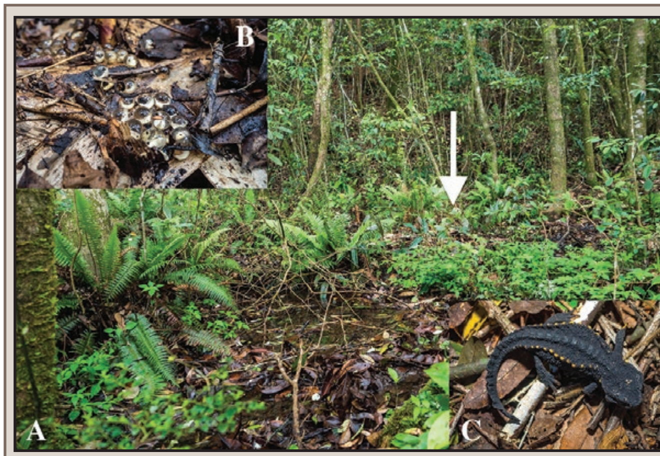
***ECHINOTRITON MAXIQUADRATUS* (Alpine Crocodile Newt). REPRODUCTION.** Newts of the genus *Echinotriton* have gained increasing conservation attention, particularly regarding collection for the illegal pet trade. Notably, the description of a new species, *E. maxiquadratus*, concealed the locality data to prevent poaching activities (Hou et al. 2013. Zootaxa 3895:89–102). However, despite the increasing attention to the conservation of *E. maxiquadratus*, nothing is known about its reproductive biology. Such information is crucial to the habitat conservation and future captive breeding of the species.



PHOTOS BY JIAJUN ZHOU

Fig. 1. Breeding habitat of *Echinotriton maxiquadratus* in Southern China. A) Example of a breeding pond; B) eggs of *E. maxiquadratus*, with their relative position indicated by arrow in A; C) an adult female of *E. maxiquadratus* found 200 m away from the pond.

On 12 July 2015 at 0000 h, we found one adult female *E. maxiquadratus* in a mixed forest (evergreen and deciduous broadleaf) in southern China. Later, on 9 May 2016 at 1413 h, we located two breeding ponds of *E. maxiquadratus* in the same area, about 200 m from where the female was found. The two ponds were about 500 m apart, 1 m^2 and 5 m^2 in size, respectively, and average water depth was about 10 cm. Four clutches of eggs were found under leaf litter around each pond, all ranging from 0.3 m to 1.1 m away from the water edge. The average clutch size for the eight clutches was 42 eggs (Fig. 1).

Our observations suggest that *E. maxiquadratus* has similar reproductive ecology to its congeners, in which eggs are deposited terrestrially near the water source (Xie et al. 2002. Acta Zool. Sin. 48:554–557; Takeshi et al. 2013. Animals 3:680–692).

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ANURA — FROGS

***AGALYCHNIS SPURRELLI* (Gliding Leaf Frog). EXPLOSIVE BREEDING AGGREGATION.** *Agalychnis spurrelli* is a nocturnal, arboreal, canopy-dwelling species that inhabits humid lowland moist and wet forests and lower premontane rainforest from southwestern Costa Rica to northwestern Ecuador (Savage 2002. The Amphibians and Reptiles of Costa Rica: Herpetofauna between Two Continents, between Two Seas. University of Chicago Press. Chicago, Illinois. 934 pp.). *Agalychnis spurrelli* is described as an explosive breeder, where large aggregations form around breeding ponds after heavy rains. However, this behavior is primarily described in only one published account from a human-made pond in Rincon de Osa, Costa Rica (Scott and Starrett 1974. Bull. So. California Acad. Sci. 73:86–94).

Here, we describe three explosive breeding events during the rainy season of 2015, in a naturally-occurring swamp on the southern tip of the Osa Peninsula, Puntarenas, Costa Rica (8.4126°N, 83.3458°W, WGS 84; 34 m elev.). In each of the three events, starting on 22 July, 19 September, and 24 August 2015, we observed a large breeding aggregation of *A. spurrelli* lasting for 3–4 days (Figs. 1, 2). To observe the breeding aggregations, we arrived at the swamp just before sunrise (ca. 0500 h). Peak breeding behavior lasted until 0800 h, when *A. spurrelli* individuals began to climb back up the vegetation to the canopy. However, on some occasions we observed frogs continuing to lay eggs until as late as 1030 h. The average nighttime temperature during the observation periods was 25 ± SD 1°C (between 1800–0600 h) and average rainfall during the breeding aggregations was 23.8 ± SD 26.5 mm. We observed the aggregations during the following moon phases: waxing crescent phase of the moon, 20 days from the last full moon, with approximately 30% illumination, waxing gibbous phase, 24 days since the last full moon, with approximately 57%

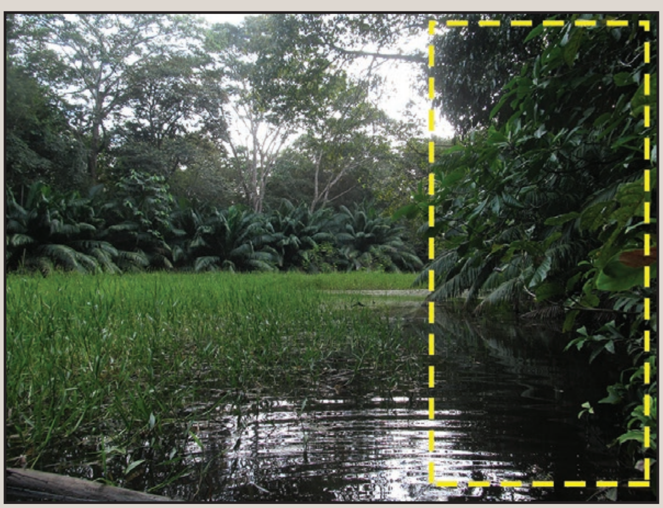

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FIG. 1. Swamp where breeding aggregation of *Agalychnis spurrelli* was observed. The dashed box denotes one of the areas in which the breeding aggregations were concentrated.

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FIG. 2. Dense concentrations of *Agalychnis spurrelli* on vegetation.

PHOTO BY MICHELLE E. THOMPSON

FIG. 3. Leaves covered with *Agalychnis spurrelli* egg masses.

illumination and waxing crescent phase, 20 days from the last full moon, with approximately 23% illumination.

Each aggregation event was highly concentrated to one or two sections of the swamp (northwest and southeast sides) on vegetation overhanging the water (Fig. 1). In the sections of the swamp where we observed aggregations, there was a mix of palm and other tree species in the lower canopy surrounded by taller canopy tree species. Water depth under the vegetation with egg masses ranged from 0.25–1.5 m and was sparsely vegetated with aquatic vegetation. Other sections of the swamp, where we did not observe breeding aggregations, were dominated by low to mid canopy palm and other tree species; large canopy tree species were absent in these sections. We observed the highest concentration of frogs approximately 1–8 m in height in the vegetation. After both breeding aggregations, trees were weeping with egg masses, primarily on the topside of leaves, often with multiple egg masses on the same leaf (Fig. 3).

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***ANAXYRUS AMERICANUS* (American Toad). ECTOPARASITES.** Freshwater leeches are known to be parasitic to amphibians. Sometimes, they are predators as well. Some glossiphoniid leech species are frequently attached to breeding amphibians inhabiting small, muddy, leaf-bottomed woodland ponds (Sutherland 2005. *In* Lannoo [ed.], Amphibian Declines: The Conservation Status of United States Species, pp. 123. University of California Press, Berkeley, California). While leech oophagy of amphibian ova is well documented, hematophagy on adult amphibians is less apparent (Wells 2010. The Ecology and Behavior of Amphibians. University of Chicago Press, Chicago, Illinois. 1162 pp.). Hirudiniform leeches are known to feed on the blood of anuran hosts (Masetti et al. 2015. Herpetol. Rev. 46:614–615), and voracious feeding could be synchronized with host reproductive cycles (Briggler et al. 2001. J. Freshwater Ecol. 16:105–111). Also, tadpoles of certain amphibian species can be palatable to leeches (Gunzburger and Travis 2005. J. Herpetol. 39:547–571).

Fig. 1. Axillary forearm attachment of *Macrobdella decora* on adult *Anaxyrus americanus.*

Fig. 2. Inner elbow attachment of *Macrobdella decora* on adult *Anaxyrus americanus.*

Hirudiniformes can also kill adult anurans and might affect individual species fitness (Merillä and Sterner 2002. Ann. Zool. Fennici. 39:343–346).

Although little is known about the ecology and life history of macrobdellid leeches, at least one species is known to parasitize siren salamanders (Graham and Borda 2010. Comp. Parasitol. 77:105–107). Furthermore, *Macrobdella decora* (American Medicinal Leech) is both a parasite and predator of some ranid tadpoles (see Howard 1978. Ecology 59:789–798; Lannoo 2005, *op. cit.*). *Desserobdella picta* is known to parasitize adult *Anaxyrus americanus* (see Briggler et al. 2001, *op. cit.*) and predate their tadpoles (Brockelman 1969. Ecology 50:632–644). Briggler et al. (2001, *op. cit.*) noted a disproportionate leech preference for *A. americanus* when multiple adult anuran species are present.

While observing anuran breeding behavior between 1955–2250 h on 9 May 2013, I encountered four instances of *M. decora* attached to adult *A. americanus*. There was a congregation of ca. 50 toads calling and amplexing at a shallow, constructed marsh in Plainville, Connecticut, USA (41.68°N, 72.89°W, WGS 84; 65 m elev.). The marsh is located within a critical habitat/special status species buffer outlined by the Connecticut Department of Energy and Environmental Protection: Natural Diversity Data Base. Toad breeding activity occurred near a cattail grove, in the shallow western end of the muddy-bottomed wetland. I noticed three accounts of axillary forearm attachment (Fig. 1) and another attachment to the inner elbow (Fig. 2). Briggler et al. (2001, *op. cit.*) notes that leeches may prefer axillary ventral areas of amphibians due to softer, vascularized skin and difficulty of removal by the host. Another adult male showed signs of "picking" (i.e., host skin is torn by the leech's anterior sucker, Barta and Sawyer 1990. Can. J. Zool. 68:1942–1950; McCallum et al. 2011. Herpetol. Notes 4:147–151) on its inner forearm.

To the best of my knowledge, this is the first report of *M. decora* parasitizing *A. americanus*. These findings also support other literature of hirudiniform parasitism upon actively breeding adult anurans. The observations herein could suggest a synchronized, opportunistic life cycle in which leeches (various life stages) might be in a position to also predate newly deposited anuran ova (Briggler et al. 2001, *op. cit.*). I did not observe leech attachment to any other anuran species (*Hyla versicolor*, *Lithobates catesbeianus*, *L. clamitans*, and *Pseudacris crucifer*) simultaneously present at the site.

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***ANAXYRUS MICROSCAPHUS* (Arizona Toad). DIET, VERTEBRATE PREY.** *Anaxyrus microscaphus* occurs along riparian habitats from 365–2700 m elevation in Arizona, Nevada, New Mexico, and Utah, USA (Blair 1955. Am. Mus. Novit. 1722:1–37; Degenhardt et al. 1996. Amphibians and Reptiles of New Mexico. University of New Mexico Press, Albuquerque, New Mexico. 431 pp.). Little is known about its diet or type of prey consumed (e.g., Schwaner and Sullivan 2005. *In* Lannoo [ed.], Amphibian Declines: The Conservation Status of United States Species, pp. 422–424. University of California, Berkeley, California). Previous descriptions of prey for *A. microscaphus* are limited to the stomach contents of five individuals from Utah that included sand crickets, beetles, true bugs, moth larvae, and ants (Tanner 1931. Trans. Utah Acad. Sci. 8:159–198). We report two vertebrate prey items from the stomachs of two individuals from New Mexico. The stomach contents were discovered in a review of specimens at the Museum of Southwestern Biology at the University of New Mexico. The discovery of these novel prey from museum specimens highlights the value of museums in elucidating the diet composition of little-known species.

We found the forearm and hand of a lizard in the stomach of an adult female (SVL = 78.1 mm) *A. microscaphus* collected on 18 July 1970 (MSB 23147) from near the Gila Cliff Dwellings, Grant Co., New Mexico, USA (33.1760°N, 108.2050°W, WGS 84; 1689 m elev.). We determined the forearm and hand to be that of an *Aspidoscelis* sp. based on scutellation (enlarged postantebrachial scales) and shape of the fingers, but we cannot determine the species of the lizard. The forearm measured 22 mm in length, and there were no other discernible fragments in the stomach or gut. Because *A. microscaphus* is not known to forage during the day when *Aspidoscelis* species are active (Degenhardt et al. 1996, *op. cit.*), this was unexpected.

We found skin and small bone fragments in an adult male (SVL = 70.1 mm) *A. microscaphus* collected on 4 April 2013 (MSB 94983) from Hells Hole, Catron Co., New Mexico, USA (33.7875°N, 108.6941°W, WGS 84; 1915 m elev.). The male was collected during the breeding season along the Tularosa River at night. We determined that the skin was from a toad species based on dorsal texture, presence of tubercles, spotting, and pigmentation. The skin was approximately 1 mm thick and possessed small and large dark pigmented brown spots and splotches, consistent with *A. microscaphus.* One other toad species, *A. punctatus*, occurs in the area but we ruled this species out as a prey item. The fragment of skin had few widely spaced dorsal warts opposed to the numerous and densely spaced warts characteristic of *A. punctatus*, suggesting the skin was from *A. microscaphus.* In addition, in three years of sampling at Hells Hole (2013–2015) we have not observed *A. punctatus* in April and the species is reported to breed in mid- to late May in New Mexico (Degenhardt et al. 1996, *op. cit.*). Therefore, we infer the skin fragments are from *A. microscaphus*, suggesting an instance of cannibalism. The presence of small bone fragments and the small size of the outer-metatarsal fragment suggest this was from the consumption of a smaller conspecific and not dermatophagy. Cannibalism is relatively common in other toad species (Crump 1992. *In* Elgar and Crespi [eds.] Cannibalism: Ecology and Evolution in Diverse Taxa, pp. 256–276. Oxford University Press, Oxford; Pizzato and Shine 2008. Behav. Ecol. Sociobiol. 63:123–133), but has not been reported in *A. microscaphus.* These observations expand the known diet of this species to lizards and conspecifics.

We thank Leland Pierce and New Mexico Department of Game and Fish for funding and support during this project. Collecting of specimens was approved by University of New Mexico's Institutional Animal Care and Use Committee Protocol 13–100983–MC and New Mexico Department of Game and Fish Authorization for Taking Protected Wildlife for Scientific Purposes #3329.

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***ANAXYRUS MICROSCAPHUS* (Arizona Toad). ECTOPARASITES.** Although there is information on the helminth parasites of *A. microscaphus* (Goldberg et al. 1996. Great Basin Nat. 56:369–374), little is known about their arthropod parasites (Schwaner and Sullivan 2005. *In* Lannoo [ed.], Amphibian Declines: The Conservation Status of United States Species, pp. 422–424, University of California Press, Berkeley, California). One report (Duszynski and Jones 1973. Int. J. Parasitol. 3:531–538) of ectoparasites on *A. microscaphus* noted an infestation of *Hannemania* spp. from New Mexico, but the mites were not identified to species. Notably, the Arizona Toad is a New Mexico Department of Game and Fish Species of Greatest Conservation Need under the State's Comprehensive Wildlife Conservation Strategy. Here we report a new host and distributional record for a larval mite (chigger) from *A. microscaphus* in New Mexico.

Six adult *A. microscaphus* (mean ± 1SD SVL = 71.5 ± 7.4 mm, range 59–79 mm) were collected by hand on 12 March 2015 at

Fig. 1. Adult *Anaxyrus microscaphus* showing red sores, encapsulated mites, (arrows) indicative of *Hannemania bufonis* infestation. The bolder arrow on the underside of the left foreleg shows an active infestation.

Indian Tank (N = 5), Catron Co. (33.4325°N, 108.0334°W, WGS 84; 2175 m elev.) and Black Canyon (N = 1), Sierra Co., New Mexico, USA (33.1856°N, 108.0326°W, WGS 84; 2045 m elev.). Toads were euthanized, fixed in 10% neutral buffered formalin, and their tissues later examined for ectoparasites. Red spheroidal lesions (chiggers were mostly encapsulated) measuring 0.5–1.5 mm were noted on the venter and legs of *A. microscaphus* (Fig. 1). Mites were excised with dissecting scissors and fine forceps, placed in 70% ethanol, cleared in lactophenol, slide-mounted in Hoyer's medium (Walter and Krantz 2009. *In* Krantz and Walter [eds.], A Manual of Acarology, pp. 83–96, Texas Tech University Press, Lubbock, Texas) and identified using appropriate guides (Loomis 1956. Univ. Kansas Sci. Bull. 37:1195–1443; Loomis and Welbourn 1969. Bull. South. California Acad. Sci. 68:161–169; Brennan and Goff 1977. J. Parasitol. 63:554–566). A voucher specimen was deposited in the General Ectoparasite Collection in the Department of Biology at Georgia Southern University (accession no. L3798). Two host voucher specimens were deposited in the Museum of Southwestern Biology (MSB) of the University of New Mexico, Albuquerque, New Mexico (MSB 96363, 96377). Four fixed specimens, not accessioned (field tags: JTG 370, MJR 626, MJR 632, MJR 633), from Indian Tank were shipped to the Florida Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute, St. Petersburg, Florida for necropsy and pathology assays. Specimens were dissected to obtain tissues for processing by routine paraffin embedded histology, and then sectioned slides were stained with hematoxylin and eosin (H&E) or thionin.

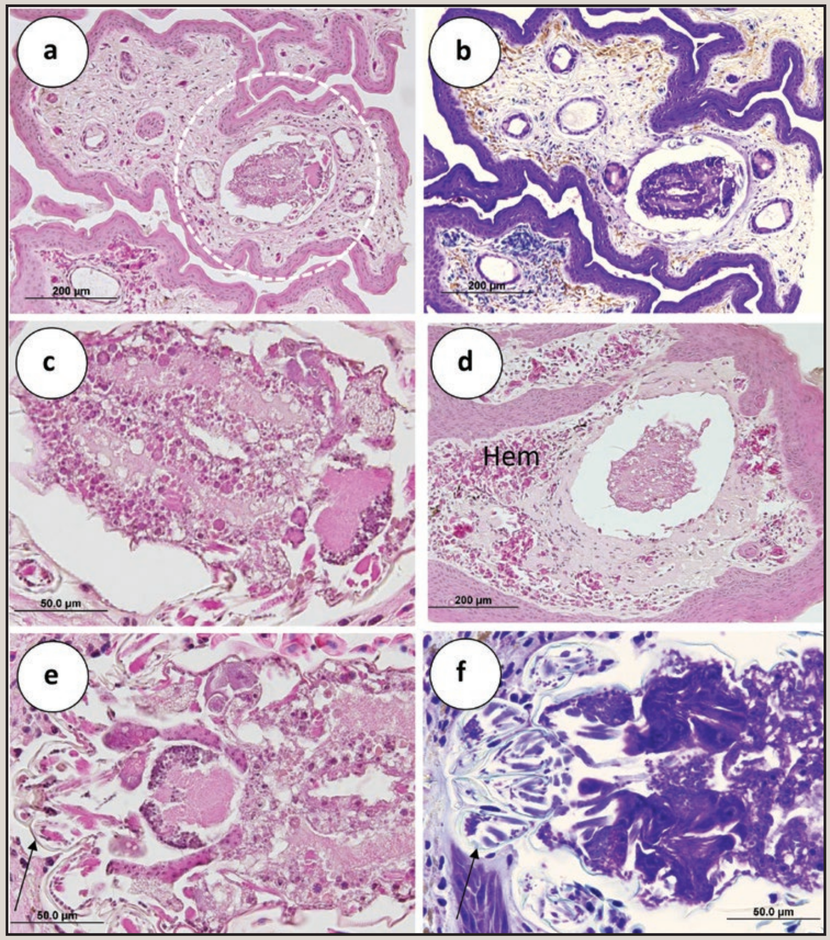

Fig. 2. Histology of *Anaxyrus microscaphus* (MJR 631) exhibiting skin lesion from Indian Tank. a) Skin tissue from thoracic area infested with a mite and (circled) associated host inflammatory response (H&E). b) Same sectioned view of (a) stained with thionin. c) Enlarged view of (a) (H&E). d) Host inflammatory response as hemorrhage (hem) and leucocytic infiltrates surrounding the mites at the left anterior leg (H&E). e) Enlarged view of larval mite mouthparts, possibly chelicerae (arrow) from pectoral skin area (H&E). f) Same sectioned view of (e) stained with thionin.

Three of six (50%) *A. microscaphus*, two from Indian Tank (MSB 96377, male, SVL = 63 mm, detected by slide mounted specimen; MJR 631, male, SVL = 68 mm, detected by histological specimen) and the one specimen from Black Canyon (MSB 96363, male, SVL = 65 mm, detected by slide mounted specimen), were found to be infested with larval mites that fit the description of *Hannemania bufonis* (Loomis and Welbourn) in having one genuala II and III and lacking femoralae (traits also shared by *Hannemania hylae* [Ewing]), having parasubterminala I branched, tarsala I longer and narrower than tarsala II, and the unique shape of the scutum (Loomis and Welbourn 1969, *op. cit.*). No gene sequences of *Hannemania* spp. are available for molecular species determinations. Histologically, the parasite was found in the left side of the thoracic skin of two specimens, MJR 631 and MJR 633 (Fig. 2, MJR 631), and in the pectoral skin (180 × 340; 184 × 284; 224 × 332 µm; N = 3 per sectioned slide). Associated congestion, hemorrhage, and leucocytic infiltrates surrounded the larval mites, causing host inflammation (Figs. 2a, b). The organism was separated from the host by a capsule (Figs. 2c, d) and possessed mouth-parts, possibly chelicerae (seen in section) presumptively composed of chitin-like structures (Figs. 2e, f). In the left anterior leg of the toad, severe congestion and hemorrhaging as well as leucocytic infiltrates surrounded the parasites (N = 1 per sectioned slide; 185 × 250 µm; Fig. 2d). No skin tissue from the left side of the pelvic skin was sectioned. However, capillaries at the myosepta in the skeletal muscle tissue were congested. The second histologic specimen (MJR 633) also revealed mites (460 × 730 µm; N = 1 per sectioned slide) in the left side of the pelvic skin dermis, and was infiltrated with leucocytes (e.g. fibrocytes). Parasites were found in the left side of the abdominal skin (256 × 470 µm; N = 1 per sectioned slide) and again, were associated with congestion. No mites were detected on the third histological specimen (MJR 626), but the capillaries of the thoracic skin and pelvic skin dermis were congested, suggesting parasitism elsewhere and not in the skin section assayed.

Hannemania bufonis has been previously reported only from *A. punctatus* (Red-spotted Toad) from western North America in Arizona, California, western Texas, southern Utah and Sonora, México (Loomis and Welbourn 1969, *op. cit.*; Walters et al. 2011. Fac. Publ. Harold W. Manter Lab. Parasitol. 697:1–183). Unlike some other *Hannemania* species (Loomis 1956, *op. cit.*; Walters et al. 2011, *op. cit.*), *H. bufonis* appears to be fairly host-specific and has only been reported from *A. punctatus, A. mazatlanensis* (Sinaloa Toad; Goldberg et al. 2002. Herpetol. Rev. 33:301–302), and *A. microscaphus* (this study). The histological findings of *Hannemania* spp. infesting anurans in New Mexico (Duszynski and Jones 1973, *op. cit.*; Grover et al. 1975. J. Parasitol. 61:382–384) resemble our findings in morphology, encapsulation, and the associated host cellular response (i.e. infiltration of fibroblasts). The geographic location also coincides with Duszynski and Jones (1973, *op. cit.*) in that the anuran samples infested with chiggers were also collected from Sierra Co., New Mexico. Duszynski and Jones (1973, *op. cit.*) also suggested that prevalence of the infestation positively correlates with altitude. They found a high prevalence of mite infestation in *Hyla arenicolor* at 1829–2743 m above sea level, similar to the elevation in our cases (2175–2181 m). We document a new host record as well as the first report of *H. bufonis* from New Mexico.

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***COLOSTETHUS FRATERDANIELI* (Santa Rita Rocket Frog, Rana Cohete). ANUROPHAGY.** *Colostethus fraterdanieli* is endemic to Colombia, distributed along the western flank of the Cordillera Central and along both the western and eastern flank of the Cordillera Occidental from Antioquia to Nariño, at elevations between 1000 and 2500 m (Silverstone 1971. Los Angeles Co. Mus. Contrib. Sci. 215:1–8; Grant and Castro 1998. J. Herpetol. 32:378–392; Sánchez et al. 2010. Phyllomedusa 9:133–139). *Colostethus fraterdanieli* is a leaf litter dwelling species (Grant and Castro 1998, *op. cit.*) that preys primarily on arthropods, like other members of the genus (Hoyos-Hoyos et al. 2012. S. Am. J. Herpetol. 7:25–34; Blanco-Torres et al. 2013. Herpetol. Rev. 44:493–494; Blanco-Torres et al. 2014. Herpetol. Rev. 45:476). Herein we present the first records of anurophagy in *C. fraterdanieli* adults from both Ecoparque Los Alcazares Arenillo (5.06508°N, 75.5329°W, WGS 84; 1893 m elev.) and Ecoparque Recinto del Pensamiento (5.0393°N, 75.4465°W, WGS 84; 2154 m elev.), Manizales, Caldas, Colombia.

We stomach-flushed 57 individuals *C. fraterdanieli* from 19–27 January 2016, between 1000 and 1400 h, in leaf litter. Of the 57 individuals examined, four (7%) contained anuran prey items besides arthropods. Three individuals from Ecoparque Recinto del Pensamiento, two females (mean SVL = 25.5 mm, range = 25–26 mm) and one male (SVL = 26 mm) consumed eggs (N = 28, range = 2–3 mm; Fig. 1A) of an undetermined *Pristimantis* species. One female (SVL = 29 mm) from Ecoparque Los Alcazares Arenillo contained a juvenile of *P. achatinus* (SVL = 11 mm), which was ingested headfirst (Fig. 1B-C).

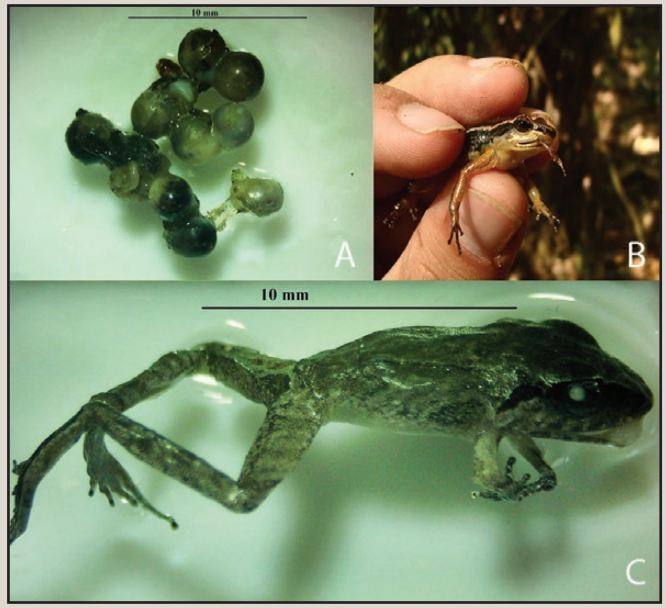

Fig. 1. Anuran prey items in the stomachs of adult *Colostethus fraterdanieli.* A) Eggs of *Pristimantis* sp.; B). Female of *C. fraterdanieli* swallowing a juvenile *Pristimantis achatinus*; C). Juvenile *P. achatinus* consumed by *C. fraterdanieli* female.

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***HYLA CHRYSOSCELIS* (Cope's Gray Treefrog), *H. AVIVOCA* (Bird-voiced Treefrog), and *H. CINEREA* (Green Treefrog). EGG AND TADPOLE MORTALITY.** Three examples are given that show the consumption or other loss of frog eggs and small tadpoles by either ciliated protozoans or an alga. An egg film of *Hyla chrysoscelis* was collected (14 April 2015; 8 km SW Starkville, Oktibbeha Co. Mississippi, USA) by letting it flow into a container tipped slightly below the water surface. Numerous ciliate protozoans were noticed in the culture container, and the population increased rapidly in the lab for the next 3 days. When a tadpole at Gosner stage 25 died during a photographic session, numerous large protozoans (Ciliophora: *Tetrahymena* sp., identified by Eleni Gentekaki, Mae Fah Luang University, Thailand) consumed the entire tadpole except the skin within about 12 h, and this kind of event was observed several times. The ciliates did not interact with living tadpoles or with tadpoles infected with an oomycete water mold. These ciliates have a cytostome with large cilia at the opening but no biting apparatus, so they apparently consume particles as they are sloughed from the carcass. These large protozoans were also associated with egg films of *Gastrophryne carolinensis* but not with the submerged egg strings of *Anaxyrus fowleri* in the same pool at the same time or with degrading egg jellies of *Ambystoma maculatum* 1.5 months after the larvae hatched in other pools.

At about 2100 h on 2 May 1977 (8 km N Starkville, Oktibbeha Co., Mississippi, USA), a group of twelve eggs of *Hyla avivoca* was found in a typical swamp environment. Two eggs that appeared to be dead were actually being eaten by a swarm of large, *Paramecium*-like protozoans, and the many ciliated protozoans swimming around the group of eggs could be seen as their rotating bodies glinted in the light source. An individual would hesitate momentarily as it easily pushed through the outer jelly layer, hesitate again at the vitelline membrane and then enter the ovum. By the next morning, nine of the twelve eggs had been eaten, and only small mounds of debris rested at the bottoms of the vitelline membranes.

Heavy rains filled a small pond (18 May 1982, 10 km NE Starkville, Oktibbeha Co., Mississippi, USA) that had received the tailings from the drilling of an oil well. Several groups of recently laid eggs of *Hyla cinerea* were found just below the surface the next morning. Two days later, because of the extreme eutrophication of the pond caused by the well tailings, essentially the entire water volume of the pool was filled with a filamentous, gelatinous, *Spirogyra*-like alga. Large dysticid beetles and belostomatid bugs that became tangled in the alga had drowned. The alga covered the undersurface of the groups of eggs and filled the interstices between adjacent eggs, but the embryos appeared normal. Three days later, tadpoles well beyond the typical hatching stage were dead and deteriorating within the jelly layers. We know of no other report of frog eggs being killed by an alga.

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***LITHOBATES SYLVATICUS* (Wood Frog). MELANISTIC LARVA.** Aberrant coloration has regularly been reported in individual adult anurans (e.g., Toledo et al. 2011. Herpetol. Notes 4:145–146) and less commonly in their larvae. Larval color abnormalities typically involve the lack or reduction of dark pigments (albino or amelanistic; e.g, Cahn 1926. Copeia 1926:107–109; Nijs and Keller 2002. Herpetol. Rev. 33:131; Pearl et al. 2002. Herpetol. Rev. 33:123; Rodrigues and Oliveira-Filho 2004. Herpetol. Rev. 35:373; Brassaloti and Bertoluci 2008. Herpetol. Bull. 106:31–33). To my knowledge, melanistic larvae have not been documented for *Lithobates sylvaticus*. I report here a likely melanistic larva of *L. sylvaticus*, which was detected due to laboratory-induced pale coloration of its siblings and other conspecifics. Albino larvae have previously been reported for *L. sylvaticus* (Luce and Moriarity 1999. Herpetol. Rev. 30:94).

In March 2010, a clutch of *L. sylvaticus* eggs was collected from a forest pond in Centre Co., Pennsylvania, USA (40.7816°N, 78.0029°W; WGS 84) as part of a larger study. The clutch was hatched in the laboratory in a transparent plastic tub of dechlorinated tap water, and 20 hatchling tadpoles were arbitrarily chosen for further rearing. They were kept in 4 L of water in a transparent plastic tub and fed ad libitum rabbit chow and fish flakes. Water was changed weekly. Most tadpoles took on a pale gray coloration, which I have observed in thousands of *L. sylvaticus* tadpoles when raised in the laboratory. This coloration, which contrasts with the typical black coloration of wild *L. sylvaticus* tadpoles, is likely due to bright lighting conditions and the light wall colors. Tadpoles develop normal dark coloration in the laboratory when provided with a darkly colored substrate (unpublished data). One tadpole in this clutch was extremely dark. This color difference was apparent in life and after the tadpole had been preserved for ~5 yrs in 70% ethanol (Fig. 1). The black coloration subjectively appeared to be more intense than even that of field-collected *L. sylvaticus* tadpoles. This suggests that this tadpole was melanistic, producing excessive amounts of melanin despite the laboratory conditions. Melanistic individuals might not normally be noticed due to the black coloration of most wild *L. sylvaticus* tadpoles. However, this was the only such strikingly colored individual I observed of several thousand tadpoles reared in the laboratory, suggesting that this may be a rare variation.

Fig. 1. The melanistic *Lithobates sylvaticus* tadpole surrounded by siblings after preservation for ~5 yrs in 70% ethanol.

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***OSTEOPILUS SEPTENTRIONALIS* (Cuban Treefrog). PREDATION.** *Osteopilus septentrionalis*, native to Cuba, the Bahamas, and the Cayman Islands, was likely unintentionally introduced to Key West, Florida, USA in cargo shipments from Cuba (Barbour 1931. Copeia 1931:140). Since it was first documented in 1931, it has dispersed rapidly from the Florida Keys northward to the Florida panhandle (Meshaka et al. 2004. The Exotic Amphibians and Reptiles of Florida. Krieger Publishing Company, Malabar, Florida. 155 pp.). *Osteopilus septentrionalis* has negatively impacted native taxa through predation and competition leading to population declines of native anurans (Smith 2005. Biol. Conserv. 123:433–441; Rice et al. 2011. Herpetologica 67:105–117).

When threatened, *O. septentrionalis* exudes a noxious secretion that may render them less palatable to predators. The effectiveness of this defense mechanism may be enhanced when employed against predators that do not share a coevolutionary history. Despite possessing novel chemical defensive compounds, several species in Florida have been documented to prey on *O. septentrionalis*, including *Strix varia* (Barred Owl; Meshaka 1996. Florida Field Natur. 24:15); *Corvus brachyrhynchos* (American Crow), *Pantherophis guttatus* (Red Cornsnake), *Agkistrodon piscivorus* (Cottonmouth), *Nerodia fasciata* (Southern Watersnake; Meshaka 2001. The Cuban Treefrog in Florida: Life History of a Successful Colonizing Species. University Press of Florida, Gainesville, Florida, 224 pp.); *Thamnophis sirtalis* (Common Gartersnake; Meshaka and Jansen 1997. Herpetol. Rev. 28:147–148); *T. sauritus sackenii* (Peninsula Ribbonsnake; Love 1995. Herpetol. Rev. 26:201–202); *P. alleghaniensis* (Eastern Ratsnake), and *Coluber constrictor* (North American Racer; Meshaka and Ferster 1995. Florida Field Natur. 23:97–98).

We report an additional native snake, *Nerodia clarkii compressicauda* (Mangrove Saltmarsh Watersnake) as a predator of *O. septentrionalis*. A dead-on-road *N. clarkii* (SVL = 42.8 cm, total length = 52 cm, 55 g) collected on 16 November 2014 from

Everglades National Park, Homestead, Monroe Co. Florida, USA (25.1588°S, 80.9131°W; WGS 84) was dissected and found to contain a juvenile *O. septentrionalis* (SVL = 2.5 cm). This is the first known documented incidence of *N. clarkii* consuming *O. septentrionalis*.

Likelihood of successful establishment of a non-indigenous species such as *O. septentrionalis*, may be increased when they possess a novel weapon or defense mechanism (Callaway and Ridenour 2004. Front. Ecol. Environ. 2:436–443). However, time and exposure may reduce the novelty and thus dampen the effectiveness of these defense mechanisms. Avian and ophidian taxa are expected to be predators of *O. septentrionalis* in the non-native range because they are the primary predators within the native distribution (Henderson and Powell 2009. Natural History of West Indian Reptiles and Amphibians. University Press of Florida, Gainesville, Florida. 495 pp.). Although *O. septentrionalis* negatively impacts some native anurans, they may also provide a significant new food resource for native snakes and birds. Additionally, native snakes may factor in regulating *O. septentrionalis* abundance and distribution.

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***PEDOSTIBES HOSII* (Brown Tree Toad). SKIN SECRETIONS.** Several species of amphibians produce skin secretions to protect themselves from predators. This secretion can be divided into four categories: odoriferous, adhesive, noxious, and slippery (Toledo et al. 2011. Ethol. Ecol. Evol. 23:1–25). *Pedostibes hosii* is a medium-sized arboreal bufonid distributed in southern Thailand, Peninsular Malaysia, Borneo and Sumatra (Das 2007. Amphibians and Reptiles of Brunei. Natural History Publications Borneo, Kota Kinabalu. 200 pp.). In Peninsular Malaysia it can be found in primary rain forest, on low vegetation along small forest streams (Berry 1975. The Amphibian Fauna of Peninsular Malaysia. Tropical Press, Kuala Lumpur. 133 pp.). Herein we report secretions produced by parotoid glands of *P. hosii* as an antipredatory strategy.

Between 2030 and 2100 h on 20 December 2014, an adult male *P. hosii* was observed calling from a tree branch (approx. 2.5 m above ground) at the edge of Sungai Sedim, Kedah, Malaysia (5.25060°N, 100.46510°E; WGS 84). We captured the toad and put in on leaves to photograph. Suddenly the toad produced a smelly milky secretion from both parotoid glands and stayed immobilized. The secretion was viscous, white in color and smelt like pepper. While releasing these secretions, the specimen was in a normal posture (immobilized) with both of its eyes open. The toad continually released the secretions until we finished photographing it (approx. 2 min). Later the specimen was brought back to the laboratory for measurements (SVL = 74 mm; 16 g). The specimen was preserved and deposited at School of Pharmacy, Universiti Sains Malaysia (14USM-SS-PH01). This finding is the first description of antipredatory secretions by *P. hosii*.

Fig. 1. Milky white secretions produced by *Pedostibes hosii* from Kedah, Malaysia.

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***PRISTIMANTIS ACHATINUS* (Cachabi Robber Frog). PREDATION.** Anurans are important prey for numerous arthropod taxa (Toledo 2005. Herpetol. Rev. 36:395–399). Among these, arachnids are reported to be the most significant predators during the amphibians' terrestrial stage (Armas 2001. Rev. Iber. Aracnol. 3:87–88; Menin et al. 2005. Phyllomedusa 4:39–47). Nevertheless, few reports exist about predation of anurans by amblypygids (Formanowicz et al. 1981. Herpetologica 37:125–129; Hovey et al. 2016. Herpetol. Rev. 47:113–114). *Pristimantis achatinus* is a common frog widely distributed in the northwestern lowlands of Ecuador, and along the west slopes of the Andes (Boulenger 1898. Proc. Zool. Soc. Lond. 9:107–126). Here we report predation of *P. achatinus* by whip spiders (Amblypygi: Phrynidae: *Heterophrynus armiger*).

On 15 Feb 2016 at ca. 0100 h, at forest reserve "El Jardin de los Sueños" in the municipality of La Maná in Cotopaxi Province, Ecuador (0.837944°S, 79.205585°W, WGS 84; 537 m elev.; temp. 23°C), we observed an adult *H. armiger* at the edge of a trail on exposed soil. This amblypygid grabbed a *P. achatinus* by its raptorial pedipalps. The frog was still alive but did not show any sign of struggling. Upon our approach the whip spider was startled and released the amphibian, which quickly escaped. An hour later, several hundred meters further along the same trail, we spotted

Fig. 1. *Heterophrynus armiger* preying on a *Pristimantis achatinus* in the cloud forest near La Maná, Cotopaxi Province, Ecuador.

another amblypygid of the same species carrying a recently caught *P. achatinus* (SVL ca. 40 mm). We managed to get closer this time and photograph the interaction (Fig. 1), followed immediately by the same outcome as observed in the previous case—the arachnid released the live frog. We suspect the whip spiders sensed our presence due to their extreme sensitivity to vibrations (Igelmund and Wendler 1991. J. Comp. Physiol. A 168:75–83). Although they failed to complete the predation interaction due to our interference, it should be noted that our consecutive observations taken on the same night suggest this interaction is common in the area. This is the first report of amphibian predation by *H. armiger* in the cloud forests west of the Andes.

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***PRISTIMANTIS NERVICUS* (Lynch's Nervous Frog). REPRODUCTION.** *Pristimantis nervicus* is an endemic, direct developing frog from the family Craugastoridae, that inhabits the highlands of the Northern Cordillera Oriental, specifically found in Cundinamarca, Boyacá and Meta, Colombia (Lynch 1994. Rev. Acad. Colomb. Cien. Exact. 19:195–203). This species is a component of the high altitude amphibian community present at elevations between 3000 and 4000 m (Navas 1999. Rev. Acad. Cien. Exact. 23:465–474). In the original species description, Lynch (1994, *op. cit.*) comments on a nesting event of a female guarding her clutch under a flat stone. Neither breeding nor mating behaviors, besides a description of its mating call, have been reported in the literature and no additional information on nesting attributes is available (Lüddecke et al. 2002. *In* Miaud and Guyetaut [eds.], Current Studies in Herpetology, pp. 285–294. Proceedings of the 9th Ordinary General Meeting of the Societas Europaea

Fig. 1. General habitat of *Pristimantis nervicus*, Pantano de Martos 3500 m. elev.

Fig. 2. *Pristimantis nervicus* couple engaged in amplexus.

Fig. 3. Nest laid in a small depression under lichen and moss. Arrow indicates location of female with eggs.

Fig. 4. Closeup of female *Pristimantis nervicus* guarding her nest

Herpetologica 25–29 August 1998, Le Bourget du Lac, France). In this note I report observations of a couple engaging in amplexus and of a separate nesting event for this species in Guatavita, Cundinamarca.

Observations on some aspects of the reproductive behavior from *P. nervicus* were recorded during the dry season (February 2015) in Pantano de Martos, vereda Montenquiva Guatavita Cundinamarca, Colombia (4.7434°N, 73.8622°W; WGS 84), located at the limits of Chingaza's Natural Park buffer area (Fig. 1). Nocturnal and diurnal searches for *P. nervicus* were held in high mountain habitats lying between 2840–3500 m elev. (Fig. 1). Diurnal sampling was done by means of the technique: "Remoción con rastrillo y Azadón or removal by rake and hoe" (RRH), following (Mueses-Cisneros et al. 2009. *In* Vriesendorp et al. [eds.], La Herpetofauna de la Región Paramuna. Ecuador: Cabeceras Cofanes-Chingual, Rapid Biological and Social Inventories Report 21, pp. 248–287. The Field Museum, Chicago).

At 0600 h on 12 January 2015, a couple engaged in axillary amplexus were observed under a moss pad at 3500 m elev. via the RRH technique (Fig. 2). During this month's fieldwork (9–15 January 2015), couples formed inside the capture bags, some of which remained in amplexus for three days, but no eggs were deposited.

A nest of *P. nervicus* was discovered in the morning of 6 February 2015, laying under a moss and lichen bed, inside remained the adult female (SVL = 32 mm; 2.5 g), guarding its eggs. The nest was placed in the transition zone between shrubland and highland (Paramo); at 3400 m elev. Ericaceae bushes dominated the standing vegetation (Fig. 3). The nest was composed of 48 fertile and three unfertile eggs guarded by the female (Fig. 4). The whole clutch weighed 2.030 g. The diameter of a single fertile egg was 4.15 mm and weighed 0.049 g.

In contrast to the single observation of a nesting event by Lynch (1994, *op. cit.*), no eggs from this species were found under rocks, though this species does use this available microhabitat at the study site and we did only observe a single nest. This frog is a relatively common species that occurs nearby in the city of Bogotá (Medina et al. 2014. Herpetotropicos 10:17–30), despite this, there is a lack of published records and limited field observations of reproduction in nature, probably because frogs remain hidden while displaying these behaviors.

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***RHINELLA YUNGA*. PREDATION.** *Rhinella yunga*, a recently described toad species of the *Rhinella margaritifera* group (Moravec et al. 2014. Zookeys 37:35–56), is known from the tropical mountains of the Cordillera Yanachaga, Junin Province, Peru. *Rhinella yunga* inhabits the forest floor, hiding in leaf litter of tropical transitional montane and tropical montane cloud forests between 1800 and 2230 m elev.; little else is known of this species' natural history.

Fig. 1. An aquatic insect (*Lethocerus* sp.) preying on an adult *Rhinella yunga* in a small pond at the Centro de Capacitación en Conservación y Desarrollo Sostenible, Peru.

At 2000 h on 21 December 2015, we observed a large (total length = 7.1 cm) aquatic insect, *Lethocerus* sp. (Family Belastomatidae) preying on an adult male *R. yunga* (SVL = ca. 4 cm; Fig. 1). We witnessed the event while searching for *R. yunga* around a small pond located at the Centro de Capacitación en Conservación y Desarrollo Sostenible, Oxapampa, Peru (10.54591°S, 75.37132°W, WGS 84; 2200 m elev.). The insect caught our attention when it captured the toad with its raptorial front legs in the middle of the pond. However, we were not able to see whether the beetle chased the toad to the middle of the pond or if it was already there. The insect then dragged the toad by its hind leg to the pond's vegetated perimeter. The toad struggled until it was pierced behind the ribs by the insect's proboscis, upon which the insect submerged with the *R. yunga* under approximately 15 cm of water, and attached itself to roots of the aquatic plant, *Echornia crassipes*, as an anchor, presumably to drown the now immobile toad. The toad made one weak attempt to reach the surface in the 8 minutes it was held under water but it sustained fatal injuries. The weather conditions were light rain with a temperature of 17.3°C and relative humidity 100%.

Insects of the family Belastomatidae are known predators of amphibians (Mitchell and Johnston 2013. Herpetol. Rev. 44:124; Batista et al. 2014. Herpetol. Rev. 45:111), including members of the family Bufonidae (Cabrera-Guzman et al. 2015. Herpetol. Monogr. 29:28–39). *Lethocerus* spp. are ambush predators, often using their front legs to catch their prey before injecting it with digestive enzymes (Wells 2007. Ecology and Behavior of Amphibians. University of Chicago Press, Chicago, Illinois. 655 pp; Maffei et al. 2014. Herpetol. Notes 7:371–374).

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TESTUDINES — TURTLES

***CHELONOIDIS DENTICULATA* (Yellow-Footed Tortoise). DIET.** *Chelonoidis denticulata* (= *Geochelone denticulata*) is a member of the Testudinidae found in South American forests. *C. denticulata* and the related species, *C. carbonaria,* have been shown to primarily be frugivorous, however they supplement their diet with protein-rich food items such as insects and vertebrate carrion (Wang et al. 2011 South Am. J. Herpetol. 6:11–19; Moskovits and Bjorndal 1990. Herpetologica 46:207–218). Previous studies indicate that fungi can compose a significant portion of the diet (up to 22%) of *C. denticulata* (Guzman and Stevenson 2008. Amphibia-Reptilia 29:468).

Fungal components in the diet of *C. denticulata* have been documented, but the taxonomic identity of the fungi consumed is rarely reported. Here we report observing *C. denticulata* consuming a *Russula* aff. *puiggarii* mushroom in the tropical rainforests of Guyana.

On 20 June 2013 during field research in the Pakaraima Mountains of Guyana our team found a *C. denticulata* juvenile along the Upper Potaro River at approximately 5.267°N, 59.9°W (WGS 84). The tortoise was placed with several mushroom fruiting bodies in a makeshift enclosure roughly 4 m^2 in area. After approximately an hour the tortoise was observed feeding on the fruiting body of *Russula* aff. *puiggarii* (Fig. 1). According to conversations with native people in the area, *C. denticulata* is frequently observed to feed on fungi, also observed previously by one of us (TWH). They are often found eating fruitings of kapiokwok mushrooms (*Lentinula* sp.).

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Fig. 1. *Chelonoidis denticulata* feeding on *Russula* aff. *puiggarii* mushroom in Guyana.

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***CHELYDRA SERPENTINA* (Snapping Turtle). ALIEN NESTING.** Here we describe a nesting record for a captive *Chelydra serpentina* in southern Brazil. The species is distributed over much of eastern and central North America (Iverson et al. 1997. Herpetologica 53:97–117), and has been introduced in Japan, China, and Taiwan (www.iucnredlist.org; accessed 16 Mar 2016.). *Chelydra serpentina* has a high reproductive potential in its natural environment (Congdon et al. 1987. Herpetologica 43:39–54; Congdon et al. 2008. *In* Steyer-mark and Brooks [eds.], Biology of the Snapping Turtle, pp. 123–134. Johns Hopkins University Press, Baltimore, Maryland). In the wild, nesting occurs from May to June and incubation varies from 75 to 95 days. The nest generally has a narrow opening with a wide globular egg chamber, constructed in sand or soil (Ernst and Lovich 2009.Turtles of the United States and Canada. Johns Hopkins University Press, Baltimore, Maryland. 827 pp.).

In March 2012, a captive female Snapping Turtle constructed a nest in the typical manner and deposited 33 eggs at a registered wildlife conservation center ("Noah's Ark"—register number 2/43/1999/000039-8/IBAMA-Brazil) situated in a fragment of semi-deciduous submontane forest (29.52824°S, 51.07063°W, 658 m elev.), in northeastern Ro Grande do Sul, Brazil. The regional climate is humid, with rain throughout the year and the warmest month averages higher than 22°C (Köppen climate catagory Cfa; Moreno 1961. Clima do Rio Grande do Sul. Porto Alegre, Secretaria da Agricultura - Div. Terras e Colonização). The nesting occurred in an outdoor semi-aquatic enclosure of 7.5 m^2, in a damp coarse sand substrate in partial shade. The nest was 30 cm from the edge of the water; the nest chamber was 23 cm deep and 14 cm wide. Eighteen eggs hatched and the hatchlings were weighed and measured one month post-hatching. They had an average mass of 13 g, an average carapace length of 32 mm, and average carapace width of 30 mm. After three years, only one individual remains alive, and at this writing has a mass of 1.57 kg, 165 mm carapace length, and 160 mm carapace width. One individual was preserved in the scientific reference collection of the Universidade do Vale do Rio dos Sinos— UNISINOS/RS No. CHLEVT:223/2015.

The parents of these hatchlings were confiscated by the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis-IBAMA during enforcement activities directed against wildlife trafficking in Brazil. *Chelydra serpentina* is often exploited for the food and pet trade (Van Dijk 2012. The IUCN Red List of Threatened Species 2012: e.T163424A18547887; accessed on 28 September 2015). The species might be expected to adapt to environments in many parts of Brazil, and could potentially be invasive in aquatic communities, with possible negative consequences for native turtle faunas, biota, and aquatic ecosystems.

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***CHELYDRA SERPENTINA* (Snapping Turtle). FORAGING BEHAVIOR.** *Chelydra serpentina* are omnivorous, dietary generalists; consuming a wide variety of plant and animal material (reviewed by Ernst and Lovich 2009. Turtles of the United States and Canada, 2nd ed. Johns Hopkins University Press, Baltimore, Maryland. 827 pp.). Analyses of *C. serpentina* stomach contents suggest that the majority of plant matter consumed are aquatic species; however, terrestrial vegetation does make up a portion of the diet (Lagler 1942. Am. Midl. Nat. 29:257–312; Alexander 1943. J. Wildl. Manage. 7:278–282; Hammer 1969. J. Wildl. Manage. 33:995–1005; Ernst and Lovich 2009, *op. cit.*). Herein, I report observations of *C. serpentina* terrestrially foraging upon Skunk Cabbage (*Symplocarpus foetidus*).

Following an initial, previously reported observation (Hartzell 2015. Herpetol. Rev. 46:422), I walked transects periodically (2–4 times per week) during 14 May to 15 July 2015 and 15 April to 14 May 2016 along a railroad bed bordering the northern shoreline of an unnamed pond near Espy, Columbia Co., Pennsylvania, USA (41.010206°N, 76.416294°W; WGS 84). *Chelydra serpentina* were opportunistically visually observed during this time and behavioral observations were recorded. In total, 14 observations were recorded of *C. serpentina* consuming Skunk Cabbage. All observations of foraging behavior occurred during sunny weather from 1000–1400 h, by turtles of ca. 20–35 cm carapace length. On most occasions, a solitary *C. serpentina* would come onto land, gather one or several Skunk Cabbage leaves in its mouth (Fig. 1) and retreat to the water to consume Skunk Cabbage. However, on two occasions, individuals appeared to consume leaves on land near the shoreline. On one occasion, two individuals were noted consuming leaves within the water approximately 1 m apart. Over time (early June 2015) many Skunk Cabbage plants along the pond appeared to have been completely defoliated by *C. serpentina* (Fig. 2); however, these plants were observed to grow back the following year (April 2016) with no notable impairment.

Fig. 1. *Chelydra serpentina* carrying Skunk Cabbage (*Symplocarpus foetidus*) leaves from land to consume in water.

Fig. 2. Skunk Cabbage (*Symplocarpus foetidus*) plant completely defoliated by *Chelydra serpentina*.

Few observations appear to have been published regarding accounts of multiple *C. serpentina* foraging on terrestrial vegetation. Aird (2008. Bull. Chicago Herpetol. Soc. 43:189–195) reports observations similar to those reported herein of multiple *C. serpentina* coming onto land to consume fallen pear (*Pyrus* sp.) fruit. Turtles are long-lived and some species are thought to remember when food is seasonally available within their habitat (Dodd 2001. North American Box Turtles, A Natural History. University of Oklahoma Press, Norman, Oklahoma. 231 pp.; Ernst and Lovich 2009, *op. cit.*). Skunk Cabbage has a seasonal cycle, with leaves typically emerging in spring and dying off in mid-summer (Small 1959. Bull. Torrey Bot. Club 86:413–416). These observations of multiple *C. serpentina* in the same locality foraging on Skunk Cabbage during two subsequent years suggests that this plant may make up a seasonal component in the diet of some *C. serpentina* populations. Additionally, as individuals diurnally foray onto land to acquire Skunk Cabbage (typically 3–6 m from the shoreline), this behavior could increase vulnerability to predation.

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***GEOCHELONE PLATYNOTA* (Burmese Star Tortoise). SCAVENGING.** *Geochelone platynota* is a medium-sized tortoise (carapace length [CL] to ca. 300 mm) endemic to the dry zone of central Myanmar (Platt et al. 2011. Chelon. Res. Monogr. 5:57.1–57.9 and references therein). *Geochelone platynota* was considered functionally extinct in the wild by the mid-2000s due to a combination of long-term, chronic subsistence harvesting by rural villagers and illegal collecting to supply the international pet trade (Platt et al., *op. cit.*). Efforts to restore a wild population by releasing captive-bred, head-started tortoises are currently (2013–present) underway at Minzontaung Wildlife Sanctuary (MWS; 21.40000°N; 95.78333°E; India-Bangladesh datum; site description available in Platt et al. 2003. Oryx 37:464–471), a protected area in central Myanmar (Platt et al. 2015. Turtle Survival 2015:28–32). Little is known concerning the ecology of *G. platynota*, and information on diet and foraging behavior among wild individuals is notably lacking (Platt et al. 2011, *op. cit.*). Platt et al. (2001. Chelon. Conserv. Biol. 4:172–177) found plant material, insect chitin, and small stones in feces obtained from four *G. platynota* captured at Shwe Settaw Wildlife Sanctuary, and Thanda Swe (2004. Autecology of Myanmar Star Tortoise, *Geochelone platynota* [Blyth, 1863]. Ph.D. dissertation, University of Mandalay, Mandalay, Myanmar. 122 pp.) observed wild *G. platynota* outfitted with VHF radio transmitters at MWS consuming gastropods, fungi, and leafy foliage. We

PHOTO BY ME ME SOE

Fig. 1. Female Burmese Star Tortoise (*Geochelone platynota*) consuming the carcass of a Barred Button Quail (*Turnix suscitator*) at Minzontaung Wildlife Sanctuary in central Myanmar. Note dried wing at lower right in photograph.

here report an observation of scavenging (carrion foraging) by *G. platynota* in the reintroduced population at MWS.

At 0925 h on 26 June 2015, while radio-tracking reintroduced tortoises as part of a monitoring program to determine post-release dispersal at MWS, we came upon a female *G. platynota* (CL = 159 mm; released November 2014) consuming the dried carcass of a Barred Button Quail (*Turnix suscitator*). The carcass consisted of the intact skull, disarticulated wing bones with attached feathers, and part of the sternum, with pieces of dried flesh adhering to some bones. The remains of an egg beside the carcass (size and coloration consistent with *T. suscitator*) led us to speculate the quail was incubating a clutch when killed and partially consumed by a predator. When found, the tortoise was consuming a wing with attached feathers (Fig. 1), but ceased feeding as we approached. We measured and weighed the tortoise before returning it to the carcass (ca. 5 minutes), at which time it ambled off into the surrounding scrub. Although our observation is apparently the first of *G. platynota* scavenging carrion in the wild, Thanda Swe (*op. cit.*) witnessed captive *G. platynota* at the Yadanabon Zoological Gardens in Mandalay, Myanmar consuming a decomposing Russell's Viper (*Vipera russelli*) tossed into their enclosure, and in the past, poachers reportedly captured *G. platynota* in pitfall traps baited with odiferous carrion (Platt and Platt 2014. Burmese Star Tortoise Conservation in Myanmar. Report to Wildlife Conservation Society, Bronx, New York. 46 pp.). Taken together, these reports suggest carrion is opportunistically taken by foraging *G. platynota* when available.

In addition to *G. platynota*, scavenging has been reported in a number of other terrestrial and aquatic chelonians (Ernst and Lovich. 2009. Turtles of the United States and Canada. 2nd edition. Johns Hopkins University Press, Baltimore, Maryland. 827 pp. and references therein), and in general, is probably more prevalent than usually recognized (DeVault et al. 2003. Oikos 102:225–234). However, given the limitations of traditional dietary studies that rely heavily on fecal and stomach contents analyses, scavenging can be difficult to distinguish from predation (DeVault et al., *op. cit.*) except through direct observation (Walde et al. 2007. Southwest. Nat. 52:147–149) or under unusual circumstances (e.g., Platt et al. 2010. Can. Field-Nat. 124:265–267; Platt and Rainwater 2011. J. Kansas Herpetol. 37:8–9). Because of these inherent challenges, opportunistic field observations such as ours are valuable in understanding the role of scavenging as a trophic pathway (Logan and Montero 2009. Herpetol. Rev. 40:352). Although difficult to detect, scavenging is nonetheless beneficial from the standpoint of individual fitness and can make important contributions to the diet (Bauer et al. 2005. Southwest. Nat. 50:466–471) because carrion is an energetically rich food source that can be safely obtained without the cost of capturing and subduing prey (DeVault and Krochmal. 2002. Herpetologica 58:429–436). Even dried carcasses such as the Button Quail we observed being consumed by *G. platynota* are an excellent source of calcium and phosphorous (Walde et al., *op. cit.*). Of course, carrion consumption also entails certain costs; most notably scavengers must compete with decomposers, and also risk exposure to toxins and disease-causing microbes in carrion (DeVault et al., *op. cit.*).

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***GLYPTEMYS INSCLULPTA* (Wood Turtle). POTENTIAL ANTING BEHAVIOR.** Turtles are frequently plagued by ectoparasites. In Ontario, these parasites include at least two species of turtle-specialist leeches (*Placobdella ornata* and *P. parasitica*; Brooks et al. 1990. J. Parasitol. 76:190–195). A turtle's limited flexibility makes self-cleaning difficult, and like many taxa, turtles may engage in mutualistic relationships with other species to remove parasites. In Ontario's Algonquin Park, *Chrysemys picta* (Painted Turtles) have been observed eating leeches from *Chelydra serpentina* (Snapping Turtles; Krawchuck et al. 1997. Can. Field-Nat. 111:315–317), while *Quiscalus* sp. (Grackles) have been observed picking leeches off of basking *Graptemys* sp. (Map Turtles; Vogt 1979. Auk 96:608–609). In both cases, the turtles being cleaned showed no inclination to avoid the cleaners.

Anting, the use of ants for anti-parasite behavior, has been observed in numerous animal species, and at least two cases have been tentatively reported in turtles. Burke et al. (1993. J. Herpetol. 27:114–115) observed that *C. serpentina* females nesting in ant mounds were typically free of leeches, and one leech-free gravid female was seen completely buried in an ant mount. McCurdy and Herman (1997. Herpetol. Rev 28:127–128) observed an adult male *Glyptemys insculpta* (Wood Turtle) sitting on an ant mound for ~20 minutes, during which ants were observed crawling over the turtle; a second male turtle was also observed to cross this ant mound, although the duration of stay was unknown. In both studies, it was uncertain if the ants were attacking leeches.

During spring emergence surveys for *Glyptemys insculpta* at a long-term study site in the Sudbury District of Ontario, Canada, we observed possible anting behavior. On 15 May 2016 at ~1100 h, researchers encountered an adult female (ID# 13, carapace length 194 mm) sitting on top of an open grassy beach, approximately 1 m from a stand of *Abies balsamea* (Balsam Fir), and 3 m from the bank of the main river. Measured air temperature was 5.6°C at time of capture, and the skies were overcast. Her carapace was dry despite her close proximity to the river, suggesting that she had been in place for some time and was not dispersing inland. When captured for measurements, we noted several small black ants (~3 mm long, species unknown) moving around the base of the turtle's tail; closer inspection also revealed a cluster of small leeches (likely *P. parasitica*) at the base of the tail, near the cloaca and another cluster in the hind-left leg pocket. Inspection of the site where the turtle was sitting at the time of capture revealed several small ant mounds (~5 cm in diameter) composed of sand. We did not directly observe any ants attacking the leeches. The turtle was located again two days later (17 May 2016) ~6 m from the site of the initial capture; a cluster of leeches was still present at the base of her tail. If she was engaged in anting behavior on 15 May, it is possible that handling by researchers scared her away from her efforts.

Although we suspect that the turtle was displaying anting behavior, it is possible that she was attempting to bask despite the overcast conditions. It is also possible that she was dispersing from the river and attempted to be cryptic when she detected our approach. These explanations seem unlikely, however, given the cold, overcast day and the fact that she was found in the same area two days later. If our supposition about anting behavior is correct, this is the second instance (to our knowledge) of such behavior recorded in *G. insculpta*, and the third in turtles in general. Further investigation into turtle anti-parasite behavior may be an informative line of study in the future.

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***GOPHERUS AGASSIZII* (Mohave Desert Tortoise). NEST DEPREDATION.** *Gopherus agassizii* is found in the Mojave and Sonoran deserts from southern Nevada and southwestern Utah, to northwestern Arizona and southeastern California. *G. agassizii* is typically considered to be an inhabitant of valleys and bajadas, but can occur in hilly or even mountainous terrain typically thought of as habitat for *Gopherus morafkai* (Sonoran Desert Tortoise) farther to the east in the Sonoran Desert of Arizona and Mexico (Averill-Murray and Averill-Murray 2005. J. Herpetol. 39:65–72). Although their habitat varies, desert tortoises spend the majority of their time sheltered in burrows or rock shelters offering protection from thermal extremes (Bulova 2002. J. Therm. Biol. 27:175–189) and providing nesting sites (Ennen et al. 2012. Copeia 2012:222–228).

Tortoises deposit their eggs in flask-shaped nest cavities usually in sandy or friable soil, typically located inside burrow tunnels, burrow aprons, or occasionally under nearby vegetation. Eggs are usually buried at depths ranging from 8–25 cm, and nests deposited near the burrow entrance tend to be oviposited deeper than those farther inside the burrow (Ennen et al. 2012. Copeia 2012:222–228). Known or suspected predators of desert tortoise nests include *Canis latrans* (Coyotes), *Vulpes macrotis* (Kit Foxes), *Taxidea taxus* (American Badgers), and various ground squirrels (e.g., *Ammospermophilus leucurus*), other rodents, and skunks (e.g. gen. *Spilogale, Mephitis*) (Ernst and Lovich 2009. Turtles of the United States and Canada. Johns Hopkins University Press, Baltimore, Maryland. 827 pp.; Nagy et al. 2015. Herpetol. Conserv. Biol. 10:535–549).

In March 2015, we initiated a study on tortoise demography within the Sonoran Desert of southern Joshua Tree National Park, an area where *G. agassizii* approaches the southern limit of its distribution. Tortoises here are found in both the rocky slopes of the Cottonwood Mountains and the associated alluvial bajadas at the base of the mountains. Using a subset of tortoises outfitted with radio transmitters, we tracked tortoises every 10–14 days during the tortoise activity season from March to July, and once per month during the remainder of the year. Females were X-radiographed (Hinton et al. 1997. Chelon. Conserv. Biol. 2:409–414) during the reproductive season to collect information on tortoise clutch size, clutch frequency, and egg size.

Nearly half of our radioed tortoises have been found inhabiting rocky slopes in the Cottonwood Mountains. Although burrows have been reported in mountainous areas, we know of no published literature on *G. agassizii* nests located in this terrain. Here we report the finding of a depredated tortoise nest in the rocky slopes of the Cottonwood Mountains.

On the morning of 3 May 2016, a tortoise nest was discovered dug up from a burrow located near the base of a rocky, north-facing slope frequented by several adult tortoises since April 2015. The nest appeared to be excavated as a result of predation, and a clutch of six broken eggs was found scattered outside the opening of the burrow. All eggs were within a small area surrounded by four large granite boulders. The dimensions of the largest boulder measured 80 cm wide x 128 cm long x 61 cm high. The other three boulders measured approximately 40 cm in all dimensions. A rock shelter large enough for a tortoise to use was formed between the largest and smallest of the four boulders. It had a depth of 20 cm and was 10 cm wide at its mouth. The soil substrate consisted of gravelly decomposing granite blended with silt. The excavated nest was relatively shallow at about 7 cm deep at the time of discovery. A rodent burrow was located near the mouth of the rock shelter where the nest was located. Vegetation surrounding the immediate vicinity of the excavated nest included *Encelia farinosa* (Brittlebush), *Trixis californica* (American Threefold), and *Tetracoccus hallii* (Hall's Shrubby-spurge).

Eggs were scattered 20–129 cm from the nest. The eggshells were mostly intact with large holes punctured in them. Egg width and diameter, as well as hole openings, were measured and documented. Egg widths ranged from 37.2 to 39.3 mm and lengths ranged from 45.0 to 48.0 mm. Hole openings had widths ranging from 20.0 to 35.2 mm and lengths ranging from 20.0 to 38.2 mm. Holes were relatively circular with jagged edges (Fig. 1). All six eggs were empty, however there was evidence of yellow yolk smeared sparingly on the inside of the egg shells and around the punctured openings. Small fragments of egg shell were found surrounding the mostly whole eggs, but some fragments were still attached suggesting the clutch may have been

Fig. 1. Close-up views of punctures in six depredated *Gopherus agassizii* eggs found in a nest on a rocky hillside of the Cottonwood Mountains, southern Joshua Tree National Park.

depredated very recently. There were no discernable mammal or bird tracks spotted near the nest site nor were any animal droppings found, thus the identity of the predator is unknown.

We strongly suspect the depredated nest belonged to a large female tortoise we equipped with a radio transmitter and who was known to inhabit the immediate vicinity. On 20 April 2016, she was located near the nest site and had a clutch of six eggs visible on her X-radiograph. On 3 May 2016, the date the depredated nest was discovered, she had no eggs visible on her X-radiograph indicating she had oviposited her clutch of six eggs. Additionally, the egg sizes from the nest were similar to those measured on her previous X-radiograph after correcting for magnification error (Graham and Petokas 1989. Herpetol. Rev. 20:46–47). This is the largest clutch found at our study site since 2015, produced by one of the largest females. Additionally, all six eggs were the largest eggs X-radiographed at the site and were oviposited early in the season relative to the other females. Our finding seems to be in accordance with a study in California showing larger females not only lay larger eggs, but also tend to lay larger clutches earlier in the year (Wallis et al. 1999. J. Herpetol. 33:394–408).

Unfortunately, there is evidence that larger clutches are more likely to be depredated. It has been suggested that this is due to increased metabolic activity and odors released during oviposition. Alternatively, larger clutches may be more difficult to deposit without damaging the eggs and causing breakage, which may also attract predators (Bjurlin and Bissonette 2004. J. Herpetol. 38:527–535). This particular nest may have been unsuccessful due to its shallow depth, also making it more susceptible to predators (Burge, unpubl. data in Hampton 1981. *In* K. A. Hashagen [ed.], Proceedings of the 1981 Symposium of the Desert Tortoise Council, pp. 128–138. Desert Tortoise Council, Inc., Long Beach, California).

The eggshells were relatively intact and the holes appeared to be punctured rather precisely, suggesting a bird may have pecked them open. Ravens (*Corvus corax*) are common predators of juvenile tortoises and have been spotted occasionally at our study site. They are not known to be predators of tortoise eggs, but are nest predators of other birds. Additionally, they are well recognized as opportunistic feeders, scavenging for food wherever it can be found. It is not unreasonable to propose that tortoise eggs would be a desirable Raven food choice. Ravens are able to consume an egg whole or pierce it and suck out the contents inside (Nelson 1934. Condor 36:10–15), the latter being similar to our predation event. However, unlike our finding, Ravens are reported to carry eggs away from the nesting area and back to their own nests for feasting (Stiehl 1991. Wilson Bull. 103:83–92; Gaston et al. 1996. Ibis 138:742–748). *Geococcyx californianus* (Roadrunners) could be another avian species posing a potential threat to tortoise eggs in Joshua Tree National Park. Although it is unlikely the clutch was destroyed by a large mammal that might crush eggs during consumption, we could not rule out the possibility that a smaller mammal, for instance *Bassariscus astutus* (Ring-tailed Cats), *Spilogale gracilis* (Spotted Skunks), or rodents could have punctured the eggs.

Due to the shortage of literature on tortoise egg predation and little available evidence left at the nest site, it was impossible for us to determine the identity of the predator with certainty. To the best of our knowledge, this is the first published report of a tortoise nest (depredated or otherwise) in Joshua Tree National Park as well as the first published finding of a *G. agassizii* nest on rocky, mountainous slopes (Berry et al. 2016. U.S. Geological Survey Open File Report 2016–1023). Our observation is particularly noteworthy since *G. agassizii* is not commonly reported in the literature to utilize rocky hillsides.

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***GOPHERUS POLYPHEMUS* (Gopher Tortoise). PREDATION.** On 19 June 2015 at 1111 h, as we were leaving our study site at the John F. Kennedy Space Center (KSC), Florida, USA, we stopped to photograph a male *Alligator mississippiensis* (American Alligator), approximately 3 m total body length, observed along a two-lane road near the Atlantic Ocean (28.61771°N, 80.60455°W; WGS

84). On approach, we noticed a *Gopherus polyphemus* (Gopher Tortoise) alive, alert, and held in the mouth of the alligator (Fig. 1). As we watched from an appropriate distance to not disturb the event, the alligator moved into a nearby small body of water. After a few minutes, the tortoise began thrashing its forelimbs in an attempt to escape. In response, the alligator attempted to drown the tortoise by placing its head under the water; however, the neck of the tortoise was long enough to reach out of the water and obtain air. After approximately 30 minutes, we heard a loud popping sound as the alligator attempted to crush the shell of the tortoise. We observed this interaction for a total of 90 minutes, with little change other than occasional popping of the shell. At this point we vacated the area. On the following day, 20 June 2015, we returned to the event's location to look for pieces of the tortoise's shell, but the alligator remained in the body of water, preventing a thorough search of the area. The tortoise was not seen in or near the water, so we assumed that the alligator succeeded in killing and consuming the tortoise, but due to lack of observable evidence it is also possible that the tortoise might have escaped.

In addition to this observation, there have been three other recent incidents involving radio-tagged tortoises at KSC that we speculate to be of a similar nature. In each of these events, after tracking to the location of each tortoise, we found fragments of the tortoise's carapace and a detached transmitter near or in bodies of water. The first event occurred with a male tortoise on 28 August 2014, the second with a male on the same day as previously described event (19 June 2015), and the third with a female on 30 July 2015. Each of these events occurred within a 0.75-km radius of the previously described observation in coastal strand habitat. Although we did not directly observe predation in any of these events, we speculate that each was due to predation by *A. missippiensis* and the distances suggest that multiple alligators were involved. During the second and third events, Brevard Co., Florida was classified as abnormally dry (D0; United States Drought Monitor) due to the lack of regular rainfall and high temperatures. We hypothesize that due to the reduction of aquatic habitat during this drought, *A. mississippiensis* may have more often fed on *G. polyphemus* due to ease of capture. Current estimates of adult survivorship of *G. polyphemus* often assume annual adult survival in excess of 95%, but we suggest that in areas with large *A. missippiensis* populations adult mortality may be higher.

Fig. 1. *Alligator mississippiensis* with *Gopherus polyphemus* in its mouth, Florida, USA.

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HYDROMEDUSA MAXIMILIANI **(Tartaruga pescoço-de-serpente; Maximilian's Snake-necked Turtle). PARASITISM.** *Hydromedusa maximiliani* is an endemic freshwater turtle from mountainous areas of the Brazilian Atlantic forest, where it inhabits sandy and rocky-bottomed streams (Souza and Abe 1998. J. Herpetol. 32:106–112). *H. maximiliani* is considered "vulnerable" by the IUCN. During a herpetological field trip on 5 September 2015 at Reserva Biológica Augusto Ruschi, Santa Teresa, Espírito Santo, southeastern Brazil (19. 918808°S, 40.552046°W, WGS84; 650 m elev.), we found one adult *H. maximiliani* submerged in a permanent stream. The individual had parts of its limbs, tail, and plastron covered by leeches of the order Rhynchobdellida (Fig. 1A–C). These leeches are common in area streams. The parasitized turtle appeared to be slimmer than non-parasitized individuals we observed, but was mobile and its swimming ability did not appear to be affected. The large number of parasites found on this *H. maximiliani* may be explained by the low vagility characteristic of this species, even in the reproductive season (September–January). In addition, parasitic infestation may be more frequent when a population is reduced or isolated from other populations due to habitat fragmentation (Souza and Abe 1997. Bol. Asoc. Herpetol. Esp. 8:17–20). This appears to be the first record of leech parasitism in *H. maximiliani.*

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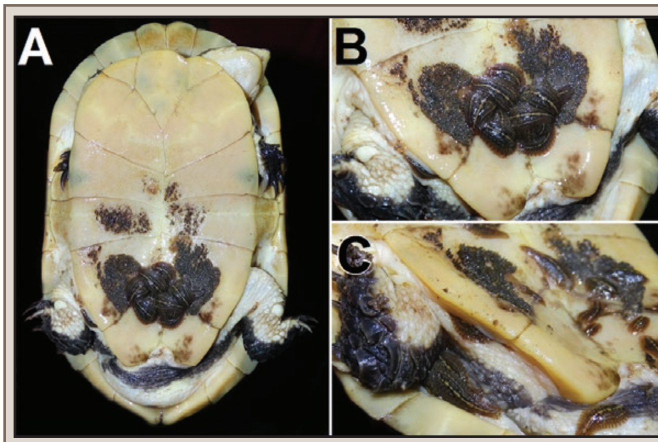

Fig. 1. An adult *Hydromedusa maximiliani* parasitized. A) Plastron containing adhered leeches; B) detail of the plastron; C) detail of posterior limb and tail with adhered leeches.

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***STIGMOCHELYS PARDALIS* (Leopard Tortoise). ROAD MORTALITY.** South Africa has one of the richest reptile faunas in the world and the richest diversity of land tortoises (Branch et al. 1995. S. Afr. J. Zool. 30:91–102). The current rate of urban expansion in South Africa means that previously intact landscapes are likely to become increasingly bisected with roads, causing increases in road deaths of reptilian fauna. *Stigmochelys pardalis* is South Africa's largest terrestrial tortoise species. Several aspects of its biology have been studied in some detail including home range size (McMaster and Downs 2009. J. Herpetol. 43:561 – 569), thermoregulation (McMaster and Downs 2006. Herpetologica 62:37–46), and population sizes and biomass (Mason et al. 2000. Afr. J. Ecol. 38: 147–153). Due to their relatively slow locomotion speed, tortoises take longer time periods to traverse paved roads, which exposes them to a greater likelihood of vehicle collisions. Although tortoises do use different micro sites for shelter and thermoregulation (McMaster and Downs 2009, *op. cit.*) their presence on or near asphalt and gravel roads does not appear to be related to using road surfaces for heat uptake as is often the case in other reptiles such as snakes. Although there has been an increased interest in the potentially negative effects of road mortality to wildlife populations in South Africa (Bullock et al. 2011. Afr. Zool. 46:60–71; Collinson et al. 2014. Ecol. Evol. 4:3060 – 3071; Coombs 2015. Herpetol. Notes 8:603–607), there remains very little data on the frequency of vehicle collisions with tortoises in general. A relatively high rate of vehicle collisions in smaller species, such as the Greater Padloper (*Homopus femoralis*) might be predicted (Loehr 2012. Chelon. Conserv. Biol. 11:226 –229).

Here I report on observations made while recording tortoises found crossing main paved (asphalt) and gravel roads in different parts of the Eastern and Northern Cape provinces of South Africa. The roads travelled (Fig. 1) include paved main roads between Grahamstown, Eastern Cape (33.308611°S, 26.549969°E) to Loeriesfontein, Northern Cape (30.949986°S, 19.433306°E).

Table 1. Summary of *Stigmochelys pardalis* found traversing tar and gravel roads during the study period. Other tortoise species (*Chersina angulata*, *Homopus areolatus*) that were found are included at the end of the table.

Specimen no.	Species	Location	Nearest town	Size class	Estimated plastron length (mm)
1	*S. pardalis*	Paved road, Grahamstown to to Bedford	Bedford	Sub-adult	143
2	*S. pardalis*	Gravel road, Medbury going to Southwell	Salem	Adult	260.1
3	*S. pardalis*	Gravel road from Riebeeck East to Addo Park (R400)	Riebeeck East	Sub-adult	147.7
4	*S. pardalis*	Paved road, Grahamstown to Salem	Salem	Sub-adult	159.8
5	*S. pardalis*	Paved road, Grahamstown to Bedford	Bedford	Sub-adult	165.4
6	*S. pardalis*	Paved road, Grahamstown to Bedford	Bedford	Adult	259.6
7	*S. pardalis*	Gravel road on Doncaster farm near Salem	Salem	Adult	-
8	*S. pardalis*	Road from Grahamstown to Salem	Salem	Juvenile	52
9	*S. pardalis*	Gravel road on Glenthorpe farm	Grahamstown	Adult	-
10	*S. pardalis*	Gravel road in Lawrence de Lange reserve near Queenstown	Queenstown	Adult	
11	*S. pardalis*	Road near De Aar, Northern Cape (killed by vehicle)	De Aar	Adult	256.4
12	*C. angulata*	Paved road near Calvinia, Northern Cape	Calvinia	Adult	146
13	*C. angulata*	Gravel road, Riebeeck East to Addo Park (R400)	Riebeeck-East	Adult	184
14	*C. angulata*	Gravel road, Grahamstown to Riebeeck East (R 400)	Riebeeck - East	Adult	143
15	*H. areolatus*	Paved road, Grahamstown to Bedford	Bedford	Adult	71

During the study period, the roads along the route between Grahamstown and Loeriesfontein (R 350, N 10, R 384 and R 357) were travelled 8 times, roads between Grahamstown and Kenton on Sea (R343, 33.681981°S, 26.666969°E) were travelled twice, and the gravel road (R400, 33.211350°S, 26.369228°E) from R 350 (Grahamstown to Bedford) to Riebeeck East and Darlington Dam in the Addo National Park (R 400, 33.175397°S, 25.151469°E) was travelled once. While driving along these roads, all tortoises found were measured if possible (plastron length) and photographed. In cases where the plastron was not directly measured, the plastron length was estimated from a photograph or the animal was visually classified as an adult (plastron length > 20 cm) or sub-adult (plastron length < 20 cm; Douglas and Rall 2006. Chelon. Conserv. Biol. 5:121–129). The total distance travelled on all trips was approximately 8100 km of which the majority comprised of trips between Grahamstown and Loeriesfontein.

All tortoises were found during spring and summer (August–March), which is when *S. pardalis* is most active. Individuals of *S. pardalis* were occasionally found crossing both paved (N = 6) and gravel roads (N = 5) and are easily visible on road surfaces (Table 1, Fig. 2). Although this is a small sample, the total distance travelled suggests that the rate of *S. pardalis* crossing asphalt or gravel roads is relatively low. I have also seen the same behavior in numerous instances prior to the current study period. The response of Leopard Tortoises to an approaching vehicle is generally the same—the tortoise withdraws into its shell and remains motionless. This behavior causes the animal to be exposed to injury or death from an oncoming vehicle. Interestingly however, owing to its size and shape, this behavior may save larger individuals from vehicle collisions. The high domed shape of the carapace makes many tortoises appear like an obstacle which motorists would rather avoid (though larger tortoises are likely killed by large trucks which cannot swerve to avoid them). This is not the case with very small tortoise species (e.g., *H. femoralis*) or freshwater turtles that do not appear as dangerous obstacles and are more likely to be overlooked by vehicle drivers. In total I recorded 11 individual tortoises that were found moving across both paved and gravel roads. Most of these were sub-adults and adults suggesting that large, reproductively mature tortoises are frequently at risk of vehicle collision. It is possible that smaller individuals were overlooked, but perhaps not often, as I also recorded very small Parrot-beaked Tortoises (*H. areolatus*). One large individual of *S. pardalis* (PL = 256 mm) was found that had been killed by a collision (Table 1). I have also seen similar road mortality of *S. pardalis* prior to this study, although this is a rare observation. Other tortoises that were found crossing asphalt roads include Angulate Tortoises (*Chersina angulata*, N = 3) and a Parrot-beaked Tortoise (*H. areolatus*, N = 1). None of these individuals had been killed by vehicles.

Fig. 1. Map of Southern Africa showing the main tar and gravel roads that were travelled during the study period. LFNTN = Loeriesfontein, CALV = Calvinia, DEAR = De Aar, BFD = Bedford, DD ADDO = Darlington Dam Addo National Park, REAST = Riebeeck East, GHT = Grahamstown, SAL = Salem, BST = Bathurst, KOS = Kenton on Sea (Map source: Google Earth)

Fig. 2. A sub-adult *Stigmochelys pardalis* (PL = 159.8) found on an asphalt road, showing the typical pattern of withdrawing into the carapace when threatened.

The total distance travelled along these roads was extensive (ca. 8100 km). Given that 11 live and one dead individuals of *S. pardalis* were found suggests that currently *S. pardalis* is not experiencing very high rates of mortality owing to vehicle collisions. The limited data available shows that reptiles can comprise a large proportion of road kills on some road sections in South Africa (G. Alexander, pers. comm.). Graham Alexander (pers. comm.) reported that reptiles comprised at least 60% of all road kills recorded in 13 surveys along a 30-km stretch of road situated north of western Soutpansberg, Limpopo province, South Africa. My data further suggests that smaller and soft-bodied reptiles are more vulnerable than larger tortoise species. Reports of high numbers of tortoises killed by vehicles (Loehr 2012, *op. cit.*) as well as other reptiles (Coombs 2015, *op. cit.*; G. Alexander, pers. comm) are likely to happen when there is a sudden movement of a large number of individuals due to disturbance or localized migrations. Further long-term data are needed to investigate the total numbers that are killed along paved and large gravel roads and to monitor changes in these numbers.

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***TRACHEMYS SCRIPTA ELEGANS* (Red-eared Slider). SEED DISPERSAL.** *Trachemys scripta* is a known disperser of seeds (Kimmons and Moll 2010. Chelon. Conserv. Biol. 9:289–294). However, previous documentations of seed dispersal were made by analyzing fecal contents. Herein we present another means of seed dispersal by *T. scripta elegans*. On 3 March 2016 at 1647 h, an adult female *T. scripta elegans* (UTADC 8646) was found at Estero Llano Grande State Park in Weslaco, Texas,

FIG. 1. Seeds of *Jefea brevifolia* in plastral algae on *Trachemys scripta elegans.*

USA, with a layer of algae coating portions of the carapace and plastron. Seeds of *Jefea brevifolia* were found embedded in the plastron algae (Fig. 1). The flowers were present along the edge of the pond and it is likely that terrestrial movements placed the turtle in contact with the plants causing subsequent dropping of the seeds which became attached to the algae when the turtle passed over them.

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TRACHEMYS SCRIPTA ELEGANS **(Red-eared Slider) and *CHRYSEMYS PICTA BELLII* (Western Painted Turtle). ENDOPARASITES.** Turtles are known to harbor a rich diversity of parasite species (Aho 1990. *In* Esch et al. [eds.], Parasites and Communities: Patterns and Processes, pp. 157–195. Chapman and Hall, London, UK). Low parasitic loads are relatively harmless, yet high parasitic loads can cause physical or physiological abnormalities and potential mortality (Roberts and Janovy Jr. 2008. Foundations in Parasitology 8th ed. McGraw Hill, Boston, Massachusetts. 701 pp.).

During laboratory studies of anoxia tolerance and behavior, we observed internal parasites from wild-caught turtles (*C. picta bellii* and *T. scripta elegans*) shed into aquaria, during necropsies, or sampling for experiments. Commercially purchased *T. scripta elegans* and *C. picta bellii* were obtained from Niles Biological and were originally captured in Louisiana or Minnesota, respectively, in 2013. Prior to transport to Saint Louis University, turtles were shipped from their state of origin to Sacramento, California, and housed for less than two weeks at the Niles Biological Facility. Animals were then shipped to St. Louis, Missouri, and housed until experiments began. During routine housing, high parasite loads were found in our population of *T. scripta elegans*, possibly causing mortality in several individuals (N = 3–5). Prior to death, animals were lethargic, stopped feeding, basked excessively, and died within several weeks of initial symptoms. Necropsies of these individuals revealed high acanthocephalan intensities within the entire gastrointestinal tract, including the oral/nasal cavity, and in some instances, the bladder. Parasites were collected and stored in 10% neutral

TABLE 1. Parasites previously reported from *Chrysemys picta* and *Trachemys scripta elegans*.

Parasite	Location collected	Host	Origin	Reference
Camallanus microcephalus	Duodenum	*Chrysemys bellii marginata* (hereafter referred to as *C. picta*)	Ohio, USA	(1)
Physaloptera sp.	Stomach	*C. picta*	Ohio, USA	(1)
Haemogregarina balli	Blood	*C. picta marginata*	Algonquin Park, Ontario, Canada	(2)
Heronimus chelydrae	Lungs	*C. picta; Pseudemys scripta elegans*	Ohio; Lake Conway, Faulkner Co., Arkansas, USA	(1); (3)
Microphallus opacus	?	*C. picta*	Ohio, USA	(1)
Neoechinorhynchus chrysemydis (n. sp.)	Intestines	*C. picta marginata; P. scripta elegans*	Kolb's Pond, near Lafayette, Indiana, USA; Lake Conway, Faulkner Co., Arkansas, USA	(4); (3)
Neoechinorhynchus emydis	Small intestine?	*C. picta*	Ohio, USA	(1)
Neopolystoma orbiculare	?; Urinary bladder; Urinary bladder	*C. picta; P. scripta elegans; C. picta marginata*	Ohio; Faulkner Co., Arkansas; Indiana, USA	(1); (3); (1)
Polystomoides oris	Pharyngeal cavity	*C. picta marginata*	Indiana, USA	(5)
Spirochid (possibly *Spirorchis parvus*)	Spleen, intestine, lung, liver, pancreas, heart, brain	*C. picta; Trachemys scripta elegans*	Commerically supplied from Wisconsin, USA	(6)

(Continued on next page)

TABLE 1. Continued.

Parasite	Location collected	Host	Origin	Reference
Spirochis artericola	Heart	*C. picta*	Ohio, USA	(1)
Spirochis parvum	Circulatory system	*C. picta*	Ohio, USA	(1)
Spiroxys constricta	Stomach; Lower intestine	*C. picta*	Ohio, USA	(1)
Spiroxys contortus	Stomach	*C. picta*; *P. scripta elegans*	Ohio; Lake Conway, Faulkner Co., Arkansas, USA	(1); (3)
Telorchis attenuatus	?	*C. picta*	Ohio, USA	(1)
Telorchis corti	?; Small intestine	*C. picta*; *P. scripta elegans*	Ohio; Lake Conway, Faulkner Co., Arkansas, USA	(1); (3)
Telorchis sp.	Small intestine?	*C. picta*	Ohio, USA	(1)
Unidentified cestode	Small intestine	*C. picta*	Ohio, USA	(1)
Camallanus trispinosus	Small intestine	*P. scripta elegans*	Lake Conway, Faulkner Co., Arkansas, USA	(3)
Dictyangium chelydrae	Colon	*P. scripta elegans*	Lake Conway, Faulkner Co., Arkansas, USA	(3)
Neoechinorhynchus emyditoides	Small intestine	*T. scripta elegans*	Tabasco, Mexico: Lake Co., Faulkner Co., Arkansas, USA	(7); (3)
Neoechinorhynchus pseudemydis	Small intestine	*P. scripta elegans*	Lake Conway, Faulkner Co., Arkansas, USA	(3)
Neoechinorhynchus schmidti (n. sp.)	Small intestine	*T. scripta elegans*	Tabasco, Mexico	(7)
Neoechinorhynchus stunkardi	Small intestine	*P. scripta elegans*	Lake Conway, Faulkner Co., Arkansas, USA	(3)
Neopolystoma sp.[3]	Urinary bladder	*T. scripta elegans*	France; Kansas and Indiana, USA	(5)
Neopolystoma sp.[7]	Pharyngeal cavity	*T. scripta elegans*	Indiana, USA; France	(5)
Neopolystoma sp.[8]	Urinary bladder	*T. scripta elegans*	Florida, USA	(5)
Neopolystoma sp.[9]	Pharyngeal cavity	*T. scripta elegans*	Maine, USA	(5)
Polystomoides sp.[3]	Pharyngeal cavity	*T. scripta elegans*	France	(5)
Polystomoides sp.[4]	Pharyngeal cavity	*T. scripta elegans*	Florida, USA	(5)
Serpinema microcephalus	Digestive tract, pancreas	*T. scripta elegans*	El Portil Pond, Huelva, Spain	(8)
Spironuora concinnae	Colon	*P. scripta elegans*	Lake Conway, Faulkner Co., Arkansas, USA	(3)
Telorichis diminutus	Small intestine	*P. scripta elegans*	Lake Conway, Faulkner Co., Arkansas, USA	(3)
Telorichis singularis	Small intestine	*P. scripta elegans*	Lake Conway, Faulkner Co., Arkansas, USA	(3)

Note: Nomenclature for the Red-eared Slider went through a period of confusion. *Pseudemys scripta elegans* and *Trachemys scripta elegans* both refer to Red-eared Sliders. (1) Rausch 1947. Am. Midl. Nat. 38:434–442; (2) Siddall and Desser 2001. J. Parasitol. 87:1217–1218; (3) Rosen and Marquardt 1978. J. Parasitol. 64:1148–1149; (4) Cable and Hopp 1954. J. Parasitol. 40:674–680; (5) Verneau et al. 2011. Parasitology 138:1778–1192; (6) Johnson et al. 1998. Lab. Anim. Sci. 48:340–343; (7) Barger et al. 2004. Comp. Parasitol. 71:1–3; (8) Hidalgo-Vila et al. 2011. J. Wildl. Dis. 47:201–205.

buffered formalin for potential identification. Recovered acanthocephalans were identified as *Neoechinorhynchus* sp. This parasite species has previously been reported in both *T. scripta elegans* and *C. picta* from Arkansas, Indiana, Ohio, and Mexico (Table 1). The reported recovery of a single *Neoechinorhynchus emydis* from *C. bellii marginata* (= *C. picta*) in Ohio contrasts with reported occurrences of 200 to 300 worms per individual in the Northern Map Turtle (*Graptemys geographica*) (Rausch 1947. Am. Midl. Nat. 38:434–442). In *C. picta*, neoplasms in the small intestine were also found to contain *N. emydis* (Rausch op. cit.), indicating that this parasite is capable of burrowing into the lumen, which results in the development of parasitic lesions. Neoplasms were observed in all *T. scripta elegans* necropsied in our study, although the lesions were not sectioned to determine if *Neoechinorhynchus* sp. were present inside the nodules. However, given the high density of acanthocephalans (upwards of 100 individuals in the ~200 g turtles), and the intimate association of the parasites with the intestinal mucosa, the lesions were likely a result of *Neoechinorhyncus* sp. Parasite loads were far lower in *C. picta bellii*, with less than 5 *Neoechinorhyncus* sp. observed in each animal.

An additional parasite-related mortality occurred in a wild-caught *C. picta bellii* originating from Kansas (collected spring/summer 2013). The turtle was discovered dead in the aquarium on 7 July 2014 during routine daily checks. During a necropsy, the ventricle of the turtle was pale and firm, and a portion was sent for histological sectioning to evaluate pathology and potential cause of death. Histology revealed the presence of parasitic egg remnants and bacteria within the cardiac tissue. The eggs were ovoid (50–100 µm diameter) and contained a 1–3 µm-thick brown to yellow shell. Staining for fungi was negative. The parasite was likely a spirochid trematode. Spirochid trematode eggs have previously been reported from wild marine turtles (e.g., Green Turtles; Herbst et al. 1999. Vet. Pathol. 36:551–564) as well as laboratory-housed freshwater turtles (e.g., *Trachemys scripta elegans* and *Chrysemys picta*; Johnson et al. 1998. Lab. Anim. Sci. 48:340–343). There were no outward symptoms of disease or infection in the animal prior to death, such as lethargy. Spirochid trematodes are transmitted through an intermediate host (e.g., snail), which was absent in lab housing, suggesting that the original endoparasite acquisition occurred in the wild.

In summary, our report is the first documentation of endoparasites among these species of turtles in the noted geographic regions. Our report also illustrates how common parasites can become lethal to the host, which likely results from high parasite intensity or a factor impeding host immune function within a lab setting.

We thank Daniel Warren for allowing us to collect endoparasites from the turtles and aquaria.

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***TERRAPENE CAROLINA CAROLINA* (Woodland Box Turtle) and *GLYPTEMYS INSCULPTA* (Wood Turtle). INTERSPECIFIC BASKING.** There are many reports of interspecific basking in North American turtle species (e.g., Weber and Layzer 2014. Herpetol. Rev. 45:117; Jones and Cochran 2014. Herpetol. Rev. 45:311–312; Hartzell et al. 2015. Herpetol. Rev. 46:621). On 31 July 2010 at 1500 h, we observed what appeared to be interspecific basking in an adult *T. c. carolina* and an adult *G. insculpta* in southeastern Northumberland Co., Pennsylvania, USA. Both turtles were situated in close proximity approximately 0.5 m apart and facing the same direction in a sunny spot within a mixed-deciduous forest near a stream. The relative positions of the turtles would suggest that they were using this locality for basking rather than other behaviors (e.g., foraging, nesting, etc.). Harding (1978. HERP, Bull. New York Herpetol. Soc. 14:3–6) reported several aggressive interactions between captive *T. c. carolina* and *G. insculpta*. In our observation, both species appeared to be neutral to the presence of the other; however, aggressive behavior or other interactions could have occurred before or after our observation. To our knowledge, this observation appears to be novel for these species. We note that the observation reported herein occurred incidentally while hiking and the turtles were observed visually but not disturbed.

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***TERRAPENE CAROLINA* (Eastern Box Turtle). SCAVENGING.** Many North American emydid turtles have been documented eating vertebrate carrion, including *Terrapene* spp. (Dodd 2001. North American Box Turtles: A Natural History. University of Oklahoma Press, Norman, Oklahoma. 231 pp.). On 16 June 2016 at 1310 h, we found an adult female *Terrapene carolina* (carapace length = 13.9 cm; 630 g) scavenging a gravid *Heterodon platirhinos* (Eastern Hog-nosed Snake; total length = ca. 0.5 m) (Fig. 1A) at the Fort Custer Training Center, near Augusta, Michigan, USA (42.30757°N, 85.33338°W; WGS 84). The animals were found under an invasive *Elaeagnus umbellata* (Autumn Olive) shrub in upland sandy habitat dominated by *Schizachyrium scoparium* (Little Bluestem). A large piece of tissue (presumably an internal organ of the *H. platirhinos*) was protruding from the turtle's mouth and extended under the entire length of its plastron (Fig. 1B). We palpated seven eggs from the *H. platirhinos*; only the caudal half of the snake was present. It was perhaps killed by a mesopredator while attempting to locate a nesting site, as we have found predated *H. platirhinos* nests in the immediate vicinity. When we returned to the area at 1900 h on the same day, the *T. carolina* had retreated deeper under the *E. umbellata*, and a *T. carolina* nest had been predated ca. 1.5

PHOTOS BY SASHA J. TETZLAFF

Fig. 1. An adult female *Terrapene carolina* (Eastern Box Turtle) scavenging a gravid *Heterodon platirhinos* (Eastern Hog-nosed Snake) in Kalamazoo Co., Michigan, USA. A) A large piece of the snake's tissue protruding from the *T. carolina*'s mouth was observed when initially located (B).

m away. It is possible that the *T. carolina* had been gravid and its nest was recently predated, as this habitat is also commonly used by turtles for nesting.

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***TERRAPENE CAROLINA CAROLINA* (Eastern Box Turtle). MAXIMUM ELEVATION.** *Terrapene carolina carolina* is a small terrestrial turtle of mesic woodlands in the eastern United States (Dodd 2001. North American Box Turtles: A Natural History. University of Oklahoma Press, Norman. 231 pp.; Buhlmann et al 2008. Turtles of the Southeast. University of Georgia Press, Athens. 252 pp.). This species typically occurs between sea level and 1220 m in elevation, becoming more infrequent with increasing elevation, particularly in the northern portion of its range (Dodd 2001, *op. cit.*). The Eastern Box Turtle is considered extremely rare, if it occurs at all, in high elevation, montane conifer forests of the southern Appalachians (Huheey and Stupka 1967. Amphibians and Reptiles of Great Smoky Mountains National Park. University of Tennessee Press, Knoxville. 98 pp.).

On 14 May 2015, we observed a female *T. c. carolina* basking in a small opening with dead fern cover in a Fraser Fir (*Abies fraseri*) dominated stand with Red Spruce (*Picea rubens*). The turtle was located on Roan High Bluff in the Roan Mountain Highlands, Mitchell Co., North Carolina at an elevation of 1875 m (36.09427°N, 82.14146°W; WGS 84). The turtle's shell was very worn, which may indicate an individual ≥ 20 years. The observation was located 4.08 km behind a gated road that leads from Carver's Gap on the Tennessee-North Carolina border. The gate is closed to public vehicle access from late October/November through late May. When the observation occurred, the gated road had not been open to the public that season.

Within the southern Appalachians, there are a few high-elevation observations for *T. carolina.* In North Carolina, the highest elevation record was 1506 m of a road-killed turtle on the Blue Ridge Parkway at Buck Spring Gap in Transylvania Co., approximately 1.38 road km from the Pisgah Inn (A. Tutterow, Carolina Herp Atlas, pers. comm.). The forest type surrounding the observation site was northern hardwood forest. In Tennessee, the highest elevation record is 1663 m along a road surrounded by northern hardwood forest near the summit of Haw Knob Mountain in the Unicoi Mountains on state line between Monroe Co., Tennessee and Graham Co., North Carolina (Chan et al. 2016. Herpetol. Rev. 47:129). Another notable record was taken from Mt. Mitchell at 2007 m from the visitor parking lot in the state park (Palmer and Braswell 1995. Reptiles of North Carolina. University of North Carolina Press, Chapel Hill. 412 pp.). However, this record is considered suspect as the individual turtle might have been a released pet (Palmer and Braswell 1995, *op. cit.*).

We believe this record is the first legitimate record of *T. carolina* from a high-elevation spruce-fir forest in the region. Unlike the record from Mt. Mitchell, we do not believe this was a released individual owing to the distance from the nearest road and the time of year the observation occurred. This record is 212 m higher than the Tennessee record and 369 m higher than the previous North Carolina record. Additionally, this record is 129 m higher than the summit of Mount Rogers, the tallest peak in Virginia at 1746 m elev., making it the highest elevation record in the southern Appalachians.

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***TERRAPENE CAROLINA MAJOR* (Gulf Coast Box Turtle). DIET.** American box turtles in the genus *Terrapene* are known to consume a wide variety of invertebrate prey including many types of arthropods (Dodd 2001. North American Box Turtles A Natural History. University of Oklahoma Press, Norman. 231pp.; Ernst and Lovich 2009. Turtles of the United States and Canada. Johns Hopkins University Press, Baltimore, Maryland. 840 pp.). The only known diet item in the order Decapoda are crayfish, and there are apparently no published records of marine invertebrates in the box turtle diet. This note documents *T. carolina major* consuming at least two species of tidal marsh crabs.

On 17 May 2015 at approximately 1730 h, LM, Benny McCoy, and Garrett McCoy encountered a fiddler crab (*Uca*; most likely the Gulf Mud Fiddler [*Uca longisignalis*]) migration crossing

Fig. 1. Gulf Coast Box Turtle (*Terrapene carolina major*) eating a marsh crab belonging to the family Grapsidae.

Fig. 2. Gulf Coast Box turtle (*Terrapene carolina major*) consuming captured fiddler crab, *Uca* sp.

Frank Griffin Rd. (30.443700°N, 88.549617°W; WGS 84/NAD 83) north of Moss Point, Jackson Co., Mississippi, USA. They observed two female *T. c. major* pursuing, catching, and consuming these fiddler crabs. LM observed another box turtle feeding on fiddler crabs (*Uca* sp.). on 16 June 2015 also on Frank Griffin Rd (30.441783°N, 88.550500°W; WGS 84/NAD 83)

On 25 July 2015, 1458 h, shortly after a rain shower, JRP observed a *T. c. major* eating what appeared to be a marsh crab (Grapsidae) at Shepard State Park in Gautier Jackson, Co Mississippi, USA (30.375355°N, 88.628342°W; WGS 84/NAD 83). The turtle was in a grassy area about 4 m from a tree and shrub line and was walking toward the shrubs with the crab in its mouth. It stopped moving when approached and did not retreat into its shell while photos were taken (Fig. 1). JRP did not see the turtle capture the crab and the crab's legs weren't moving inside the turtle's beak, so it is unclear if the crab was scavenged or captured alive. Other live fiddler crabs and marsh crabs were seen scuttling about nearby. Another smaller box turtle surrounded by more crabs was observed in a swale about 90 m away.

ML witnessed a *T. c. major* eating fiddler crabs on 6 Sept 2014 at 1421 h at the edge of a tidal sawgrass marsh near the Pascagoula River Audubon Center north of Moss Point, Jackson Co., Mississippi, USA (30.443165°N, 88.549796°W; WGS 84/NAD 83). Photos were taken (Fig. 2) and the turtle was left undisturbed.

This is the first record of *T. c. major* consuming crabs and documents the consumption of species belonging to two families—Ocypodidae (*Uca* sp.) and Grapsidae. This observation illustrates an interesting and important marine-terrestrial trophic connection. While some might doubt the ability of a turtle to run down active prey, Dodd (2001, *op. cit.*) provides several anecdotes of box turtles tracking and running down other arthropod prey such as grasshoppers. The fact that independent observations were made at multiple locations and dates on multiple turtles indicates that crabs are not just an occasional diet item but possibly a staple food item for resident box turtles in these habitats. This feeding behavior may be unique to *T. c. major* given their proximity to marshes.

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***TRACHEMYS SCRIPTA ELEGANS* (Red-eared Slider). BASKING BEHAVIOR.** Urbanization and habitat degradation along riparian corridors may alter suitable basking habitat for freshwater turtles (Hill and Vodopich 2013. Chelon. Conserv. Biol. 12:275–282). Therefore, optimal basking sites may be a limited resource in urbanized habitat (Lambert et al. 2013. Chelon. Conserv. Biol. 12:192–199).

Orange County, Texas, is highly agricultural and much of the land is private. Similar to urban canals, bayous were built in this area to facilitate flooding events. These bayous often have step cut bank profiles that are indicative of waterways that receive fast moving water during periodic flooding events. Quality basking sites in these bayous appear to be limited. We rarely notice fallen logs and debris, and believe that periodic floods routinely remove basking sites. Herein, we report the usage of an unusual basking site by *Trachemys scripta elegans* in Adams Bayou, Orange Co., Texas, USA (30.163278°N, 93.826806°W, WGS 84; 321 m elev.).

Fig. 1. Adult *Trachemys scripta elegans* basking on hog carcass.

On 11 February 2015 at ca. 1330 h, while conducting a wetland delineation project, one of us (EM) observed several feral hog (*Sus scrofa*) carcasses floating in the water. We attributed this to landowner removal of a nuisance species. Upon closer examination of one of the carcasses, EM noticed that five large emydid turtles were basking on one of the dead hogs. From a vantage point upon the top of the bank ca 9 m from the water's surface, it appeared that the turtles consisted of three Texas Cooters (*Pseudemys texana*) and two *T. s. elegans*. Both species are native to Texas and are relatively common in the larger waterways of the state. Four of the five turtles dove off of the carcass and into the murky water before a photograph could be taken. The lone turtle within the provided photo (Fig. 1) is a *T. s. elegans*.

Turtles tend to adjust their basking behaviors in response to levels of urbanization and disturbance (Peterman and Ryan 2009. Northeast. Nat. 16:629–636). Interestingly, as shown in Fig. 1, the bank behind the carcass appears adequate to accommodate basking turtles. We speculate that perhaps by basking on the carcass, the turtles were acquiring heat radiating from the decaying carcass.

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CROCODYLIA — CROCODILIANS

***ALLIGATOR MISSISSIPPIENSIS* (American Alligator). NESTING.** *Alligator mississippiensis* is a crocodilian inhabiting the southeastern U.S., including the Florida Everglades (Mazzotti and Brandt 1994. *In* Davis and Ogden [eds.], Everglades: The Ecosystem and its Restoration, pp. 485–505. St. Lucie Press, Delray Beach, Florida). It is used as an indicator species of the success of Everglades restoration efforts (Mazzotti et al. 2009. Ecological Indicators 95:137–149). Tree islands are also an indicator of the success of Everglades restoration efforts. They make up only about 5–10% of the area of the Everglades, but provide important habitat for the amphibious and terrestrial fauna (Sklar and van der Valk [eds.] 2002. Tree Islands of the Everglades. Kluwer Academic Publishers, Dordrecht, The Netherlands). Everglades tree

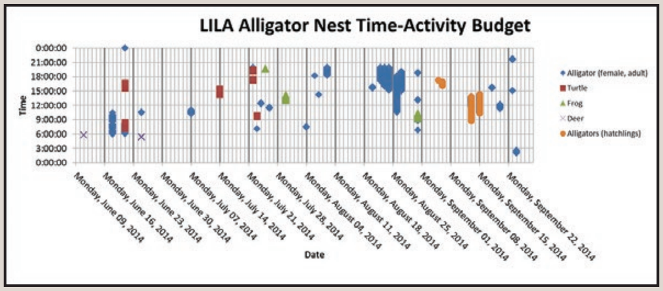

Fig. 1. Time-activity budget for significant LILA alligator nest activities captured by the camera.

Fig. 2. An *Alligator mississipiensis* laying eggs in the nest she created on a constructed tree island at LILA. Note the turtle (*Pseudemys nelsoni*) positioning herself to lay her eggs in the nest.

Fig. 3. A female *Pseudemys nelsoni* apparently laying eggs in an alligator nest, with the female *Alligator mississippiensis* that created the nest in attendance.

islands have been lost at an alarming rate, however. For example, from 1953 to 1995, the total number of tree islands decreased by 87% in a 42,000-ha impounded area of the Everglades called Water Conservation Area-2A (Hofmockel 1999. Master's Thesis, Duke University, Durham, North Carolina). Efforts for restoration therefore include the rehabilitation and/or construction of tree islands.

The Loxahatchee Impoundment Landscape Assessment (LILA) is a living biogeophysical model of the Everglades. It is located on the property of the Aurthur R. Marshall Loxahatchee National Wildlife Refuge, and consists of four 8-ha macrocosms (Aich et al. 2011. J. Env. Sci. Eng. 5:289–302). A goal of LILA is to construct tree islands to replace those lost within the Everglades. Each of the four macrocosms contains two constructed tree islands that were each planted with 717 native trees during 2006–2007. The islands were designed to mimic both the topography and substrate of natural tree islands. Over the past decade, the trees have developed into a full canopy on each tree island.

In June 2014, a mounding of leaves and twigs was noted on one of the tree islands, and a remote wildlife camera was employed to capture any activity between 10 June and 20 September 2014. A total of 12,595 images were recorded, 572 of which contained the images of a female *A. mississippiensis* on or near her nest (Fig. 1). The laying of eggs by the female alligator was captured by the camera on 21 June between 0605 h and 0725 h (Fig. 2). The nest was successful in that the *A. mississippiensis* was observed digging up the young on the morning of 31 August and at least four young were observed at the nest site. In addition, the nest was visited by a female *Pseudemys nelsoni* (Florida Red-bellied Cooter), which appeared at 0710 h (Fig. 3). The turtle laid her eggs at 0805 h. Between 21 June and 23 July the alligator nest was visited six times by other individual *P. nelsoni*, with nesting behavior exhibited in 45 of the images. Use of *A. mississippiensis* nests in Florida by other reptile species has been observed previously (Deitz and Jackson 1979. J. Herpetol. 13:510–512; Kushlan and Kushlan 1980. Copeia 1980:930–932). A male *Odocoileus virginianus* (White-tailed Deer) appeared on two separate occasions: June 11 and June 25, having been caught on camera (14 images) investigating the nest. This buck may have been investigating the nest for eggs; deer have been observed feeding on bird eggs and hatchlings (Allan 1978. Bird Banding 49:184; Pietz and Granfors 2000. Am. Midl. Nat. 144:419–422). In addition, a frog (species unknown) was observed climbing and/or entering the nest on several occasions.

The utilization of the LILA tree island by *A. mississippiensis* and *Pseudemys nelsoni* for nesting provides evidence that the constructed tree island serves as suitable habitat for certain vertebrates. Properly-designed constructed tree islands have the potential to provide a broad range of ecological functions where they have been lost in the Everglades.

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***CROCODYLUS ACUTUS* (American Crocodile). ANTHROPOGENIC NESTING.** *Crocodylus acutus* is a coastal species inhabiting tidal estuaries, coastal lagoons and mangrove swamps, but often can be found in freshwater habitats including rivers, lakes and reservoirs (Thorbjarnarson et al. 2006. Biol. Conserv. 128:25–36). Currently, the main threats to *C. acutus* populations are habitat fragmentation, land use change, and human conflicts (Thorbjarnarson et al., *op. cit.*, Thorbjarnarson 2010. *In* Manolis and Stevenson [eds.], Crocodiles. Status Survey and Conservation Action Plan, pp. 46–53. IUCN–The World Conservation Union Publications, Switzerland). In the central Pacific coast of Mexico, habitat fragmentation has resulted in *C. acutus* inhabiting residential properties, golf courses, and marinas (Cupul-Magaña et al. 2003. Croc. Spec. Group Newsl. 22:21–22; Cupul-Magaña et al. 2010. Cuad. Med. Forense 16:153–160; Cupul-Magaña et al. 2011. Herpetol. Notes 4:213–214); however, a number of aspects of the life history of *C. acutus* in these man-made habitats, in particular nesting ecology, are little

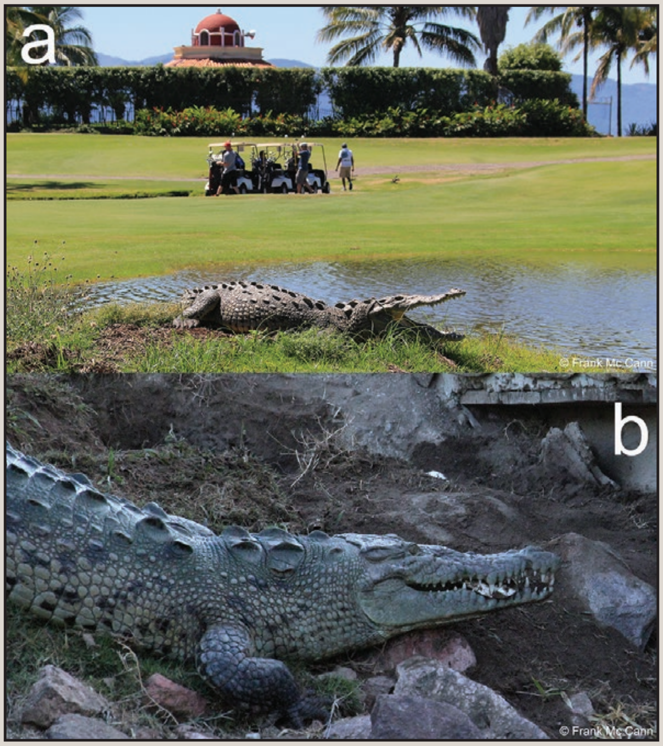

Fig. 1. An American Crocodile, *Crocodylus acutus*, at the Marina Vallarta Golf Course, in Puerto Vallarta, Mexico. a) The mother attending the nest; b) the mother with a hatchling in her mouth.

documented (Kushlan and Mazzotti 1989. J. Herpetol. 23:1–7; Mazzotti et al. 2007. J. Herpetol. 41:121–131; Cherkiss et al. 2011. Estuar. Coasts 34:529–535). Here we provide evidence of nesting success of *C. acutus* on a golf course in Puerto Vallarta, Jalisco, Mexico.

Three crocodile nests were found between March and April, 2015 at the Marina Vallarta Golf Course (20.6675°N, 105.2625°W, WGS 84; < 5 m elev.). We discovered nests by noting attending females (Fig. 1a). Once a nest was located, we recorded date and location with a portable GPS. We also measured height, distance to the shoreline and distance between nests. All nests were close to water hazards. The average distance of nests to the shoreline was 2.73 ± 0.66 m SD. The average height above water of nests was 0.95 ± 0.13 m, and the average distance between nests was 213.06 ± 119.60 m. One of the three nests was partially consumed by raccoons in April, as evidenced by 10 eggshells. Hatching occurred in June, and we found two hatchlings near the first nest site (the nest that was preyed upon), and three hatchlings in the water hazard near the second nest. In the third nest, the mother facilitated hatching form the egg (Fig. 1b), and moved hatchlings to the water hazard pond; we observed 14 hatchlings near that nest site. In late August, we observed only a total of 14 hatchlings in all golf course water hazards.

In a high modified coastal environment, the nesting success at the golf course suggests some conservation implications. Our observations suggest that the golf course provides important resources such as appropriate nest-site characteristics, incubation conditions and protection from predators. Thus, this urban ecosystem supports nesting crocodiles. However, to our knowledge, only six active nests per year have been recorded in the natural areas around the golf course (Cupul-Magaña et al. 2004. Ciencia y Mar 8:31–42).

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***CROCODYLUS MORELETII* (Morelet's Crocodile). TROGLODYTISM.** Troglodytism (cave-dwelling) appears to be rare among crocodilians, having been reported for only four of 23 (17.3%) extant species (reviewed by Soomaweera et al. 2014. Rec. West. Austr. Mus. 29:82–81). Nile Crocodiles (*Crocodylus niloticus*), Dwarf Crocodiles (*Osteolaemus* sp.), and Australian Freshwater Crocodiles (*C. johnstoni*) are known to inhabit waterbodies in caves (Wilson 1987. Cave Science 14:107–111; Soomaweera et al., *op. cit.*), and False Gharial (*Tomistoma schlegelii*) trackways have been found entering caves (Steubing et al. 2004. Crocodile Specialist Group Newsletter 23:11–12). We here report an observation of troglodytism by *C. moreletii* at a cave in northern Belize.

Our observation occurred at Sally's Pond (17.28859°N, 88.46786°W; WGS 84), a heavily vegetated depressional wetland along the Coastal Highway about 10 km S of La Democracia Village in Cayo District. The areal extent of Sally's Pond varies from about 4.0 ha at the height of the wet season to < 1.0 ha late in the dry season, drying completely in some years (Platt and Rainwater, pers. obs.). Sally's Pond is adjacent to a forest-covered karst hill with a cave at its base. The cave opening is approximately 4.5 m high × 9 m wide and the main cavern extends > 150 m into the hill. Several smaller branches extend laterally from the main cavern. Floodwaters partially fill the cave during much of the wet season (June–November) and then begin to recede at the onset of the dry season (December–May); by late dry season the cave generally contains little water. The cave hosts large numbers of bats (*Moromoops megalophylla*, *Artebius* sp., and possibly others) for part of the year. *Crocodylus moreletii* are frequently encountered in Sally's Pond and have nested on the adjacent hillside (Platt and Thorbjarnarson 2000. Biol. Conserv. 96:21–29; Platt et al. 2008. J. Zool. 275:177–189).

On 11 August 1996 (ca. 1400–1530 h) while searching for *C. moreletii* nests at Sally's Pond (Platt et al., *op. cit.*), we paddled a canoe into the flooded cave, navigating with handheld spotlights. Our entry disturbed a roosting aggregation of >10,000 bats, which exited the cave over a period of several minutes. After proceeding about 150 m from the cave entrance we reached a large flooded chamber and observed a subadult *C. moreletii* (total length ca. 150 cm) swimming on the surface in the area vacated by roosting bats only moments before. Water depth in this chamber was estimated to be about 1.5 m. We unsuccessfully attempted to capture and mark the crocodile as part of a nationwide population survey (Platt and Thorbjarnarson, *op. cit.*). Although known to occupy subterranean burrows (Platt 2000. Amphibia–Reptilia 21:232–237), to our knowledge, this is the first report of troglodytism by *C. moreletii*, and one of the few observations of any species of crocodile inhabiting caves (Soomaweera et al., *op. cit.*).

We consider it likely the crocodile entered the cave to prey on bats (Cedeño-Vazquez et al. 2014. Herpetol. Rev. 45:322) or scavenge carcasses beneath bat roosts. Large numbers of cichlid fishes were also present near the cave mouth on the day of our visit. Other potential crocodile prey (Platt et al. 2006. Herpetol. J. 16:281–290) known to inhabit the cave include insects, arachnids, and turtles (*Trachemys venusta* and *Staurotypus triporcatus*)

(Richard and Carol Foster, *in litt.*). Soomaweera et al. (*op. cit.*) likewise described an abundance of fish, amphibian, reptile, and mammal (including bats) prey inhabiting caves where *C. johnstoni* was observed in Western Australia. Wilson (*op. cit.*) reported crabs, shrimp, crayfish, and eels and other fish in a cave system inhabited by *C. niloticus* in Madagascar. Crocodilians have excellent low-light vision (Richardson et al. 2002. Crocodiles: Inside and Out. Surrey Beatty and Sons, Pty. Ltd., Sydney. 172 pp.) and much foraging activity occurs at night (Thorbjarnarson 1993. Copeia 1993:1166–1177). However, because ambient light is often unavailable in caves, foraging crocodiles probably rely on tactile and olfactory cues to facilitate prey capture (Weldon et al. 1990. Ethology 85:191–198; Soares 2002. Nature 417:241–242). In addition to prey, caves may offer other benefits to crocodiles including thermoregulatory advantages, reduced rates of dehydration, predator-free refuges for juveniles, and perhaps aestivation sites (Soomaweera et al., *op. cit.*).

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SQUAMATA — LIZARDS

***ACANTHOSAURA ARMATA* (Peninsular Horned Tree Lizard). ENDOPARASITES.** *Acanthosaura armata* ranges from southern Thailand, southward through Peninsular Malaysia to Singapore and Sumatra, and is also known from the Andaman Islands (Grismer 2011. Amphibians and Reptiles of the Seribuat Archipelago [Peninsular Malaysia], Edition Chimaira, Frankfurt am Main. 239 pp.). Mullin (1973. Proc. Helminthol. Soc. Washington 40:282–285) previously described the nematode *Gonofilaria rudnicki* from *A. armata*. The purpose of this note is to add to the helminth list for *A. armata*.

A sample of 13 *Acanthosaura armata* (mean SVL = 110.3 mm ± 9.9 SD, range = 85–126 mm) from West Malaysia, collected in 2008–2009 by LLG and deposited in the herpetology collection of La Sierra University (LSUHC), Riverside, California, USA, was examined. Specimen numbers, collected by state were: Kedah (LSUHC 10602), Pahang (LSUHC 9090–9093), Perlis (LSUHC 8988, 8989), and Terengganu (LSUHC 9385–9389, 9405). A lateral incision was made through the body wall and the digestive tract was removed. The esophagus, stomach and small and large intestines were opened longitudinally and searched for helminths utilizing a dissecting microscope. The body cavity was also searched. Helminths were cleared in a drop of lactophenol, placed on a microscope slide, coverslipped, and studied under a compound microscope. Four species of Nematoda were found: 365 *Meteterakis singaporensis* in the large intestine (prevalence = number infected / number examined × 100 = 85%; mean intensity = mean number infected lizards = 33.2 ± 30.9 SD, range = 5–89); six *Abbreviata* sp. in the stomach (prevalence = 15%, mean intensity = 3.0 ± 1.4 SD, range = 2–4); one Capillariinae gen. sp. (prevalence = 8%) in the small intestine; and 25 Physalopteridae gen. sp., 3rd stage larvae in the stomach (prevalence = 15%, mean intensity = 12.5 ± 13.4 SD, range = 3–22). Helminths were deposited in the Harold W. Manter Laboratory (HWML), University of Nebraska, Lincoln, USA as *Meteterakis singaporensis* (HWML 92092), *Abbreviata* sp. (HWML 92093), Capillariinae gen. sp. (HWML 92094), Physalopteridae gen. sp., 3rd stage larvae (HWML 92095).

Meteterakis singaporensis is widespread in amphibians and reptiles in Malaysia, including in bufonids: (Sandosham 1954. Kuala Liam Malay Inst. 26:210–226), lizards: *Eutropis multifasciata* (Singh 1967. Bull. Nat. Mus. Singapore 33:95–100), *Cnemaspis mcguirei* (Bursey et al. 2014. Acta Parasitologica 59:643–652), *C. affinis, C. baueri, C. biocellata, C. grismeri, C. kumpoli, C. nuicamensis. C. pemanggilensis* (Goldberg et al. 2015. J. Nat. Hist. 49:2683–2691), and *Aphaniotus fusca* (Goldberg et al. 2015. Herpetol. Rev. 46:87). The *Abbreviata* sp. found may represent an undescribed species. Our specimens were insufficient for a species description. However, it was unlike any previously described Oriental species, namely, *A. achari* (Mirza, 1935), *A. borneensis* Schad, 1959, *A. bufonis* Yuen, 1963, *A. deschiensi* Le Van Hoa and Nguyen Van Liem, 1966, *A. indica* Soota, Srivastava and Ghosh, 1969, *A. kolayatensis* Soota and Chaturvedi, 1969, *A. mirzai* Soota and Chaturvedi, 1969, and *A. varani* (Parona, 1889). One female specimen assignable to Capillariinae gen. sp. was found. Because the anterior and posterior ends were missing (eggs were present), identification to genus was not possible. Third stage larvae of Physlopteridae are common in amphibians and reptiles (Goldberg et al. 1993. Bull. Southern California Acad. Sci. 92:43–51). No further development occurs until the amphibian or reptile is eaten by a carnivore in which development to the adult stage occurs.

Meteterakis singaporensis, *Abbreviata* sp., Capillariinae gen. sp. and Physalopteridae gen. sp. (3rd stage larvae.) in *Acanthosaura armata* are new host records.

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***AMEIVA AMEIVA* (South American Common Green Lizard). DIET.** *Ameiva ameiva* is a teiid lizard occurring in edges, forest clearings and anthropic areas from Panama and the Caribbean islands to south-central Brazil (Vitt and Colli 1994. Can. J. Zool. 72:1986–2008). It is an active forager, consuming mainly insects, but other arthropods, leaves and animal eggs have also been reported in the diet (Silva et al. 2003. Bol. Mus. Biol. Mello Leitão. N. Sér. 15:5–15). Herein we report three observations of *Ameiva ameiva* feeding on the eggs of Peters' Lava Lizard, *Tropidurus hispidus.*

The observations occurred along a forest border area called Parque Estadual Dois Irmãos (8.002665°S, 34.942679°W; WGS 84), an Atlantic Forest conservation area in the municipality of Recife, Pernambuco, northeastern Brazil. At 0930 h on 25 November 2015, we observed a female *A. ameiva* (approximate total length = 17 cm) excavating the subterranean nest of a *T. hispidus.*

Fig. 1. *Ameiva ameiva* preying on an egg of *Tropidurus hispidus* in Parque Estadual de Dois Irmãos, Recife, Pernambuco, Brazil.

The *Ameiva* grasped one egg (1.21 cm long) from the hole, but fled when a *T. hispidus* female approached rapidly and chased the *Ameiva*. The *Tropidurus* then re-buried the eggs. At 1057 h again at 1106 h, the same *A. ameiva* individual (identified due to its unique tail) returned to the nest, excavated it, and removed two more eggs, one at a time, each time moving about 40 cm from the nest with the egg in its mouth (Fig. 1). The *Ameiva* ingested the last two eggs in 46 and 61 s, respectively.

The ingestion of eggs by teiid lizards has been reported in *Salvator merianae* (Gonçalves et al. 2007. Rev. Bras. Zool. 24:1063–1070) and in *A. ameiva*, where traces of unidentified eggs in female's stomach were registered (Silva et al. 2003. Biol. Bull. Mus. Mello Leitão [N. Sér] 15:5–15). *Ameiva ameiva* also preys upon turtle eggs (Moll and Legler 1971. Bull Los Angeles Co. Mus. Nat. Hist. Sci. 11:1–12). However, our observations are apparently the first record of *A. ameiva* feeding on lizard eggs.

Saurophagy, in general, has been documented for *A. ameiva*, including on young *Tropidurus torquatus* (Rocha and Vrcibradic 1998. Science and Culture 50:364–368). Although the ingestion of eggs may be related to the competition between the syntopic *A. ameiva* and *T. hispidus*, it is more likely that the eggs of *T. hispidus* provide a high nutrient dietary source that is relatively common.

Images of the events and *T. hispidus* eggs were deposited in the Herpetological Collection of Universidade Federal Rural de Pernambuco, Recife, Pernambuco, Brazil (CHPUFRPE 4412). We thank the management at Parque Estadual de Dois Irmãos for the authorization and license to conduct the research, and Fundação de Amparo a Ciência e Tecnologia do Estado de Pernambuco - FACEPE for the scholarship granted to the first author of this article and also ICMBio for license number 11218-1.

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***ANOLIS CRISTATELLUS* (Puerto Rican Crested Anole). ABSENT TYMPANUM.** *Anolis cristatellus* is native to Puerto Rico and has been introduced to Miami, Florida, USA (Kraus 2009. Alien Reptiles and Amphibians: A Scientific Compendium and Analysis. Springer, [Dordrecht, Netherlands], 563 pp.; Krysko et al. 2003. Florida Sci. 66:74–79). In Miami, there are two independent and spatially distinct populations originating from two different locations in Puerto Rico: Key Biscayne, from San Juan, northwestern Puerto Rico; and South Miami, from Agua Claras/Ceiba, northeastern Puerto Rico (Kolbe et al. 2012. Ecol. Evol. 2:1503–1516). *Anolis* lizards have a visible external tympanum (Losos 2009. Lizards in an Evolutionary Tree: Ecology and Adaptive Radiation of Anoles. University of California Press, Berkeley, California. 528 pp.). Audition in *Anolis* lizards is sensitive, with a significant directional capacity (Christensen-Dalgaard and Manley 2008. J. Assoc. Res. Otol. 9:407–416), and hearing ranges are comparable to that of small birds (1000–7000 Hz) (Brittan-Powell et al. 2010. J. Acous. Soc. Am. 128:787–794). Hearing in *Anolis* lizards may be important in predator evasion (Cantwell and Forrest 2013. J. Herpetol. 47:293–298), and therefore damaged or missing auditory structures could reduce survival. Here we report an absent tympanum in *A. cristatellus*.

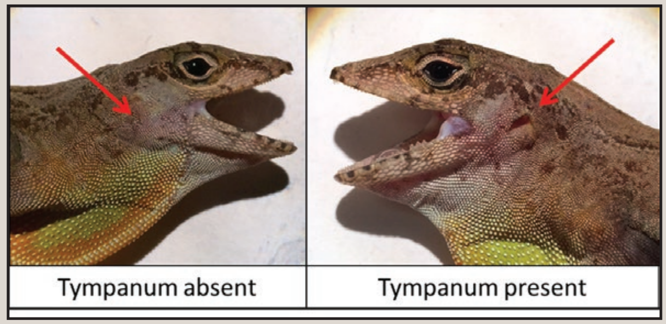

Fig. 1. *Anolis cristatellus*, showing an absent tympanum, with a normal tympanum for comparison.

At 1400 h on 1 November 2015, an adult male *A. cristatellus* was observed at Fairchild Tropical Botanical Gardens, Miami, Florida (25.403°N, 80.163°W, WGS 84; < 1 m elev.), and subsequently captured using a 3-m Cabela telescopic fishing pole with Glide dental floss noose. This lizard is a member of the population of *A. cristatellus* in South Miami originating from Agua Claras/Ceiba, northeastern Puerto Rico. Upon capture, we noted that this lizard was lacking an external tympanum on the right side of its head, such that skin covered the ear opening. Assessment under a laboratory microscope revealed that scalation was faultless and continuous such that skin regeneration following an injury was deemed unlikely. We have not observed this condition in any other *Anolis* lizards at FTBG despite extensive sampling. Moreover, we could not find any published reports noting the complete absence of the tympanum for any species of *Anolis* lizard. Despite at an apparent auditory disadvantage this individual was fully mature and in good condition, suggesting no obvious consequences of this abnormality.

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***ANOLIS EQUESTRIS* (Cuban Knight Anole). NOVEL PREDATOR-PREY INTERACTION.** *Anolis equestris* and *A. cristatellus* are native to Cuba and Puerto Rico respectively, and have both been introduced to South Florida, USA (Kraus 2009. Alien Reptiles and Amphibians: A Scientific Compendium and Analysis. Springer, Dordrecht, Netherlands, 563 pp.; Krysko et al. 2003. Florida Sci. 66:74–79). In South Miami, Florida, both species occur sympatrically. *Anolis equestris* is a large species, reaching up to 20 cm SVL, and has a broad generalist diet including invertebrates, small vertebrates, and fruits (Giery et al. 2013. Funct. Ecol. 27:1436–1441). In Miami, Florida, they have been observed preying upon smaller sympatric species of *Anolis* (Stroud 2013. Herpetol. Rev. 44:661), although never *A. cristatellus*. *A. cristatellus* are smaller than *A. equestris* with a maximum SVL of ~7 cm, and feed primarily on invertebrates, specifically leaf-litter insects. These two species show slight differences in microhabitat use; *A. equestris* are highly arboreal and typically occur in tree canopies, while *A. cristatellus* commonly utilize lower tree trunks, branches and the ground. Here we report on a predation event of *A. equestris* on an *A. cristatellus* in South Florida.

On 16 August 2015 at 1415 h, we observed a large adult male *A. equestris* (~ 18 cm SVL) in Fairchild Tropical Botanical Garden (25.676°N, 80.274°W, WGS 84; < 1 m elev.) on the trunk of a palm tree approximately 3 m off the ground covered by canopy shade. Below the *A. equestris* on the same tree trunk, at approximately 1.5 m, an adult female *A. cristatellus* (~ 4.5 cm SVL) was observed basking. The female *A. cristatellus* moved horizontally around the tree trunk into the field of vision of the *A. equestris* (approx. 1–1.5 m away). Upon detecting movement of the *A. cristatellus*, the *A. equestris* immediately and rapidly moved down the trunk in pursuit. Despite retreating to its previous thermally-exposed position, the *A. cristatellus* was caught and preyed upon by the *A. equestris* on the tree trunk (approx. ~ 0.7 m from the ground). Ingestion took < 1 minute. This is the first recorded observation of *A. equestris* preying upon *A. cristatellus* in South Florida.

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***ANOLIS SAGREI* (Brown Anole). AVIAN PREDATION.** Avian predators are often documented preying upon various herpetofauna, and passerines are no exception. Some families, such as Laniidae (shrikes; Chiu et al. 2011. Herpetol. Notes 4:87–89), possess specialized foraging behaviors (spearing with plant thorns) to subdue insects and small vertebrate prey. However, even dietary generalists such as the American Robin (*Turdus migratorius*) opportunistically consume small lizards (Smith 1983. Herpetol. Rev. 14:46). Here we report a new predator-prey relationship that also documents a new passerine family as a lizard predator.

Fig. 1. A Black-and-White Warbler (*Minotilta varia*; Family Parulidae) carrying a juvenile (*Anolis sagrei*). Note the apparent spider web residue on the anole.

Anolis sagrei, a native to the Caribbean Islands, was introduced to Florida and Key West over 100 years ago. This species has been highly successful when introduced to new areas due to its competitive adaptability and limited predation by native species (Losos et al. 1993. Oecologia 95:525–532). On 7 November 2015 at Key West Tropical Forest and Botanical Gardens (24.5737°N, 81.7493°W) in the Lower Florida Keys, Monroe Co., Florida, USA, we observed an adult Black-and-White Warbler (*Mniotilta varia*; Parulidae) carrying a juvenile *Anolis sagrei* that appeared to be covered in spider webbing (Fig. 1). The warbler proceeded to beat the lizard against a tree trunk similarly to the expected handling of a large insect as prey. Wood warblers (Parulidae) are primarily insectivorous and opportunistically frugivorous (Greenberg 1981. Biotropica 13:215–223) and ours is the first documentation of any species from that family preying upon a lizard. Given that the *A. sagrei* was covered in spider webbing, it is probable that the warbler opportunistically collected the anole from a spider web as opposed to capturing and subduing the prey on its own. As this is the first documentation of a parulid preying upon a lizard, wood warblers are likely infrequent predators of lizards; however the value of exotic species as prey for migratory birds warrants further examination.

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***ANOLIS VANIDICUS* (Escambray Grass Anole). MAXIMUM ELEVATION.** *Anolis vanidicus* (Fig. 1) is an endemic dactyloid lizard restricted to the Guamuhaya Range and immediate surroundings

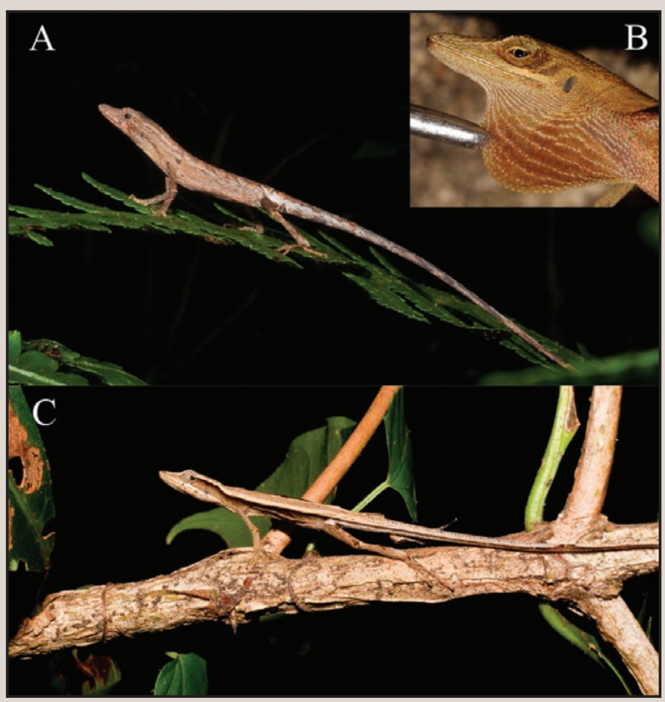

Fig. 1. *Anolis vanidicus* from the municipality of Pico San Juan Cumanayagua, Cienfuegos Province, Cuba: A) male, B) male`s dewlap and C) female. Photos by Raimundo López-Silvero (A, C) and Ruben Marrero (B).

in central Cuba (Rodríguez Schettino 1999. The Iguanid Lizards of Cuba. University Press of Florida, Gainesville. 428 pp.; Schettino et al. 2013. Smithson. Herpetol. Inf. Serv. 144:1–98). It occurs between 100 and 931 m elevation (Rodríguez Schettino 2010. Poeyana 498:11–20). Herein we report a new maximum elevation for *A. vanidicus* that exceeds the previous maximum (931 m at Pico Potrerilloin, in the municipality of Trinidad, Sancti Spíritus Province (Rodríguez Schettino, *op. cit.*).

The specimen was found at 1100 m on 9 November 2013 by RM and TMRC, in secondary vegetation near the meteorological radar station at Pico San Juan (21.9919°N, 80.1432°W; WGS 84), in the municipality of Cumanayagua, Cienfuegos Province, Cuba. Species identity was verified by O. H. Garrido (voucher number MFP 12.580, herpetological collection of the Museo de Historia Natural "Felipe Poey," Facultad de Biología, Universidad de La Habana, Cuba). The species can be relatively common in this area. We have observed around 30 adults between November 2013 and February 2015 in five expeditions averaging one-week duration, with a maximum of six adults and several juveniles observed in a single day. However, this species is considered "Vulnerable" in Cuba (Chamizo Lara 2012. *In* González Alonso et al. [eds.], Libro Rojo de los Vertebrados de Cuba, pp. 137–138. Editorial Academia, La Habana).

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***ASPIDOSCELIS EXSANGUIS* (Chihuahuan Spotted Whiptail). DIET.** Walker et al. (2014. Southwest. Nat. 59:419–423, fig. 1) reported an extreme color pattern variant of parthenogenetic *Aspidoscelis exsanguis* (83 mm SVL and 16 g mass) captured on 20 August 2013 on a gravel driveway of a home in Bosque Farms, Valencia Co., New Mexico, USA. Because it was the only extreme variant among the hundreds of individuals of this species we have examined from Arizona, New Mexico, Texas, and Chihuahua and Sonora in Mexico, we analyzed the stomach contents of the lizard, which was deposited in the Museum of Southwestern Biology, University of New Mexico (MSB 94825). The stomach contents from this adult lizard were numerically dominated by Coleoptera (beetle) larvae of various sizes representing at least three species (Table 1). The contents were volumetrically dominated by Lepidoptera (moth) larvae: the lizard had consumed six large caterpillars in addition to the many beetle larvae. The only adult insect found was a single beetle of the family Tenebrionidae. Overall, this lizard consumed insect larvae almost exclusively. Beetle and moth larvae are slow-moving, nearly sedentary prey. This suggests that either such prey were very common in the lizard's habitat on the day it was caught or that this lizard passed up more active prey (such as grasshoppers and spiders). We could not discount the possibility that this unique lizard's use of the gravel driveway during July and August 2013 was indicative of an associated behavioral peculiarity. Alternatively, its presence there could have been based on a temporal abundance of easily harvested insect larvae. This example of diet in *A. exsanguis* differed markedly from studies of the species in natural habitats. Smith (1989. Southwest. Nat. 34:418–420) reported that *A. exsanguis* in the Davis Mountains of Brewster Co., Texas, consumed 46% grasshoppers and 42% termites in June, changing to 70% grasshoppers and 20% termites in July.

Table 1. Stomach contents of an extreme variant of *Aspidoscelis exsanguis* (MSB 94825) from Bosque Farms, Valencia County, New Mexico.

Prey Taxon	Number	Numerical percent	Volume (mm^3)	Volumetric percent
Coleoptera larvae	19	73.1%	50.3	43.4%
Lepidoptera larvae	6	23.1%	61.4	53.0%
Tenebrionidae adult	1	3.8%	4.2	3.6%
TOTAL	26	100%	115.9	100%

This study was facilitated by the assistance of J. Noble and T. Giermakowski, University of New Mexico, in the process of having the specimen catalogued into the MSB collection of amphibians and reptiles.

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***BASILISCUS VITTATUS* (Brown Basilisk). DIET.** *Basiliscus vittatus* occurs from Mexico to Colombia, where it occupies wetland and forested areas adjacent to rivers (Meshaka et al. 2004. The Exotic Amphibians and Reptiles of Florida. Krieger Publishing Company, Malabar, Florida, 155 pp.). Juvenile *Basiliscus vittatus* feed on beetles, ants, grasshoppers, amphipods, lycosid spiders, and lepidopteran larvae, while the diet of adults consists of plant matter and both aquatic and terrestrial invertebrates (Krysko et al 2006. Iguana 13:24–30).

Basiliscus vittatus has been introduced to southern Florida, USA through the pet trade, where it was first documented in the wild in in 1976 in Miami-Dade Co., Florida (Meshaka et al., *op. cit.*). Since its introduction, it has spread across six counties, and has been documented eating beetles, roaches, ants, hemipterans, *Ficus* spp. (figs), arachnids, *Anolis sagrei* (Brown Anole), *Sesarma cinereum* (Wood Crab), and *Uca pugilator* (Fiddler Crab) (Krysko et al. 2006, *op. cit.*).

On 22 June 2014, we collected a male *B. vittatus* (SVL = 11.5 cm; total length = 39 cm; 40 g) at Homestead Air Reserve Base in Homestead, Florida (25.48943°N, 80. 37209°W; WGS 84). The specimen was dissected, and an *Opheodrys aestivus* (Rough Green Snake) was recovered from its stomach. Although snakes are the only documented predator of *B. vittatus* in Florida (Flaherty and Friers 2014. Southeast. Nat. 13:N57–N58), this provides the first documented incidence of the non-native *B. vittatus* preying upon a native snake in southern Florida. Native taxa, such as *O. aestivus*, may be ecologically naïve to predation by a novel non-native predator, making them easy prey for foraging *B. vittatus.*

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***BRONCHOCELA CRISTATELLA* (Green Crested Lizard). DIET AND FORAGING BEHAVIOR.** *Bronchocela cristatella* is an agamid lizard inhabiting forests, forest edges, and gardens in southeast Asia (Das 2010. A Field Guide to the Reptiles of South-east Asia. New Holland Publishers, London. 376 pp.). It is generally insectivorous (Diong and Lim 1998. Raffles Bull. Zool. 46:345–359), consuming mayflies, beetles, flies, and ants, in addition to skinks (Das 2006. A Photographic Guide to the Snakes and Other Reptiles of Borneo. New Holland Publishers, London. 144 pp.; Das 2010, *op. cit.*). Occasionally, larger prey are taken, such as stick insects (Das 2013. Herpetol. Rev. 44:319–320). Here we describe a *B. cristatella* preying upon a caterpillar, a previously unpublished prey item for the species.

At 1050 h on 9 October 2015 in lowland rainforest fringing the Kinabatangan River at the Sukau Rainforest Lodge, Sukau, Sabah, East Malaysia (Borneo) (5.4981°N, 118.2808°E), we observed an individual *B. cristatella* on a thin branch next to a boardwalk, approximately 2.5 m above the ground. The lizard discovered and lunged toward a green caterpillar with orange spines (size = approximately 3 × 1 cm). Over the course of approximately 4 minutes the lizard slowly chewed the caterpillar with bites occurring approximately every 10 seconds. During this process the lizard moved the caterpillar around the mouth, and half of the caterpillar often protruded from the side. It was assumed that the slow manipulative biting and chewing was to soften the prey (or potentially lessen the impact of the spines). However, the caterpillar remained intact until it was eventually swallowed whole. The lizard then moved up the tree.

The species of caterpillar was not identified and it is not clear whether the tufted knobs were toxic. The Bornean Lepidoptera fauna is considered rich with around 11,000 species of butterflies and moths (Garbutt and Prudente 2006. Wild Borneo: The Wildlife and Scenery of Sabah, Sarawak, Brunei, and Kalimantan. New Holland Publishers, London. 176 pp.). Although caterpillars have not previously been recorded in the literature as part of the diet of *B. cristatella*, it is likely they are taken when available. With the exception of Das (2013, *op. cit.*), predation events for *B. cristatella* have not been described in detail, and our observation adds to that knowledge for this agamid lizard.

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***CNEMASPIS BIDONGENSIS* (Pulau Bidong Rock Gecko). ENDOPARASITES.** *Cnemaspis bidongensis* is known from the type locality of Pulau Bidong, Terengganu, Peninsular Malaysia (5.62001°N, 103.05406°E) (Grismer et al. 2014. Zootaxa 3755:447–456). In this note we establish the initial helminth list for *C. bidongensis*.

Three *C. bidongensis* (mean SVL = 51.7 mm ± 1.5 SD, range = 50–53 mm) were collected at the above type locality August 2013 and deposited in the herpetology collection of La Sierra University (LSUHC), Riverside, California, USA as LSUHC 11429, 11431, 11450. A lateral incision was made through the body wall. The esophagus, stomach, small and large intestines were opened longitudinally and searched for helminths utilizing a dissecting microscope. The body cavity was also searched. Helminths were cleared in lactophenol, placed on a microscope slide, coverslipped and studied using a compound microscope.

Found were one species of Nematoda, 16 *Meteterakis singaporensis*, both in the small and large intestines (prevalence = number infected lizards/number lizards examined × 100 = 67%; mean intensity = mean number helminths per infected lizard = 8.0 ± 1.41 SD, range = 7–9). Helminths were deposited in the Harold W. Manter Laboratory (HWML), University of Nebraska, Lincoln, USA as HWML (64808).

Meteterakis singaporensis was described from *Duttaphrynus* (as *Bufo*) *melanostictus* from Singapore by Inglis (1958. Parasitology 48:9–31) and was also found in *C. mcguirei* (Bursey et al. 2014. Acta. Parasitol. 59:643–652), *C. affinis*, *C. baueri*, *C. biocellata*, *C. grismeri*, *C. kumpoli*, *C. nuicamensis*, and *C. pemanggilensis* from Peninsular Malaysia (Goldberg et al. (2015. J. Nat. Hist. 49:2683–2691). *Meteterakis singaporensis* in *C. bidongensis* is a new host record.

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***CNEMASPIS SILVULA* (Endemic Forest Day Gecko). PREDATION.** The predation of lizards, frogs, and snakes by spiders in tropical rainforests has been amply highlighted in the literature (e.g., Jones et al. 2011. Herpetol. Rev. 42:441; Lange 2007. Herpetol. Rev. 38:460; Riehl et al. 2008. Herpetol. Rev. 39:77; Bauer 1990.

Fig. 1. An adult *Cnemaspis silvula* being preyed upon by the Nephilid spider (*Nephilengys malabarensis*) at the Sinharaja World Heritage Site, Sri Lanka.

Herpetol. Rev. 21:83–87). However, in Sri Lanka, such predation is not well documented. Herein, we report on an observation of a nephilid spider (*Nephilengys malabarensis*) preying upon an endemic forest day gecko (*Cnemaspis silvula*) in Sri Lanka (Fig. 1).

The predation event was observed in the evening at 1750 h on 2 August 2013 at the Sinharaja World Heritage Site (6.4169611°N, 80.4234861°E; 440 m elev.), Sri Lanka. The incident was observed near a foot trail with high canopy cover (around 90%) and emergent vegetation. At the time of the encounter, the spider was holding the lizard with its pedipalps and the chelicerae were pierced into the ventral side of the gecko's mid-body region. After 15 min, the gecko did not show any movement. The bite area gradually became discolored, signaling the beginning of liquefaction in the area of envenomation. The spider then began feeding on the fluid of the predigested prey using its sectorial organ. Subsequent observations were made every 15 min from 1820 h until 1945 h, and the entire predation event took approximately 2 h. To the best of our knowledge this is the first account of predation on an endemic day gecko in Sri Lanka. The observation here enhances our knowledge of the predatory interactions between spiders and geckos, and also highlights the valuable trophic connections between arthropods and reptiles.

We thank Mr. Tharindu Ranasinghe for helping the spider identification and Ms. Merinda Longjam for diverse ways to enrich this work. We also thank the Forest Department, Sri Lanka, for continued access to the Sinharaja forest.

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CTENOSAURA OAXACANA **(Oaxacan Spiny-Tailed Iguana). PREDATION.** *Ctenosaura oaxacana* is a large semi-arboreal iguana restricted to dry forests in Oaxacana, Mexico. As part of an ongoing study of the spatial ecology and conservation of this critically endangered lizard, we radio-tracked several individuals using transmitters affixed to the base of the tail. Herein we report an observation of predation by a *Boa constrictor* on a telemetered *C. oaxacana*.

At 0830 h on 27 May 2015 in Nizanda, Oaxaca (2.5322°N, 81.0210°W, NAD 83; 113 m elev.) while tracking an adult male *C. oaxacana* (SVL = 14.0 cm; TL = 12.8 cm; mass = 89 g on 26 April 2015), we discovered that the lizard had been ingested by a female *Boa constrictor* (SVL = 70.1 cm; TL = 10.3 cm; mass = 307 g). The snake was outside a small burrow where the iguana had been previously located at 1845 h on 20 May 2015. We maintained the *B. constrictor* at ambient temperature in the laboratory until scales and transmitter were defecated (post-defecation boa mass = 293 g). The *C. oaxacana* represented an estimated 30.6% of the total length and 30.4% of the mass of the snake.

Other known predators of *Ctenosaura* include birds of prey, carnivorous mammals, and snakes (Pasachnik et al. 2013. IUCN Red List of Endangered Species). Western Lyre Snakes (*Trimorphodon biscutatus*) have also been reported to prey on *C. oaxacana* (Corneil et. al. 2015. Herpetol. Rev. 46:630-631). Our observation represents the first report of *B. constrictor* feeding on *C. oaxacana*. However, *B. constrictor* has been reported to feed on congeners, including *C. pectinata* (Lemos-Espinal and Ballinger 1994. Herpetol. Rev. 25:26), *C. melanosterna* (Reed et. al. 2006. Herpetol. Rev. 37:84), *C. similis* (Bakkegard and Timm 2001. Herpetol. Rev. 32:261–262), and *C. bakeri* (Pasachnik et al. 2013. IUCN Red List of Endangered Species) as well as other iguanid species, including *Iguana iguana* (Quick et. al. 2005. J. Herpetol. 39:304–307) and *I. delicatissima* (Knapp et. al. 2009. Herpetol. Rev. 40:229–230).

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CTENOSAURA PALEARIS **(Guatemalan Spiny-tailed Iguana). TAIL TRIFURCATION.** *Ctenosaura palearis* is an endangered species of spiny-tailed iguana endemic to the seasonally dry tropical forests of eastern Guatemala (Ariano-Sánchez and Pasachnik 2010. The IUCN Red List of Threatened Species 2013: e.T44192A10860487). This species uses hollow trunks of Pitayo Organ Pipe Cactus (*Stenocereus pruinosus*), Quebracho (*Lysiloma divaricatum*), and Yaje (*Leucaena collinsii*) as shelters (Cotí and Ariano-Sánchez 2008. Iguana 15:142–149).

At 0730 n on 13 March 2015, an adult male *C. palearis* (SVL = 210 mm, tail length = 169 mm, body mass = 160.2 g) was found inside a hollow trunk of Quebracho in the surroundings of Heloderma Natural Reserve, Cabañas, Guatemala (14.856407°N, 89.792265°W, WGS 84; 642 m elev.). This individual showed a trifurcation on the tail (Fig. 1). Trifurcation of the tail was represented by three newly regenerated tails at the section were the original tail presented an injury. This trifurcation was located 105 mm posterior to the cloaca. Bifurcation or multiple tail regeneration cases have been published for many species of lizards (e.g., Bateman and Chung-MacCoubrey 2013. Herpetol. Rev. 44:663; Kumbar and Ghadage 2011. Herpetol. Rev. 42:94; Mata-Silva et al. 2013. Herpetol. Rev. 44:686–687) but this is the first report of trifurcated tail in *C. palearis* and to the best of our knowledge is among the scarce reports of trifurcation on any Iguanidae in the wild (Hayes et al. 2012. Biodivers. Conserv. 21:1893–1899).

Given that *C. palearis* use hollow trunks as shelters, the multiple tail regeneration of this individual may limit the size of cavities that can be occupied by the individual and may increase risk of predation, given the potential burden of the tail in locomotion.

FIG. 1. Adult male *Ctenosaura palearis* showing tail trifurcation.

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***CYRTODACTYLUS BATUCOLUS* (Besar Island Bent-toed Gecko). REPRODUCTION.** *Cyrtodactylus batucolus* is known from Pulau Besar, in Melaka State, Peninsular Malaysia (Grismer 2011. Lizards of Peninsular Malaysia, Singapore and their Adjacent Archipelagos. Edition Chimaira, Frankfurt am Main, Germany. 728 pp.). In this note, we present the first information on its reproductive biology.

We examined a sample of eight *C. batucolus* consisting of three males (mean SVL = 65.0 ± 7.6 SD, range = 58–73 mm) and five females (mean SVL = 64.6mm ± 3.8 SD, range = 61–70 mm) collected on 5 June 2008 at Pulau Besar (2.2°N, 128.2°E) Melaka State, Peninsular Malaysia and deposited in the herpetology collection of La Sierra University (LSUHC), Riverside, California, USA, as LSUHC 8934, 8937, 8938, 8940, 8945–8947, 8949. Lizards were sacrificed by an overdose of pentobarbital.

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 with Harris hematoxylin, followed by eosin counterstain. Oviductal eggs were counted. Histology slides are deposited at LSUHC.

All three males were producing sperm (spermiogenesis). The smallest reproductively active male measured 58 mm SVL (LSUHC 8947). The smallest reproductively active female (LSUHC 8938) exhibited early yolk deposition (vitellogenic granules in the ooplasm) and measured 61 mm SVL. Another female, LSUHC 8937 (SVL = 70 mm) contained two oviductal eggs. Two females of adult size (LSUHC 8940, SVL = 62 mm; LSUHC 8946, SVL = 63 mm) contained quiescent ovaries that were not undergoing yolk deposition and may have been between clutches. The remaining female (LSUHC 8934) (SVL = 67 mm) was undergoing early vitellogenesis. Examination of *C. batucolus* samples from additional months is needed to more completely ascertain the reproductive pattern of this species.

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***CYRTODACTYLUS TEBUENSIS* (Tebu Mountain Bent-toed Gecko). ENDOPARASITE.** *Cyrtodactylus tebuensis* was described from Gunung Tebu (5.6°N, 102.6°E) Terengganu, Peninsular Malaysia (Grismer et al. 2013. Zootaxa 3616:239–252). To our knowledge, there are no published reports of helminths for *C. tebuensis*. The purpose of this note is to establish the initial helminth list for *C. tebuensis*.

One female (80 mm SVL) *C. tebuensis* was collected from the type locality in January 2013 and deposited in the herpetology collection of La Sierra University (LSUHC), Riverside, California, USA, as LSUHC 11199. A lateral incision was made through the body wall and the body cavity was examined for helminths. One nematode was found. It was cleared in lactophenol, placed on a microscope slide, coverslipped, studied using a compound microscope, and identified as *Hexametra rotundicaudata*. It was deposited in the Harold W. Manter Parasitology Laboratory (HWML), University of Nebraska, Lincoln, Nebraska as HWML 92085.

Hexametra rotundicaudata has previously been reported from *Calotes calotes* from Sri Lanka (as Ceylon) and *C. versicolor* from India. (Sprent 1978. J. Helminthol. 52:355-384). *Cyrtodactylus tebuensis* is a new host record for *H. rotundicaudata* and the third species recorded to harbor it.

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***EUMECES SCHNEIDERI* (Schneider's Skink). REPRODUCTION.** *Eumeces schneideri* ranges from Algeria to Egypt, Lebanon, Israel, Syria, Turkey, Cyprus, Iraq, Iran, Trans-Caucasia, Russia, Turkmenistan, Asia Minor, Afghanistan, Pakistan, and India (Bar and Haimovitch 2011. A Field Guide to Reptiles and Amphibians of Israel. Pazbar Ltd., Herlizya, Israel. 245 pp.). Despite its extensive geographical range, most of the information on the reproduction of *E. schneideri* consists of reports of clutch sizes: 3–20, Israel and North Africa (Bar and Haimovitch, *op. cit.*; Schleich et al. 1996. Amphibians and Reptiles of North Africa. Koeltz Scientific Publishers, Koenigstein, Germany. 630 pp.); 4–15, Jordan (Disi et al. 2001. Amphibians and Reptiles of the Hashemite Kingdom of Jordan, An Atlas and Field Guide. Edition Chimaira, Frankfurt am Main, Germany. 408 pp); 6–20, Turkey (Baran and Atatür 1998. Turkish Herpetofauna. Amphibians and Reptiles. Republic of Turkey Ministry of Environment, Ankara, Turkey. 214 pp.). The purpose of this note is to add information on reproduction of *E. schneideri* from Israel.

A sample of 41 *E. schneideri* consisting of 19 males (mean SVL = 142.63 mm ± 9.9 SD, range = 118–167 mm), 7 females (mean SVL = 121.7 mm ± 9.9 SD, range = 117–137 mm), 6 subadult males (mean SVL = 90.8 mm ± 16.2 SD, range = 71–113 mm), and 9 subadult females (mean SVL = 92.9 mm ± 15.2 SD, range = 71–111 mm), collected in Israel between 1948–2014 and deposited in the Steinhardt Natural History Museum of Tel Aviv University (TAUM), was examined (specimens by region: A'rava Valley TAUM 1815; Central Negev 1632, 15963; HaSharon TAUM 297, 301, 305, 310, 3566, 3567, 4006, 4007, 4138, 13159; HaShefla TAUM 16108; Jordan Valley TAUM 1201; Judea Foothills TAUM 17356; Karmel Ridge TAUM

TABLE 1. Monthly stages in the testicular cycle of 19 *Eumeces schneideri* males from Israel.

Month	N	Regressed	Recrudescence	Spermiogenesis
January	1	0	1	0
February	2	2	0	0
March	6	1	4	1
April	2	0	0	2
May	4	0	0	4
July	2	1	1	0
September	1	1	0	0
October	1	1	0	0

308, 2095, 2096, 13784; Northern Negev TAUM 3526, 7179–7181, 4366, 13161; Shomeron TAUM 1351, 13173, 15961, 16696, 16756; Southern Coastal Plain TAUM 1754, 4101, 4398, 16561; Yizreel Valley TAUM 303, 975, 2236; Upper Galil TAUM 14354, 16208, 16552).

A small slit was made in the left side of the abdomen and the left testis was removed from males and the left ovary was removed from females for histological examination. Removed gonads were embedded in paraffin, sections were cut at 5 µm and stained by Harris' hematoxylin followed by eosin counterstain. Slides of the testes were categorized as to the stage of the testicular cycle. Slides of ovaries were examined for yolk deposition; oviductal eggs were grossly noted.

Three stages were noted in the testicular cycle (Table 1): 1) spermiogenesis (seminiferous tubules lined by clusters of sperm and/or metamorphosing spermatids); 2) recrudescence = renewal (proliferation of germ cells for the next period of spermiogenesis). Primary spermatocytes predominate in early recrudescence; secondary spermatocytes and spermatids predominate in late recrudescence; 3) regressed, seminiferous tubules contain spermatogonia and interspersed Sertoli cells. The smallest reproductively active male (spermiogenesis) measured 118 mm (TAUM 16108) and was from April.

Three stages were present in the ovarian cycle: 1) quiescent, no yolk deposition; 2) early yolk deposition, vitellogenic granules in the ooplasm; 3) oviductal eggs. The smallest reproductively active female (TAUM 16208) contained 4 oviductal eggs, which measured 118 mm SVL and were from June. Two other females: (TAUM 15961) from July (SVL = 118 mm) and (TAUM 1632) from October (SVL = 119 mm) had started early yolk deposition (stage 2) but would not have completed it because they were undergoing atresia, a process in which granulosa cells enlarge and engulf yolk granules. Incidences of follicle atresia increase late in the reproductive season in lizards (Goldberg 1973. Herpetologica 29:284–289). Other adult females contained quiescent ovaries (stage 1): March (N = 2), April (N = 1), May (N = 1), September (N = 3).

The presence of sperm-containing males and reproductively-active females in spring indicates synchrony in the reproductive cycles of both sexes. The female reproductive cycle of *E. schneideri* appears to fit the "monoestrous" type (Schleich et al., *op. cit.*) in which one egg clutch is produced in a fixed (spring) reproductive period.

I thank Shai Meiri (TAUM) for permission to examine *E. schneideri*, Ezra Maza (TAUM) for facilitating the loan and the Steinhardt Museum of Natural History at Tel Aviv University for providing *E. schneideri* for my examination.

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***LIOLAEMUS RAMIREZAE*. HEADBOB DISPLAY BEHAVIOR.** One of the most common visual signals in lizards is the headbob display. Headbob displays consist of stereotyped up and down movements of the head and/or torso, used in different contexts, such as territorial defense, agonistic interactions, and courtship (Carpenter and Ferguson 1977. *In* Gans and Tinkle [eds.], Biology of the Reptilia: Ecology and Behaviour A, pp. 335–554. Academic Press, New York). Despite the fact that headbob displays are stereotyped and species-specific (Martins et al. 2004. Anim. Behav. 68:453–653), their structure reveals variations among sexes, individuals, populations, and social context (e.g., Martins 1991. Anim. Behav. 41:403–416, Macedonia and Clark 2003. J. Herpetol. 37: 266–276, Vicente and Halloy 2015. Herpetol. J. 25:49–53). The neotropical genus *Liolaemus*, with more than 250 species (Abdala and Quinteros 2014. Cuad. Herpetol. 28:55–82), offers great potential to study ecology and evolution of lizard communication (e.g., Halloy et al. 2013. Cuad. Herpetol. 27:15–26). The genus is

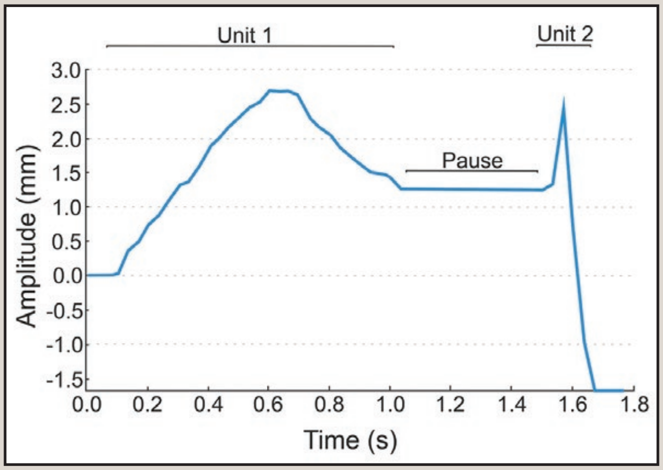

FIG. 1. The headbob display of *Liolaemus ramirezae*.

TABLE 1. Headbob display measurements for seven *Liolaemus ramirezae*, showing means, SD, range, and coefficient of variation of the amplitude (in mm) and duration (in seconds) of each unit.

N	Amplitude unit 1	Amplitude unit 2	Duration unit 1	Duration pause	Duration unit 2	Total duration
1	3.73	3.42	0.96	0.37	0.16	1.49
2	5.15	5.12	0.98	0.38	0.17	1.54
3	2.37	2.24	1.14	0.43	0.21	1.78
4	2.50	1.97	1.12	0.38	0.2	1.70
5	2.72	2.44	0.96	0.47	0.17	1.60
6	5.83	3.83	1.17	0.29	0.26	1.72
7	7.81	6.37	1.15	0.32	0.16	1.63
Mean	4.30	3.63	1.07	0.38	0.19	1.64
SD	2.05	1.63	0.10	0.06	0.04	0.10
Range	(2.37–7.81)	(1.97–6.37)	(0.96–1.17)	(0.29–0.47)	(0.16–0.26)	(1.49–1.78)
CV (%)	47.62	44.90	9.01	16.18	19.22	6.30

distributed in South America from Perú to Tierra del Fuego, Argentina, showing a great variety in habitat preferences, reproductive strategies, and feeding habits. Here we analyze the form and structure of the headbob display of *L. ramirezae* in its natural environment.

Liolaemus ramirezae is a diurnal, oviparous (Lobo and Espinoza 1999. Copeia 1999:122–140), and insectivorous lizard (Halloy et al. 2006. Rev. Esp. Herpetol. 20:47–56). This species lacks sexual dichromatism and dimorphism (mean SVL = 51.5 mm ± 2.8 mm SD; Lobo and Espinoza 1999, *op. cit.*). It is found in northwestern Argentina, in the Salta, Tucuman and Catamarca provinces (Lobo 2005. Acta Zool. Lill. 49:65–87). The study site is located at "Los Cardones" (26.6670°S, 65.8180°W, WGS 84; 2725 m elev.), Tucuman Province, Argentina. Seven adults were filmed with a digital camcorder (Sony HDR-Cx290), as part of a study of headbob displays of the sympatric lizard, *Liolaemus pacha*. Active lizards were filmed between 1000 h and 1700 h, during sunny or partially cloudy days. The observer was located at approximately 4 m from the focal subject to minimize interference. The observer never sampled the same area twice to avoid filming the same lizard multiple times. Headbob displays were analyzed using the software Tracker (www.cabrillo.edu/~dbrown/tracker/), following the same procedures used in previous studies (Vicente and Halloy 2015, *op. cit.*). Graphs were obtained marking the position of the snout, frame by frame, through time. Videos were calibrated using the mean snout–vent length. We defined a lizard headbob display as a succession of ups and downs of the head, each one called units. We obtained the form of the headbob display and we measured the amplitude and duration of each unit. We followed the convention that display units with a coefficient of variation (CV) < 35% can be considered highly stereotyped (Barlow 1977. *In* Sebeok [ed.], How Animals Communicate, pp. 98–134. Indiana University Press, Bloomington, Indiana).

Liolaemus ramirezae headbob displays were characterized by one long up and down motion (called unit 1), followed by a pause and a quick up and down movement of approximately the same amplitude (unit 2, Fig. 1). This form was similar among the seven individuals, possibly corresponding to the signature bob for this species (Carpenter and Ferguson 1977, *op. cit.*). The amplitude of both units was highly variable, which may be signaling differences among individuals, sexes or social contexts. On the other hand, the duration of units and pause were more conservative (CV < 35%, see Table 1). This could be part of the identity of the species. More studies are needed in the field and in the laboratory to understand better the observed variations.

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NEPHRURUS SHEAI **(Northern Knob-tailed Gecko). DIET.** Little is known about the ecology of *Nephrurus sheai*, a recently described knob-tail gecko from north-western Australia (Couper and Gregson 1994. Mem. Queensland Mus. 37:53–67). The only reported dietary items for this species are lepidopteran larvae and isopterans (*ibid.*), although a wide range of arthropod prey (including spiders, scorpions, centipedes, and many insect

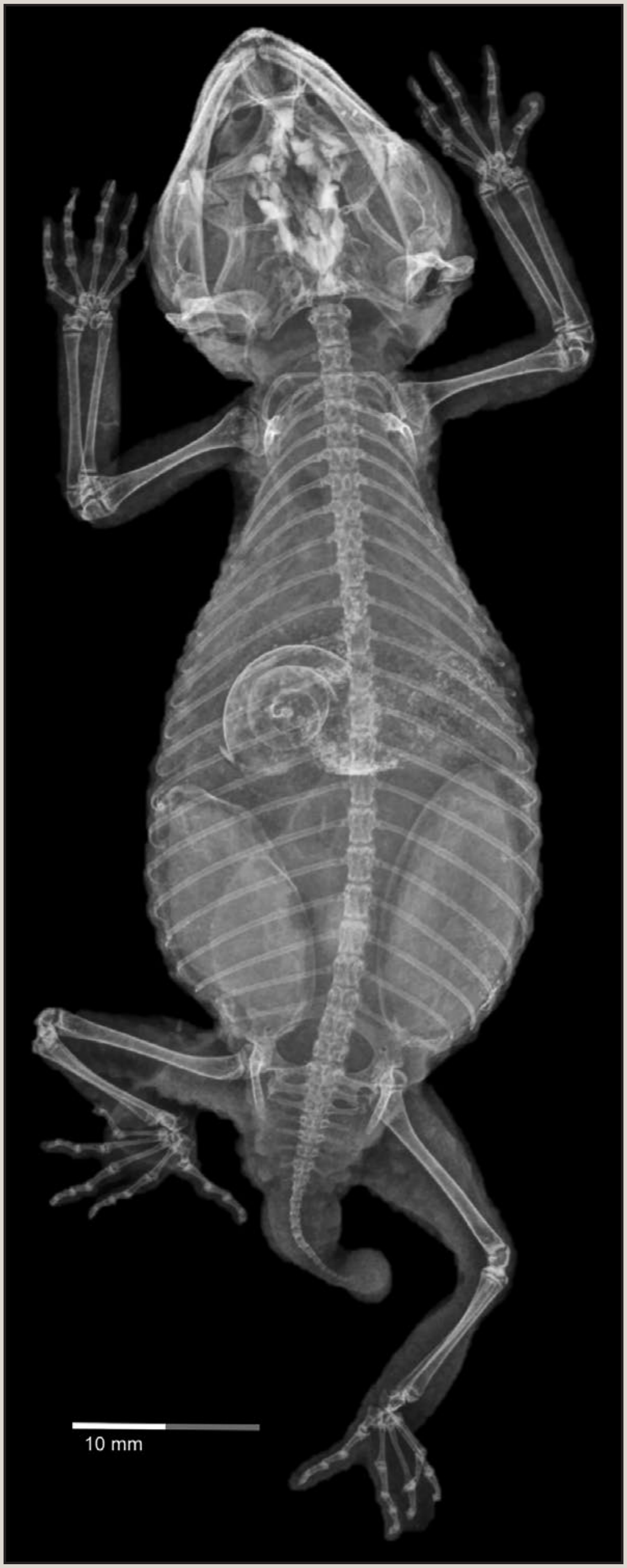

Fig. 1. Radiograph of *Nephrurus sheai* (WAM R174053) showing ingested camaenid gastropod.

groups), lizards, and even plant material have been recorded for other carphodactylid geckos (Pianka and Pianka 1976. Copeia 1976:125–142; McPhee 1979. The Observer's Book of Snakes and Lizards of Australia. Methuen, Australia. 157 pp.; Harvey 1983. Trans. Roy. Soc. South. Aust. 107:231–235; Bauer 1990. Herpetol. Rev. 21:83–87; How et al. 1990. Rec. West. Aust. Mus. 14:449–459; Couper et al. 1993. Queensland Geogr. J., Ser. 4, 8:261–265; Couper and Gregson 1994, *op. cit.*; Doughty and Shine 1995. Herpetologica 51:193–201). Herein we report a new and unusual prey item for *N. sheai* from Western Australia.

An adult female *Nephrurus sheai* (WAM R174053; 118 mm SVL), collected from Johnson Creek, Drysdale River National Park, Western Australia (14.7814°S, 127.0997°E; WGS 84), was X-rayed using a Thermo Kevex PXS5-927EA Microfocus source with a LTX-1717 Digital Flat Panel Detector (settings: 40 kV, 80 µA, 3.2 W) at the Western Australian Museum and found to have a camaenid gastropod (likely *Amplirhagada drysdaleana*, 16 mm shell diameter) in its stomach (Fig. 1). This is not only the first record of *Nephrurus sheai* preying on a gastropod, but also the first documentation of molluscivory in the family Carphodactylidae. At least 15 species of other gekkotans have been reported to feed on gastropods, however, including diplodactylid, sphaerodactylid, gekkonid, and phyllodactylid taxa (Daza et al. 2009. Biol. J. Linn. Soc. 97:677–707).

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***PHRYNOSOMA HERNANDESI* (Greater Short-Horned Lizard). COMMENSALISM.** Commensalism is a relationship between two organisms whereby one benefits without negatively affecting the other. Like other horned lizards, *Phrynosoma hernandesi* feeds primarily on ants, but will take other insects (Powell and Russell 1983. Can. J. Zool. 62:428–440). Here we describe apparent commensalism between *P. hernandesi* and Lark Buntings (*Calamospiza melanocorys*).

Between 27–30 June 2001 a *P. hernandesi* was observed inside a *C. melanocorys* nest on the Pawnee National Grassland (Weld Co, Colorado, USA; 40.69034°N, 104.35785°W, WGS 84; 1513 m elev.). The lizard was first observed in the ground nest at 1554 h on 27 June 2001, along with four nestlings that were two days old and spontaneously begging for food. The parents were in the vicinity with food (e.g., grasshoppers). During the subsequent nest check, two days later, at 0844 h on 29 June the lizard was again observed in the nest. On this particular occasion, the lizard moved to the rim of the nest while we weighed the three remaining four-day old nestlings (Fig. 1). When we returned the nestlings to the nest, the lizard repositioned itself into the nest cup. The last day that we observed the lizard in the nest was on 30 June during a routine nest check at 1039 h. The female Lark Bunting flushed from the nest when we approached, and in the nest was the lizard alongside the three nestlings. Nestlings were now six days old, sleeping, and occupying most of the nest cup. The last day with young in the nest (three nestlings) was 1 July; the lizard was not seen and was not found during a 1-m radius search of the nest area.

The nest association we observed occurred over four days, and it was unclear if the lizard gained any thermoregulatory or dietary benefit from the association. While in our presence, neither Lark Bunting parent reacted adversely to the presence of the lizard. *P. hernandesi* is known to feed on a variety of ant and beetle species, ground-dwelling bees, true bugs, and other similar ground-dwelling arthropods in Weld County (D. Martin, unpubl. data). Ants were often associated with our Lark Bunting nests and on many occasions were seen removing dried droppings of older nestlings (just prior to and after fledgling). Thus, the lizard may have benefitted from the association by feeding on ants that were attracted to the bird droppings. We suspect that such lizard-bird nest associations are quite rare because it was not observed in the other 810 Lark Bunting nests monitored over seven years in this region.

Fig. 1. *Phrynosoma hernandesi* (Greater Short-Horned Lizard) in the nest of a Lark Bunting (*Calamospiza melanocorys*).

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***PODARCIS SICULUS* (Italian Wall Lizard). HABITAT AND SUBURBAN INVASION.** *Podarcis siculus* has invaded multiple regions of North America (Burke and Ner 2005. Northeast. Nat. 12:349–360). In New York state, multiple populations have been documented on Long Island in urban and suburban environments (Gossweiler 1975. Copeia 1975:584–585; Burke and Ner, *op. cit.*). Recently, *P. siculus* was documented invading nearby suburban Greenwich, Connecticut (Donihue et al. 2015 Herpetol. Rev. 46:260–261). We recently documented the first populations of *P. siculus* in Westchester Co., New York (Goldfarb et al. 2016. Herpetol. Rev. 47:82), and herein describe their habitat use and discuss a possible movement pathway.

On 29 August 2015 between 1100 h and 1700 h, in response to a previous sighting of *P. siculus* by BAG, we surveyed a 3500 m^2 area incorporating three households, a church, and a small office building in Hastings-on-Hudson, Westchester Co., New York. Following 4 h of searching we (BAG, MRL, CMD) found one adult male and one adult female, four sub-adults or adults of unknown sex, and three young-of-the-year (~3 cm snout–vent length) *P. siculus*. One individual, the adult female, was collected as a voucher specimen (YPM HERR.019476; Fig. 1A). The two adults were found at the base of a tree in the front yard of a private home (Fig. 1b). Nearby habitat included a 1.3 m tall rock wall, in most places covered with dense ivy. An additional sub-adult was found in this ivy on this wall, 15 m from the two adults. The other three sub-adults were found in landscaped vegetation and upon a concrete curb separating another

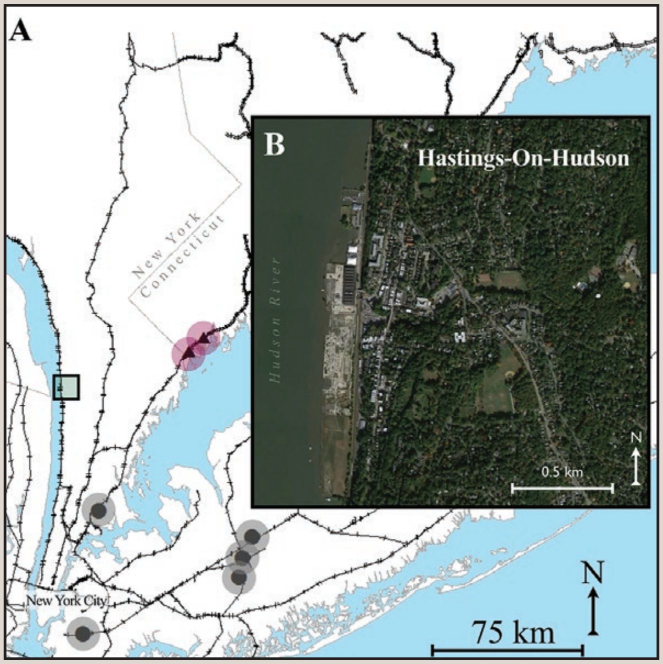

Fig. 1. Map of A) Hudson River and Long Island Sound region with our *Podarcis siculus* sightings in Hastings-on-Hudson (inset map B) and previously-reported regions of Connecticut (maroon circles) and the New York City area (grey circles) with *P. siculus* populations (Gossweiler, *op. cit.*; Burke and Mercurio 2002. Am. Midl. Nat. 147:368–375; Burke and Ner, *op. cit.*; Kolbe et al. 2013. Biol. Invas. 15:775–783.

Fig. 2. Female *Podarcis siculus* (A) caught at Hastings-on-Hudson and taken as voucher (YPM HERR.019476). The nearby habitat (B) was complex with ivy-covered tree, loose rocks, cemented rock wall, and many cultivated plants.

household and the office building. The three young-of-the-year lizards were all in a heavily-landscaped garden in the front yard of this second household. While a variety of stone, brick, and clay gardening debris as well as logs were found in the area, no lizards were seen basking on these items or found underneath them.

Donihue et al. (*op. cit.*) recently suggested that *P. siculus* is radiating north from established populations in New York City using railroad tracks. All lizards in Greenwich, CT were found within 10 m of railroad tracks that ran directly to New York City. Not discounting a potentially novel introduction to Westchester county, railroad track right-of-ways present a viable hypothetical dispersal avenue into Hastings-on-Hudson. The area we surveyed was only 250 m from railroad tracks with services to New York City where the putative *P. siculus* source population is.

Although ours is the first record of this species in Westchester Co., a conversation with a resident of one of the households indicated that the species has been present for at least seven years. Furthermore, the young lizards in our sample indicate that the local population is successfully breeding. Although the exact duration of *P. siculus* colonization this far north in New York state is unknown, the indication that this species may have been present for almost a decade and that they may be moving via railroad track right-of-ways indicates that more extensive surveys throughout this region would be of value.

Our location represents one of the northernmost occurrences of *P. siculus*; Greenwich, Connecticut is approximately 3 km further north. How this species copes with the particularly cold winter conditions in the northeastern United States relative to their native Mediterranean climate is of particular interest. Donihue et al. (*op. cit.*) also suggested that railroad tracks, which are often heated in winter, as well as the urban heat island effect, might provide a warm microclimate for these lizards to survive cold winters. In addition to this, the Hudson River may buffer the climatic conditions of Hastings-on-Hudson relative to more inland regions of New York. Similarly, Long Island Sound may provide a thermal buffer for Connecticut populations of *P. siculus*. Whether this species is rapidly adapting to live in suburban Westchester Co., as well as other urban regions of the United States (Donihue and Lambert 2015. AMBIO 44[3]:194–203) is an important question for future research. Specimen collection was authorized under Yale University IACUC protocol number 2015-10681.

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***PTYCHOZOON KUHLI* (Kuhl's Parachute Gecko). REPRODUCTION.** *Ptychozoon kuhli* is known from Thailand, Peninsular Malaysia, Sumatra, the Mentawai and Natuna Archipelagos, Borneo and Java (Das 2010. A Field Guide to the Reptiles of South-East Asia, New Holland Publishers, Ltd, UK. 376 pp.). Information on reproduction is summarized in Grismer (2011. Lizards of Peninsular Malaysia, Singapore and their Adjacent Archipelagos, Edition Chimaira, Frankfurt am Main. 728 pp.). In this note we provide additional information on *P. kuhli* reproduction from a histological examination of museum specimens.

A sample of 29 *P. kuhli* consisting of 8 adult males (mean SVL = 85.4 mm ± 6.1 SD, range = 78–93 mm) 21 adult females (mean SVL = 93.2 mm ± 4.6 SD, range = 84–103 mm) collected 2002 to 2013 and deposited in the herpetology collection of La Sierra University (LSUHC), Riverside, California, USA was examined by West Malaysia state: Johor LSUHC 5055, 5587, 5708, 6272, 6321, 6397, 7027, 7640, 7716, Kedah LSUHC 7141, 9629, 9630, 9631, 9632; Kelantan LSUHC 11159; Pahang LSUHC 3855, 4679, 5042,

Table 1. Monthly stages in the ovarian cycle of 21 adult female *Ptychozoon kuhli* from Peninsular Malaysia (N = 20) and Borneo (N = 1).

Month	N	Quiescent	Early yolk deposition	Enlarged follicles > 4 mm	Oviductal eggs
March	6	2	0	1	2
June	1	1	0	0	0
July	5	1	0	1	3
August	6	2	1	1	1
September	1	1	0	0	0
October	2	2	0	0	0

6433, 7265; Perak LSUHC 5646; Terengganu LSUHC 8317, 8674, 8708, 10047, 11285, 11476, 11477, 11478. LSUHC 7077 was from Sarawak, Borneo.

A cut was made in the lower abdominal cavity and the left testis or ovary was removed, embedded in paraffin, cut into 5µm sections, and stained with Harris hematoxylin followed by eosin counterstain. Enlarged follicles (> 4 mm) or oviductal eggs were counted. Histology slides were deposited in LSUHC.

The only stage noted in the testicular cycle was spermiogenesis in which seminiferous tubules are lined by sperm or clusters of metamorphosing spermatids. Males undergoing spermiogenesis were collected in March (N = 1), July (N = 3), August (N = 2), September (N = 1), October (N = 1). The smallest reproductively active male (spermiogenesis) measured 78 mm SVL (LSUHC 5055) and was collected in August.

Four stages were observed in the ovarian cycle (Table 1); 1) quiescent, no yolk deposition; 2) early yolk deposition, basophilic vitellogenic granules in the ooplasm; 3) enlarged follicles > 4 mm; 4) oviductal eggs. Mean clutch size (N = 9) was an invariant 2. The smallest reproductively active female (2 oviductal eggs) measured 85 mm SVL (LSUHC 5587) and was collected in July. One slightly smaller female (SVL = 84 mm) was arbitrarily considered to be of adult size (LSUHC 8674). There was no evidence that *P. kuhli* produces multiple clutches (oviductal eggs and concurrent yolk deposition), although this may reflect our small female sample size. *Ptychozoon kuhli* may breed year-round in captivity (Henkle and Schmidt 1995. Geckoes, Biology, Husbandry, and Reproduction, Krieger Publishing Company, Malabar, Florida. 237 pp.). While it is clear from our data that *P. kuhli* exhibits an extended reproductive cycle, examination of additional specimens is needed to determine the exact duration of yearly reproduction under natural conditions.

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SCELOPORUS OLIVACEUS **(Texas Spiny Lizard). PREDATION.** *Sceloporus olivaceus* is a phrynosomatid lizard occurring in the southern USA in the states of Texas and Oklahoma and in northeastern Mexico in the states of Nuevo León, Tamaulipas, Coahuila, and San Luis Potosí (Lemos-Espinal and Smith 2007. Amphibians and Reptiles of the State of Coahuila, Mexico, UNAM and CONABIO, Mexico, D.F. 550 pp.). It is a diurnal insectivore that takes shelter in trees as well as in human-made structures which may be shared with other animals such as scorpions, spiders, and

Fig. 1. *Scolopendra heros* (red head variant) enveloping and consuming a young *Sceloporus olivaceus.*

centipedes that usually contribute to the species' diet (Dixon 2009. *In* Jones and Lovich [eds.], Lizards of the American Southwest, pp. 238–241. Rio Nuevo Publishers, Tucson, Arizona). Here we report an observation of predation on *S. olivaceus* by a scorpion.

On 13 June 2013, in Gillespie Co., Texas, USA (30.28469°N, 98.89483°W; 527 m elev.), a local resident observed the centipede in the act of preying upon the lizard. The centipede had enveloped the lizard with its legs (Fig. 1). The centipede pierced the lizard's head with its forcipules, killing it. No body size data were collected. The scorpion was identified as *Scolopendra heros*, a species that occurs from the southwestern USA south through most of Mexico as far as the state of Yucatan (Cupul-Magaña and Bueno-Villegas 2015. Boletín del Museo de Entomología de la Universidad del Valle 15:7–9). It is a nocturnal carnivore that preys mostly on invertebrates, but large specimens can prey upon small vertebrates such as lizards and juvenile snakes (Babb and Busboom 2013. Herpetol. Rev. 44:696). Our observation is the first report of predation on *S. olivaceus* by *S. heros.*

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SPHENOMORPHUS CYANOLAEMUS **(Blue-headed Forest Skink). REPRODUCTION.** *Sphenomorphus cyanolaemus* is known from Peninsular Malaysia, Sumatra and Borneo (Das 2010. A Field Guide to the Reptiles of South-East Asia. New Holland Publishers, London, UK. 376 pp.). Das (*op. cit.*) reported that *S. cyanolaemus* was oviparous and produced clutches of two eggs. In this note I provide additional information on reproduction of *S. cyanolaemus* from a histological examination of museum specimens.

A sample of 24 *S. cyanolaemus* consisting of 13 adult males (mean SVL = 52.3 mm ± 4.6 SD, range = 43–58 mm) and 11 adult females (mean SVL = 53.1 mm ± 6.0 SD, range = 46–53 mm) from Sabah and Sarawak, Malaysia was borrowed from the herpetology collection of the Field Museum of Natural History (FMNH), Chicago, Illinois, USA. Sabah (N = 16) Beaufort District, FMNH 249845–249847; Ranau District, FMNH 239879; Sipitang District, FMNH 235153, 239867, 239880–239882, 239884, 239886, 239887, 239889; Tenom District, FMNH 239858, 239863, 239865; Sarawak

Table 1. Monthly stages in the ovarian cycle of 11 adult female *Sphenomorphus cyanolaemus* from Sabah and Sarawak, Malaysia. Three July females with oviductal eggs* were undergoing concurrent early yolk deposition* for a sunsequent clutch.

Month	N	Quiescent	Early yolk deposition	Enlarged follicles > 4 mm	Oviductal eggs
April	1	0	0	0	1
June	1	0	0	0	1
July	3	0	3*	0	3*
August	3	1	0	1	1
September	1	1	0	0	0
November	2	1	0	0	1

(N = 8) Belaga District, FMNH 221622; Bintulu District, FMNH 158785, 161489, 161490, 269137–269140.

A cut was made in the lower abdominal cavity and the left ovary or testis was removed embedded in paraffin, cut into 5-µm sections and stained with Harris hematoxylin followed by eosin counterstain. Enlarged yolking follicle (> 4 mm) or oviductal eggs were counted. Histology slides were deposited in FMNH. The only stage noted in the testicular cycle was spermiogenesis in which seminiferous tubules are lined by sperm or clusters of metamorphosing spermatids. Males undergoing spermiogenesis were collected in March (N = 1), May (N = 3), July (N = 1), August (N = 2), September (N = 3), November (N = 2), December (N = 1). The smallest reproductively active male measured 43 mm SVL (FMNH 239858) and was collected in December.

Four stages were observed in the ovarian cycle (Table 1): 1) quiescent, no yolk deposition; 2) early yolk deposition, basophilic vitellogenic granules in the ooplasm; 3) enlarged follicles > 4 mm; 4) oviductal eggs. Mean clutch size (N = 8) was 2.3 ± 0.46 SD, range = 2–3. Three females from July with oviductal eggs were undergoing concurrent yolk deposition (Table 1) indicating *S. cyanolaemus* may produce multiple clutches in the same year. The smallest reproductively mature female measured 46 mm SVL (FMNH 249845) contained two oviductal eggs and was collected in November.

It is apparent *S. cyanolaemus* from Malaysia exhibits an extended reproductive cycle which appears typical for scincids from Southeast Asia (e.g., Goldberg 2013. Hamadryad 36:168–171; Goldberg 2014. Hamadryad 36:180–182; Goldberg 2015. Hamadryad 37:115–117; Goldberg and Grismer 2014. Herpetol. Rev. 45:697–698).

I thank Alan Resetar (FMNH) for permission to examine *S. cyanolaemus* and L. L. Grismer (LSUHC) for assistance with taxonomy.

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***VARANUS BUSHI* (Bush's Monitor). DIET.** *Varanus bushi* is a small-bodied member of the varanid subgenus *Odatria*, endemic to the Pilbara region of Western Australia. The species is often recorded in mulga (*Acacia* spp.) or eucalypt (*Eucalyptus* spp.) woodlands where it takes refuge under loose bark and in small hollows of fallen or standing trees. There remains little knowledge of the species' ecology since its description in 2006, in particular its diet in the wild. Examination of the stomach contents of two specimens of *V. bushi* has previously identified the remains of a spider and a skink tail in one specimen, and the remains of a mole cricket in the other (Aplin et al. 2006. Zootaxa 1313:1–38). Here I report on the identifiable stomach contents of a road-killed specimen and identify prey species not previously recorded for *V. bushi*.

During April 2014, an adult road-killed *Varanus bushi* (SVL = 118 mm; total length = 282 mm) was located on a gravel track approximately 63 km NE of Munjina, Western Australia (22.2060°S, 119.2823°E; WGS84). Dissection and examination of stomach contents revealed three prey items, including two not previously recorded for the species. The stomach contents included a subadult *Gehyra variegata* (ca. 54 mm SVL) and the remains of a wolf spider (Lycosidae) and an unidentified cockroach. All three prey items were observed in the nearby mulga woodland adjacent to the track. The three prey items identified are comparable to the skink tail, spider, and mole cricket presented by Aplin et al. (*op. cit.*) indicating the diet primarily consists of small reptiles and invertebrates. This observation suggests the species feeds both terrestrially and arboreally, and as suspected the diet is similar to that of *V. caudolineatus* and *V. gilleni* identified by Pianka (1969. West. Austr. Nat. 11:76–82).

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***VARANUS VARIUS* (Lace Monitor). HARASSMENT BY BIRDS.** *Varanus varius*, Australia's largest lizard (by mass), is widespread across much of eastern Australia (Cogger 2014. Reptiles and Amphibians of Australia [7th ed.]. CSIRO Publishing, Collingwood, Victoria, Australia. xxx + 1033 pp.). It is a mainly diurnal, terrestrial, and arboreal carnivore that consumes carrion and a wide range of vertebrate prey including birds and their eggs. The Noisy Miner, *Manorina melanocephala* (Meliphagidae), is an endemic honeyeater with a widespread distribution in eastern Australia. It is often abundant in urban habitats, and is a gregarious, colonial species (Conrad et al. 1998. The Condor 100:342–349). Coalitions comprising 5–8 birds assist in territorial defense, with coalitions of up to 40 birds formed to mob potential predators (Higgins et al. 2001. Handbook of Australian, New Zealand and Antarctic Birds. Volume 5, Tyrant-flycatchers to Chats. Oxford University Press, Melbourne, Victoria, Australia. 126 pp. + 44 pp.). This note documents two observations of harassment of adult *V. varius* by *M. melanocephala*.

Observations were recorded on 5 December 2015 within the ~4.05-ha Crusader Lake Macquarie Outdoor Recreation Centre, Yarrawonga Road, Balcolyn (a "suburb" within the municipal jurisdiction of City of Lake Macquarie ~8 km ENE of Morisset), on a slightly elevated headland of the western coastal plain of Lake Macquarie, Central Coast region, New South Wales, Australia (33.09586°S, 151.54537°E, WGS 84; 18 m elev.). In the first case, at 1130–1150 h, TJH noticed a small (SVL ~0.5 m) adult *V. varius* walking across Yarrawonga Road and into the camping area; it then scurried beneath the observer's car, then moved into a nearby carpark. TJH chased the *V. varius* away from nearby small children along the ground away from the carpark, upon which it climbed the trunk of a medium-sized (height ~20 m; dbh ~30 cm) *Eucalyptus resinifera* tree to an initial height of ~1.5 m. Almost immediately, 2 *M. melanocephala* appeared from the sky and commenced "dive-bombing" the *V. varius*, accompanied by continuous loud alarm calls. They alternated attacks from either side, but did not appear to make contact with the lizard. The *V. varius* responded by moving further up the trunk to height of

~6 m where it remained stationary, clinging closely to the bark surface, apparently partly protected from aerial assaults by overhanging branches and foliage of the tree and adjacent trees; it did not engage in the typical varanid threat display. The *M. melanocephala* persisted in dive-bombing assaults for ~5 minutes until they desisted, perhaps deterred by close proximity of the observers. Habitat comprised level extensive cleared areas with 12 small buildings, unsealed entry road, parking area and campground, and scattered retained trees of former coastal Dry Sclerophyll Forest (DSF) dominated by *Allocasuarina torulosa* (Casuarinaceae), *Angophora costata*, *Eucalyptus eugenioides*, *E. resinifera*, and *E. tereticornis* (Myrtaceae), no shrub midstorey, and a mown lawn ground storey of exotic grass species (Poaceae),

In the second case, at 1335–1355 h, a slightly larger (SVL ~0.6 m) *V. varius* was observed moving slowly on the ground up a 5–10° incline in a small area of disturbed remnant native vegetation just outside the Recreation Centre property near the northern boundary fence ~15 m from the Lake Macquarie shore. Two *M. melanocephala* then appeared and commenced dive-bombing the *V. varius* from above and with continuous alarm calls. The *V. varius* immediately increased pace rapidly over the ground to nearest tree, also a medium-sized (height ~20 m; dbh ~30 cm) *E. resinifera*, ascended the trunk to a height of ~2 m, then remained stationary close to the bark surface, still harassed by the *M. melanocephala* (although partly sheltered by overhanging small branches and foliage). At this point an exotic Indian Mynah *Acridotheres tristis* (Sturnidae) also arrived and perched on a branch near the *V. varius* and examined it, but soon flew away without harassment or calling. The *M. melanocephala* dive-bombed the *V. varius* in the tree for ~5 minutes before they flew off, again perhaps deterred by close proximity of observers. Habitat comprised sloped terrain with a small area of disturbed remnant DSF comprised of an upper storey of the preceding species, a shrub midstorey with ~40% coverage comprised of saplings of *A. torulosa*, *Eucalyptus* spp., *Pittosporum undulatum* (Pittosporaceae), and exotic *Lantana camara* (Verbenaceae), and a ground storey of mixed endemic and exotic grasses and exotic herbaceous weeds of several genera and species. Weather conditions were T_a = 32–35°C, 2/8 oktas cloud cover, high relative humidity, with strong sun and no wind.

It was of interest that neither lizard responded to aerial assaults with the typical varanid threat display of gaped mouth, erected gular pouch and inflated lateral body air sacs, instead chose to move away from the threat into shelter and apparently adopt crypsis. A range of birds are included in *V. varius* diets; *M. melanocephala* has not specifically been reported, however congeneric *M. melanophrys* has (Meek 2008. Austr. Field Ornithol. 23:153–155), hence inclusion of nestling and adult *M. melanocephala* and eggs is also likely, thus harassment of *V. varius* by *M. melanocephala* is relatively unsurprising. Although *M. melanocephala* routinely harass exotic domestic cats, and endemic raptors, crows, magpies, currawongs, and smaller avian intruders into their territories (pers. obs.), both in and out of the breeding season, harassment of *V. varius* by *M. melanocephala* has apparently been unreported in any detail hitherto, but likely frequently occurs where the two species come into contact. Arboreal hollow-nesting birds such as Sulphur-crested Cockatoos *Cacatua galerita* (Cacatuidae) have been reported harassing and even inflicting injury upon marauding *V. varius* on trees (e.g., Frauca 1963. Encounters with Australian Animals. William Heinemann Ltd., Melbourne, Victoria, Australia. vi + 154 pp.). The above observations add to the ecological portrait of *V. varius*.

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SQUAMATA — SNAKES

***AHAETULLA PRASINA* (Oriental Whip Snake). DIET.** *Ahaetulla prasina* is an arboreal colubrid commonly found in rural, agricultural, urban, and forested habitats throughout Southern Asia. It is known to feed on lizards (including agamids, skinks, and geckos), snakes, birds, and small mammals (Hnizdo and Krug 1997. Sauria 19:3–12; Keng and Tat-Mong 1989. Fascinating Snakes of Southeast Asia: an Introduction. Tropical Press Sendirian Berhad, Kuala Lumpur, Malaysia. 124 pp.; David and Vogel. The Snakes of Sumatra: An Annotated Checklist and Key with Natural History Notes. Edition Chimaira, Frankfurt am Main, Germany. 260 pp.; Malkmus et al. 2002. Amphibians and Reptiles of Mount Kinabalu (North Borneo). Serpents Tale NHBD/ Gantner Verlag Kommanditgesellschaft. 424 pp.). Although *A.*

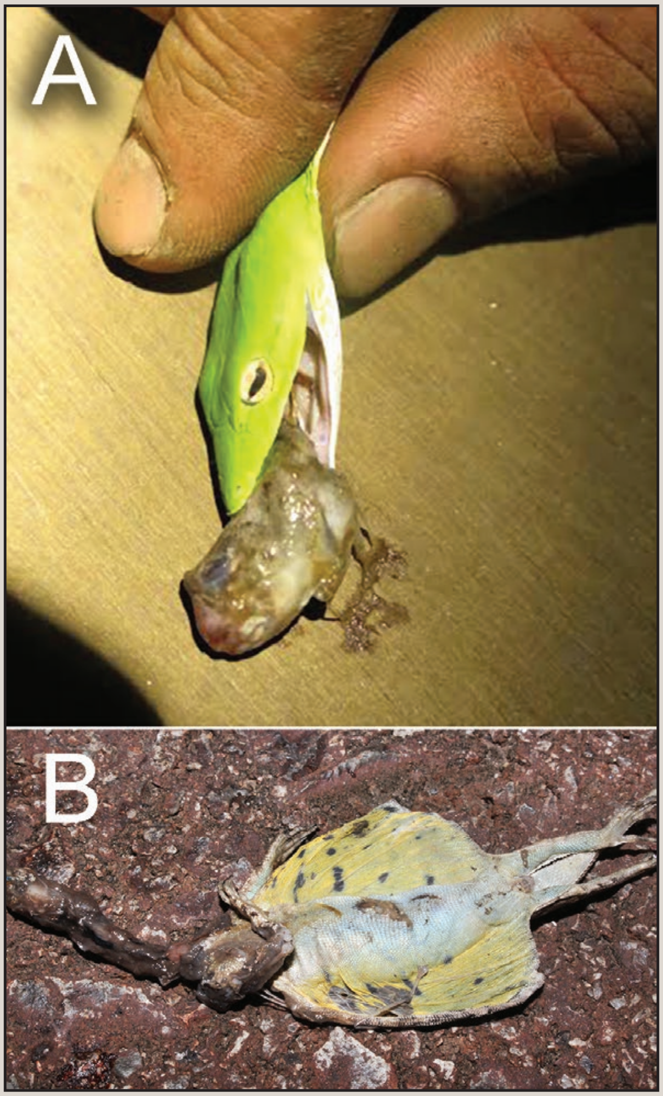

Fig. 1. A) Mudskipper (family Gobiidae) and B) *Draco sumatranus* regurgitated from *Ahaetulla prasina* on Pulau Ubin, Singapore.

prasina has not been confirmed to consume fish in the wild, one account of wild caught captive individuals successfully seizing and consuming fish has been published (Vogel 2003. Litt. Serpent. 23:163–173), and is the basis for suggesting that piscivory may be a natural behavior (Murphy 2010. Secrets of the Snake Charmer: Snakes in the 21st Century. iUniverse, Bloomington, Indiana. 420 pp.). This report is further confused because the specimens in question were later identified as *A. mycterizans* (Malayan Vine Snake), not *Ahaetulla prasina* (Hnizdo and Krug, *op. cit.*). Although there is a lack of clarity in these published accounts, evidence of captive *A. prasina* consuming fish can be found on social media. Here we provide documentation of piscivory by *A. prasina* in the wild as well as a new species of lizard in the snake's diet.

On 9 August 2015 at 0324 h we found a male *A. prasina* (SVL = 886 mm, tail length = 430 mm) 5 m above ground in a tree, near the edge of the boardwalk at Chek Jawa mangrove wetlands on Pulau Ubin, Singapore (1.4105°N, 103.9895°E; WGS84). This snake was identified as *A. prasina* by the divided anal plate and a depressed snout (Miralles and David 2010. Zoosystema 32:449–456). We palpated the snake, and it regurgitated the head and pectoral fins of an unidentified mudskipper (family Gobiidae; Fig. 1A). Mudskippers are abundant within the Check Jawa mangroves and commonly utilize perches on mangrove roots up to 0.75 m above the mud or water level (pers. obs.).

On 19 August 2015 at 0245 h we found a male *A. prasina* (SVL = 996 mm, tail length = 541 mm) 3.65 m above ground in a tree at the edge of a mangrove tidal stream (1.4151°N, 103.9554°E; WGS 84) on Pulau Ubin, Singapore. We palpated the snake, and it regurgitated a partially digested adult *Draco sumatranus* (Common Gliding Lizard; SVL ~87 mm; tail length = 115 mm; Fig. 1B). Therefore, we provide evidence of wild *A. prasina* consuming fish and *Draco sumatranus.*

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***ASTHENODIPSAS LASGALENENSIS* (Mirkwood Forest Slug Snake). REPRODUCTION.** *Asthenodipsas lasgalenensis* was described from Bukit Larut, Perak State, Malaysia (Loredo et al. 2013. Zootaxa 3664:505–524). It is known only from Genting Highlands, Fraser's Hill, Cameron Highlands, Pahang State and Bukit Larut, Perak State, where it inhabits montane cloud forests above 800 m elevation (Loredo et al., *op. cit.*). In this note we provide the first information on *A. lasgalenensis* reproduction.

Five *A. lasgalenensis* collected in Malaysia during 2008 to 2012 and deposited in the herpetology collection of La Sierra University (LSUHC), Riverside, California were examined. Our sample consisted of two males (LSUHC 10654) SVL = 522 mm, (LSUHC 10272) SVL = 530 mm, both collected at Bukit Larut, (4.74326°N, 100.75895°E; WGS 84) and three females (LSUHC 10668) SVL = 443 mm, collected at Cameron Highlands, (4.52125°N, 101.38655°E, WGS 84); (LSUHC 9152) SVL = 496; (LSUHC 8366) SVL = 513 mm, both collected at Bukit Larut. The left ovary or testis was removed, embedded in paraffin and cut into sections of 5µm. Histology slides were stained with Harris hematoxylin followed by eosin counterstain and were deposited at LSUHC.

Considering males, both LSUHC 10654 (June) and LSUHC 10272 (September) were mature at 522 and 530 mm SVL, respectively. Their testes exhibited spermiogenesis in which the seminiferous tubules were lined by sperm or clusters of metamorphosing spermatids. Vasa deferentia of both contained sperm. Considering females, LSUHC 9152 (November) was mature at 496 mm SVL and had commenced yolk deposition as evidenced by basophilic yolk granules in the ooplasm. Both LSUHC 8366 (July) and LSUHC 9152 (November) had quiescent ovaries that were not undergoing yolk deposition.

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***ATRACTUS WAGLERI* (Wagler's Ground Snake). MAXIMUM SIZE.** The maximum total length reported for *Atractus wagleri* is 541 mm (Passos and Arredondo 2009. Zootaxa 1969:59–68). At 2330 h on 17 January 2015, during a nocturnal visual encounter transect for herpetofauna, I captured a female *A. wagleri* (SVL = 600 mm, tail length = 93 mm) in Predio El Diviso, vereda La Colorada, municipality San Vicente de Chucurí, Santander, Colombia (6.792494°N, 73.479743°W, WGS 84; 1400 m elev.). At 693 mm total length, this specimen is the longest known *A. wagleri.* The snake was collected and deposited in the Colección Herpetológica at the Universidad Industrial de Santander, Colombia (UIS-R-2795)

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***BOA CONSTRICTOR* (Boa Constrictor). DIET.** *Boa constrictor* is widely distributed in rainforests, savannas, and wetlands of the Neotropics (Tipton 2005. Snakes of the Americas: Checklist and Lexicon. Krieger Publishing Co., Malabar, Florida. 492 pp.). This snake is a large (to 400 cm total length) semi-arboreal ambush predator that can feed efficiently both in terrestrial and arboreal environments (Pizzatto et al. 2009. Amphibia-Reptilia, 30:533–544). It is known to consume diverse prey, including birds, amphibians, mammals, and reptiles (Bakkegard and Tim 2001. Herpetol. Rev. 32:261–262; Pizzatto et al., *op. cit.*; Rocha-Santos et al. 2014. Biota Neotrop. 14:1–4). Here we report a *B. constrictor* preying upon an additional prey item, an adult *Didelphis aurita* (Big-eared Opossum).

At 0830 h on 14 January, 2016, FQ, a park ranger, responded to a call from residents who reported the presence of a *B. constrictor* ca. 250 cm in total length, in a grassy area next to residences near the boundary of Serra da Tiririca State Park – PEST (22.951227°S, 43.024327°W, SAD 69; 26 m elev.), Rio de Janeiro State, Brazil. When FQ arrived at the scene, he noted that there was an opossum under the snake (Fig. 1). After a few minutes, he saw the snake with the opossum's head in its mouth. During the event, the opossum tried to escape, but it was eventually subdued and consumed, over the course of approximately 15 min. *Didelphis aurita* is an omnivorous marsupial, nocturnal and solitary, common in the Atlantic Forest. To the best of our knowledge, this is the first record of predation on *D. aurita* by *Boa constrictor.*

Fig. 1. *Boa constrictor* preying upon an adult male *Didelphis aurita* (Big-eared Opossum). The white arrow points to the opossum under the snake.

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***BOGERTOPHIS SUBOCULARIS* (Trans-Pecos Ratsnake). DIET AND FORAGING BEHAVIOR.** Chiropterophagy (i.e., bat eating) has been reported in the literature only once for *Bogertophis subocularis* in nature (Tennant 2006. Lone Star Field Guide to Texas Snakes, 3rd ed. Taylor Trade Publishing, Lanham, Maryland. 352 pp.), and the prey species was *Tadarida brasiliensis* (Mexican Free-tailed Bat). The aforementioned was only an indirect observation, because no consumption was witnessed, only an apparently satiated *B. subocularis* resting beneath a layer of flightless, young *T. brasiliensis*. Here I report the first known direct observation of chiropterophagy in *B. subocularis* involving a second prey species.

On 26 July 2008, an adult female "Blonde" patterned *B. subocularis* (total length ca. 76.2 cm) was observed constricting and consuming (Fig. 1) a *Myotis yumanensis* (Yuma Myotis) from atop a drain hole in a bridge on Farm-to-Market Road 170 in Presidio Co., Texas, USA (29.295836°N, 103.920342°W; WGS 84). The snake already had a sizeable, apparently fresh, lump in its midsection (Fig.

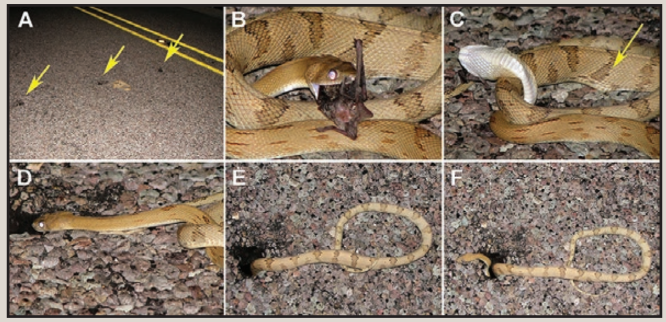

Fig. 1. A) The three drain holes on a bridge in Presidio County, Texas, USA, with a *Bogertophis subocularis* constricting *M. yumanensis* near the middle hole; B) swallowing *M. yumanensis* post-constriction; C) bulge of recent meal; and D–F) repeatedly reentering and probing the drain hole.

1C) perhaps belying other *M. yumanensis* recently consumed. After subduing and ingesting the *M. yumanensis*, the snake entered the drain hole next to it and began to methodically probe around with the posterior half of its body anchored to the pavement above. The snake emerged once and reentered the hole again. After a few minutes of observing this apparent foraging behavior, a truck began to approach, and the snake was moved out of the path of the oncoming traffic. Further inspection underneath that drain hole in the bridge revealed an active *M. yumanensis* roost with many individuals both hanging and in flight. This is one of the few observed accounts of foraging behavior by *B. subocularis* in literature (Rhoads 2008. The Complete Suboc: A Comprehensive Guide to the Natural History, Care, and Breeding of the Trans-Pecos Ratsnake. ECO Herpetological Publishing and Distribution, Lansing, Michigan. 291 pp.). It is possible that the *B. subocularis* was dangling the anterior half of its body and catching bats midflight, a behavior that has been documented extensively in *Pseudelaphe phaescens* (Yucatecán Ratsnake) (Bayona Miramontes and Sánchez Cháez 2007. Proyecto Kantemó. La Cueva de las Serpientes Colgantes. Biodiversitas 73:1–7)—a taxon of the hypothetical sister genus to *Bogertophis* (Pyron and Burbrink 2009. Mol. Phylogenet. Evol. 52:524–529).

I credit and thank Daryl Eby for the observation and photographs, Loren Ammerman for assistance in identifying the bat species as *M. yumanensis*, and Robert Hansen for assistance with the figure.

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***BOTHROPS ATROX* (Common Lancehead). DIET AND FANG REPLACEMENT.** *Bothrops atrox* is a neotropical, primarily terrestrial pitviper found in lowland rainforests of northern South America, east of the Andes (Campbell and Lamar 2004. The Venomous Reptiles of the Western Hemisphere. Cornell University Press, Ithaca, New York. 1032 pp.). Observations and dietary studies indicate that *B. atrox* is an opportunistic ambush predator (Martins et al. 2002. *In* Schuett et al. [eds.], Biology of the Vipers, pp. 307–328. Eagle Mountain Publishing, Eagle Mountain, Utah; Martins and Oliveira 1999. Herpetol. Nat. Hist. 6:78–150).

On 23 July 2009, a dead subadult *B. atrox* (Fig. 1A; SVL ca. 528 mm, total length ca. 603 mm, unknown sex) was found at Puesto de Vigilancia (PV2) Tacshacocha, Pacaya Samiria National Reserve, Loreto region, northeastern Peru (4.8794°S, 74.3569°W; WGS 84). A local worker had recently killed the snake. Habitat in the immediate area consisted of a disturbed forest clearing with a single human dwelling within 20 m of the Rio Samiria. The snake's

PHOTOS BY P. D. MOLDOWAN

Fig 1. Sub-adult *Bothrops atrox*, Pacaya Samiria National Reserve, Loreto region, northeastern Peru. A) View of ventral body length. B) Close-up on distended abdomen. C) Terrestrial spiny rat, *Proechimys* sp. (Rodentia: Echimyidae: Eumysopinae) recovered from the gut of *B. atrox*. Scale bar in cm.

abdomen was noticeably distended (Fig. 1B) and a partial necropsy revealed a terrestrial spiny rat, *Proechimys* sp. (Rodentia: Echimyidae: Eumysopinae), consumed head first and measuring ca. 90 mm from nose to base of tail (Fig. 1C). Given body size, dark overall body color, a short dark tail not exceeding body length, and local habitat type, the prey item likely represents *Proechimys* aff. *brevicauda* (Patton et al. 2000. Bull. Am. Mus. Nat. Hist. 244:1–306; J. L. Patton, pers. comm. 2015); however, *Proechimys* species are extremely difficult to distinguish. Thus, generic, rather than species-level, recognition of the prey item would be most appropriate. *Proechimys* are among the most abundant members of the mammalian community in lowland Amazonian forest (Patton et al. 2000, *op. cit.*). *Bothrops atrox* and many *Proechimys* spp. are sympatric in the Amazon Basin, both species occupy similar habitat, and both may occur in high densities (Martins and Oliveira 1999, *op. cit.*; Patton et al. 2000, *op. cit.*; Campbell and Lamar 2004, *op. cit.*). Thus, it is likely that the two species interact regularly and that *Proechimys* spp. form an important, yet under-reported, dietary component of *B. atrox*. *Proechimys* spp. have been recorded in the diets of *B. asper* in Costa Rica (Sasa et al. 2009. Toxicon 54:904–922) and *B. jararaca* in southeastern Brazil (Sazima 1992. *In* Campbell and Brodie [eds.], Biology of the Pitvipers, pp. 199–216. Selva Publishing, Tyler, Texas). This record, to the best of my knowledge, represents a novel prey item for *B. atrox*.

Further dissection of the *B. atrox* permitted examination of the maxillary fangs. Three well-developed replacement fangs (also known as accessory, auxiliary, or reserve fangs) were present posterior to the functional fang on the left maxilla. The replacement fangs were of graduated lengths with the anterior-most replacement fang being the longest. On the right maxilla, one functional fang was present with a single replacement fang immediately posterior.

I greatly appreciate the assistance of J. L. Patton and J. R. Malcolm in identifying the prey item, S. Marks for assistance sourcing reference material, and J. D. Willson for thoughtful review. I also thank fellow members of the Operation Wallacea Peru Expedition 2009.

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***BOTHROPS JARARACUSSU* (Atlantic Forest Jararacussu). DEFENSIVE BEHAVIOR.** Defensive behaviors portrayed by *Bothrops* spp. are widely described in the literature; *B. jararacussu* is reported to react to disturbances with dorsal flattening, caudal vibration, cloacal discharge, strike or mouth gaping (Marques et al. 2001. Serpentes da Mata Atlântica: Guia Ilustrado para a Serra do Mar. Holos, Ribeirão Preto. 184 pp.). On 19 November 2015, at 0830 h, we found a female *B. jararacussu* (total length = 470 mm) in the Dacnis Project particular reserve (23.459167°S, 45.142617°W, WGS 84; elev. 15 m), in the Atlantic Forest of Ubatuba, São Paulo, southeastern Brazil. The specimen was crossing a trail in an area of dense vegetation, and was subsequently captured for biometric analysis. Upon release, it turned to its dorsum and exhibited a thanatosis (death-feigning) display (Fig. 1), which ceased once the specimen was disturbed with a snake hook; this represents the first record of thanatosis in the species.

Fig. 1. *Bothrops jararacussu* exhibiting thanatosis.

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***BOTHROPS LEUCURUS* (White-tailed Lancehead). DIET.** *Bothrops leucurus* is a large terrestrial pitviper that is restricted to the Atlantic Forest of Brazil, being found in the states of Espírito Santo, Bahia, Sergipe, Alagoas, Pernambuco, and Ceará, with records ranging from sea level to about 300–400 m (Campbell and Lamar 2004. The Venomous Reptiles of the Western Hemisphere. Comstock Publishing/Cornell University Press. Ithaca, New York. 870 pp.; Guedes et al. 2014. Zootaxa 3863:1–93). Like other species of the genus, *B. leucurus* presents an ontogenetic shift in diet (Argôlo 2004. As Serpentes dos Cacauais do Sudeste da Bahia. Editus, Ilhéus, Brazil. 260 pp.; Lira-da-Silva 2009. Gazeta Médica da Bahia 79[1]:56–65); juveniles feed on ectothermic prey such as frogs and lizards and adults on endothermic prey, mainly rodents (Argôlo, *op. cit*).

On 5 December 2011 a road-killed juvenile *B. leucurus* (22.4 cm total length) was collected at Barra do Sahy, municipality of Aracruz, state of Espírito Santo, southeastern Brazil. The posterior portion of the specimen was torn apart (Fig. 1), and contained a *Amerotyphlops brongersmianus* (14.9 cm total length) in its stomach (Fig. 1). Both specimens are housed at the Instituto Nacional da Mata Atlântica, former Museu de Biologia Prof. Mello Leitão, Santa Teresa, Espírito Santo, under the same number: MBML 3355.

Amerotyphlops brongersmianus is small fossorial blindsnake (to 32.5 cm total length) that is widely distributed in Brazil (Martins et al 2010. Herpetol. Notes 3:247–248) and is found in various habitats, including deforested areas and farmlands

Fig. 1. *Amerotyphlops brongersmianus* (left) removed from the stomach of a *Bothrops leucurus* (right).

(Strüssmannn and Sazima 1993. Studies on Neotropical Fauna and Environment 28:157–168). Due to its secretive fossorial habits, little is known about its biology (Avila 2006. Herpetol. J. 16:403–405). Although there are a few reports of ophiophagy in Brazilian viperids (Egler et al 1996. Herpetol. Rev. 27:22–23, 1993; Fagundes et al 2009. Bol. Mus. Biol. Mello Leitão 25:67–71), this is the first record of a blindsnake as prey of *Bothrops leucurus*.

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***CHIRONIUS FOVEATUS* (Atlantic Forest Sipo Snake). DEFENSIVE BEHAVIOR.** Anti-predator behaviors displayed by *Chironius* are poorly known; *C. foveatus* is reported to react with gular flattening, mouth gaping, biting, and cloacal discharge (Marques et al. 2001. Serpentes da Mata Atlântica: Guia Ilustrado para a Serra do Mar. Holos, Ribeirão Preto. 184 pp.). On 29 October 2015, at 2200 h, we found a specimen of *C. foveatus* (total length = 190 cm) 2.3 m above ground in at tree at the Dacnis Project particular reserve in the Atlantic Forest of Ubatuba (23.457590°S, 45.143997°W; elev. 30 m), São Paulo, southeastern Brazil. After being handled, the specimen was released on the ground, where it raised the anterior one third of its body and exhibited head triangulation (Fig. 1). This represents the first record of head triangulation in *C. foveatus*.

PHOTO BY EDELCIO MUSCAT

Fig. 1. Head view of *Chironius foveatus* while displaying head triangulation.

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***COLUBER CONSTRICTOR* (North American Racer). DIET.** The diet of *Coluber constrictor* is diverse, including arachnids, amphibians, mammals, birds, insects, and reptiles (Klimstra 1959. Copeia 1959:210–214; Palmer and Braswell 1995. Reptiles of North Carolina. University of North Carolina Press, Chapel Hill. 412 pp.). On 14 March 2012, while driving on Painters Gap Road, Rutherford Co., North Carolina, USA, in the late afternoon, I encountered a road-killed young *C. constrictor* ca. 5 km E of the Cove Road junction. This was one of the first days warm enough for this snake to be out of hibernation; however, it seemed to have had a successful few days of feeding. Its stomach contents included three snake species (Fig. 1): *Carphophis amoenus* (Common Wormsnake), *Nerodia sipedon* (Common Watersnake), and *Thamnophis sirtalis* (Common Gartersnake). Various snake species have been reported in the diet of *C. constrictor* (Fitch 1963. Univ. Kansas Publ. Mus. Nat. Hist. 15:351–468); however, the species diversity found in this individual's stomach is unique and not previously reported. I suspect that the diversity of its diet was likely a result of high numbers of snakes emerging from hibernation the first warm days of the year.

Fig. 1. Road-killed *Coluber constrictor*, revealing the bodies of recently consumed *Carphophis amoenus*, *Nerodia sipedon*, and *Thamnophis sirtalis* consumed in Rutherford Co., North Carolina, USA.

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***COLUBER MENTOVARIUS* (= *MASTICOPHIS MENTOVARIUS*) (Neotropical Whipsnake). DIET.** *Coluber mentovarius* is a generalist forager that is thought to feed on invertebrates, fishes, frogs, eggs, birds, small turtles, small mammals, snakes, and lizards, including species of *Sceloporus*, *Ameiva*, *Aspidoscelis*, *Ctenosaura*, and *Anolis* (Solórzano 2004. Serpientes de Costa Rica. INBio. San Jose, Costa Rica. 792 pp.; Pérez-Higareda et al. 2007. Serpientes de la Región de los Tuxtlas, Veracruz, México. UNAM, México, D.F. 189 pp.; Calderón-Patrón et al. 2011. Herpetol. Rev. 42:293). Here we document a predation event by a *C. mentovarius* upon *Anolis sericeus* (Silky Anole), a diurnal lizard that prefers open habitats (Lee 2000. A Field Guide to Amphibians and Reptiles of the Maya World. Cornell University Press, Ithaca, New York. 402 pp.).

On 2 June 2014, at 1000 h, a juvenile *C. mentovarius* (SVL = 826 mm) was found injured in savanna with secondary vegetation habitat, in Tuxpan, Veracruz, México (20.958543°N, 97.326081°W, WGS 84; 11 m elev.). The specimen later died and was deposited in the herpetology collection of Instituto de Investigaciones Biológicas, Universidad Veracruzana (IIB-UV H00468). In the stomach, we found remains of an adult *A. sericeus* (head length = 11.59 mm) (Fig. 1). *Anolis sericeus* and *C. mentovarius* are relatively common species in savanna habitat, so that interactions between this two species should be frequent.

We are grateful to Secretaría General de Protección al Ambiente for the licence number SGPA/DGVS/04575/13.

Fig. 1. Remains of *Anolis sericeus* in stomach of a juvenile *Coluber mentovarius.*

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***CROTALUS ATROX* (Western Diamond-backed Rattlesnake). RERPRODUCTION / COURTSHIP TRACKS.** On 20 November 2015, two of us (JD, RD) discovered a side by side, double rectilinear track, identified by BB as *Crotalus atrox* based on the description and characteristics described by Lillywhite (1982. *In* Scott Jr. [ed.], Herpetological Communities, pp. 181–191. U.S. Fish and Wildlife Service Rep. 13, Washington, D.C.). We followed the double track over the next four days for 3.28 km. The tracks were found in a Sonoran Desert Wash (30 m average width) 19 km S of Wikieup, Mohave Co., Arizona, USA (34.509616°N, 113.62261°W, WGS 84; 600 m elev.). Each track was 4 cm wide, and the tracks were touching or within 2 cm for about 95% of their length. The tracks separated occasionally for short distances (10 cm to 5 m, Fig. 1). Occasionally the right-sided snake, presumably the male, would crawl on top of the other, making a single track. Based on track characteristics (Lillywhite, *op. cit.*), the two snakes were heading north from a small piped water source, traveled up a hill, around a house and associated debris, up a road to the wash, then north in the fine sand in the center of the wash, occasionally on the Creosote (*Larrea tridentata)* vegetated more gravely sides of the wash, around a trailer and some boards, to the edge of a cliff with big rocks. The trail was lost among the rocks. The snakes did not go beyond the rocks as the wash below was walked carefully looking for tracks and none were found. The snakes crossed three dirt roads, spent some time in dirt holes under Creosote, and under a plastic cabinet door. The snakes backtracked twice, once in a N–S, and once in an E–W direction, the latter 50 m in each direction. These movements were near the north end of the track where the snakes were presumably looking for a winter retreat. One backtrack explored around a previously passed Creosote bush, the other backtrack was a fairly direct 60 m path to a temporary retreat under a plastic cabinet door that the snakes had previously crossed over. Later they emerged, went back to their main north track area and headed north to the boulders. Occasionally the snakes stopped and moved around together making a messy circular track, typically 0.5 m in diameter; perhaps a courtship or mating encounter. *Crotalus atrox* mates locally in the Spring and Fall (E. Nowak, pers. comm.). These tracks were made late in the season for *C. atrox* (Brattstrom, pers. obs.) but the temperatures were still warm (4–22°C) and several other *C. atrox* tracks, one of which was another double track, were seen around the southern water source.

Fig. 1. Photograph of a portion of a 3.2-km double track of *Crotalus atrox*, showing one of the few places that the tracks separated for about 30 cm.

This is the longest double track known for any rattlesnake, though individual *C. atrox* are known to travel longer distances (E. Nowak, pers. comm.). It is not known how long it took the snakes to travel the 3.28 km (linear distance, not including back and sidetracks) and whether the three retreats were for a night or just a short time.

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***CROTALUS DURISSUS* (South American Rattlesnake). ARBOREAL HABITAT USE.** On 16 January 2016, at 2240 h, I observed arboreal habitat use by an adult *Crotalus durissus* in an area of Cerrado in Santa Barbara Ecological Station (22.814978°S, 49.240890°W, WGS84; 638 m elev.), state of São Paulo, southeastern Brazil. The rattlesnake (SVL = 1001 mm, tail length = 170 mm) was found resting about 1.5 m above the ground in a small tree, supported by leaves of a bromeliad (Fig. 1). Many species of *Crotalus* have been recorded resting, foraging, and feeding above ground (Walde et al. 2016. Herpetol. Notes. 9:55–58). However, in Brazil there is only one record of *C. durissus* making use of arboreal habitat (Dayrell et al. 2010. Herpetol. Rev. 41:89–90). This observation extends the knowledge about the natural history of *C. durissus* and reinforces the capacity of this species to use arboreal habitats. This behavior, however, may be not common and may be limited to small or medium-sized individuals, as already recorded for *C. horridus* (Rudolph et al. 2004. Texas J. Sci. 56:395–404).

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Fig. 1. An adult *Crotalus durissus* using arboreal habitat in an area of Cerrado, Santa Bárbara Environmental Station, southeastern Brazil.

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***CROTALUS LEPIDUS KLAUBERI* (Banded Rock Rattlesnake). DIET / MORTALITY.** *Crotalus lepidus klauberi* is typically a predator of lizards, with larger individuals occasionally taking mammalian prey (Holycross et al. 2002. J. Herpetol. 36:589–597). Holycross et al. (*op. cit.*) mention voles (*Microtus* spp.) as prey for *C. l. lepidus* in captivity (Falck 1940. Copeia 1940:135). Here we report the first record of Mogollon Vole (*Microtus mogollonensis*) as prey for *C. l. klauberi.*

Fig. 1. *Crotalus lepidus klauberi* post-mortem with *Microtus mogollonenis* prey item removed.

On 24 June 2015, along the Middle Fork of the Gila River ca. 1.5 river miles below Snow Lake, Gila National Forest, Catron Co., New Mexico, USA (33.410942°N, 108.481587°W; NAD 83), one of us (AB) found a female *C. l. klauberi* (MSB 96064; SVL = 360 mm, tail = 26 mm, mass without prey = 35.75 g.) in a horse-tail (*Equisetum* sp.) thicket within 0.5 m of the water. The snake was greatly distended from recently consuming a large prey item, which restricted its ability to move. Twenty-four hours later we found the snake dead within 0.5 m of its previous location and with no apparent reason for mortality other than having eaten too large a meal. Upon closer inspection and dissection we found that the prey item was a *M. mogollonensis*, formerly considered a sub-species of *M. mexicanus* (Mexican Vole), identified by its short tail (less than 32 mm; Frey 2007. Key to the Rodents of New Mexico. Unpubl. report to New Mexico Dept. Game and Fish. 120 pp.; Crawford et al. 2011. West. N. Amer. Nat. 71:176–194). *Microtus mogollonensis* was commonly observed at this site. Prey mass was 26.25 g, total length = 138 mm, tail length = 28 mm. The prey mass to snake mass ratio was 73%. The snake was deposited at the Museum of Southwest Biology, UNM, Albuquerque. The vole was identified in the field by RDJ.

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***DIADOPHIS PUNCTATUS* (Ring-necked Snake). DIET.** *Diadophis punctatus* prey on a wide assortment of small animals including plethodontid and salamandrid salamanders (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Institution Press, Washington D.C. 668 pp.), and salamanders may comprise a large proportion of their diet (Uhler et al. 1939. Trans. N. Am. Wildl. Conf. 4:605–622). Herein I report the consumption of a novel salamander prey species, *Ambystoma talpoideum* (Mole Salamander).

At 1635 h, 23 November 1992, I found an adult *D. punctatus* (SVL = 312 mm; tail length = 57 mm) beneath a log in a forested wetland in northwestern Tallahassee, Leon Co., Florida, USA. Gentle palpation of a food bolus revealed that the snake had consumed an adult male (swollen cloaca) *A. talpoideum* (SVL ca. 84 mm, tail length = 52 mm). The snake had swallowed the salamander head-first as evidenced by near-complete digestion of the head, complete digestion of the forelimbs, and partial digestion of the anterior three-fourths of the trunk. *Ambystoma talpoideum* employ several active defensive behaviors in the presence of small colubrid snakes, including biting, which can repel small snakes (Dodd 1977. J. Herpetol. 11:222–225). The *D. punctatus* may have envenomated and immobilized the salamander, enabling it to overcome the salamander's defenses (O'Donnell et al. 2007. Toxicon 50:810–815).

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***DREPANOIDES ANOMALUS* (Amazon Egg-eating Snake). DIET / OPHIOPHAGY.** On 22 October 2012 at 2300 h the Fauna Forever herpetology team came across a *Drepanoides anomalus* during a night walk at ARCC (Amazon Research and Conservation Centre), Las Piedras Province, Péru. The specimen was a female in good condition (SVL = 46 cm; total length = 61 cm; 38 g post-regurgitation), and was found in leaf litter by an aged oxbow lake of the Rio Las Piedras (12.0558°S, 69.6597°W; WGS 84). The capture took place during the dry season when there was no standing water nearby. When checked the next day the snake had regurgitated two unidentified lizard eggs (most likely *Gonatodes* sp. due to length of < 1 cm) and two juvenile *Helicops angulatus* in a peculiar pose (Fig. 1). Previous studies describe *D. anomalus* as a dietary specialist on lizard eggs (Martins and Oliveria 1998. Herpetol. Nat. His. 6:78–150; da Silva et al. 2010. Rev. Brasil. Zoociên. 12:165–176), with lizard eggs comprising > 70% of the diet (Alencar et al. 2013. S. Am. J. Herpetol. 8:60–66; Gaiarsa et al. 2013. Pap. Avul. Zool. [São Paulo] 53:261–283). This is the first record of ophiophagy in *D. anomalus*, suggesting that *D. anomalus* may alter its foraging strategies to include larger food items within its prey repertoire, despite successfully foraging for relatively small lizard eggs.

It is unknown how the unusual position of *H. angulatus* occurred—pre-ingestion, or post-ingestion due to struggling or gut peristaltic action. We suggest it is a result of the two juveniles, possibly littermates since they were of a similar size, struggling while still alive inside the stomach of the *D. anomalus. Helicops angulatus* is facultatively oviparous, but has been recorded as being predominantly viviparous in eastern Brazil and southern Péru (Duellman 2005. Cusco Amazónica: the Lives of Amphibians and Reptiles in an Amazonian Fainforest. Cornell University Press, Ithaca, New York. 372 pp.).

We thank Matt De Couto and Freddy Harvey Williams for their assistance in the field.

Fig. 1. Stomach contents of *Drepanoides anomalus*, consisting of two lizard eggs (most likely *Gonatodes* sp.) and two juvenile *Helicops angulatus* in a peculiar pose.

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***ERYTHROLAMPRUS TYPHLUS* (Green Smoothsnake). DIET.** *Erythrolamprus typhlus* is a diurnal and predominantly terrestrial species (Martins and Oliveira 1998. Herpetol. Nat. Hist. 6:78–150), widely distributed in Brazil, occurring in several states and biomes (Wallach et al. 2014. Snakes of the World. A Catalogue of Living and Extinct Species. CRC Press, Boca Raton, Florida. 1227 pp.). It is a small species, reaching ca. 74 cm (males) and ca. 85 cm (females) and its diet consists mainly of frogs (Martins and Oliveira, *op. cit.*). In Jan 2009, in Manicoré, state of Amazonas, northern Brazil (5.32476°S, 61.94183°W; WGS84; elev. 42 m), we observed predation by *E. typhlus* upon *Rhinella* gr. *proboscidea* (Fig. 1). Bufonid species, including *R. prosboscidea*, present highly toxic skin secretions (Jared and Antoniazzi 2009. *In* Cardoso et al. [eds.], Animais Peçonhentos no Brasil. Biologia, Clínica e Terapeutica dos acidentes, pp. 317–330. Sarvier Publishing, São Paulo, Brazil) as a primary defense mechanism, especially against visually oriented predators (Lima et al 2005. Guide to the Frogs of Reserva Adolpho Ducke, Central Amazonia. Atema Design Editorial, Manaus, Brazil. 56 pp.). A few species of frog-eating snakes, such as *Xenodon merremi* and *Philodryas argentea* (Vidal 2002. Alimentacíon de los Ofídios de Uruguay. Asociacíon Herpetología Española, Barcelona. 126 pp.; Menin 2005. Herpetol. Rev. 36:299) are able to feed on highly toxic prey. Our observation suggests that *E. typhlus* is another species that is able to feed on these highly toxic prey.

Fig. 1. *Erythrolamprus typhlus* preying upon *Rhinella* gr. *proboscidea* in Manicoré, Amazonas, Brazil.

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***HELICOPS ANGULATUS* (Brown-banded Watersnake). PREDATION.** *Helicops angulatus* is a mildly venomous snake that inhabits still or slow-flowing waters of Venezuela, Guiana,

Fig. 1. *Trigisoma lineatum* (Rufescent Tiger-heron) preying upon a *Helicops angulatus* in RPPN do Cristalino, Alta Floresta municipality, Mato Grosso state, central Brazil.

Suriname, Colombia, Brazil, Bolivia, Peru, Trinidad, Ecuador, and French Guiana (Estrella et al. 2011. Herpetotropicos 5:79–84). Despite being widely distributed, there have been few studies of its natural history and consequently information about its diet and predators are scarce. *Trigisoma lineatum* (Rufescent Tiger-heron) is a bird species of the family Ardeidae that lives on the banks of rivers and feeds on fish, mollusks, amphibians, and reptiles. During an avifaunal survey on 14 October 2010, we observed a *T. lineatum* preying upon an adult *H. angulatus* (Fig. 1) at the margins of a semi-temporary pond in the RPPN Lote Cristalino, municipality of Alta Floresta, Mato Grosso state, central Brazil (55.93068°S, 9.59865°W; WGS 84). For approximately 10 min, the heron pecked at the snake and pressed it against the ground. At this point, the snake appeared dead and the heron took flight with the snake in its beak. To our knowledge, this is the first report on predation of *H. angulatus* by *T. lineatum*.

We thank photographer João Quental for providing the picture and details of the predation event. ATM thanks Coordenação de Aperfeiçoamento Pessoal de Nível Superior (CAPES) and APVK thanks Fundação de Amparo à Pesquisa e Inovação do Espírito Santo (FAPES) for the scholarships.

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***HYPSIGLENA JANI* (Texas Nightsnake). REPRODUCTION / TIMING OF MATING.** Observations of mating in secretive animals such as snakes are often rare, forcing us to use anatomical and physiological data to estimate timing of mating and minimum size at reproduction in a species. Here we describe our observation of a mating pair of *Hypsiglena jani* (formerly *H. torquata*), in northcentral Texas.

At 1945 h on 23 April 2015 (overcast; 23°C), we discovered a copulating pair of *H. jani* in northcentral Texas, USA, near the town of Holliday (33.697231°N, 98.573410°W; WGS 84). The snakes were entwined together and mostly concealed in a dirt cavity underneath a flat rock measuring approximately 50 cm × 50 cm × 5 cm thick (Fig. 1). The habitat was a rocky sandstone hillside in grassland, with soils of mixed sand and clay. The snakes (female: SVL = 365 mm, tail length = 30 mm; male: SVL = 280 mm, tail length = 55 mm) were attached and remained so for approximately 10 min while being photographed.

Fig. 1. A mating pair of *Hypsiglena jani* found under a rock in Spring near Holliday, Texas, USA.

Mating had not been previously recorded in wild *Hypsiglena*. The seven pairs of entangled male *H. torquata* found under rocks in spring by Diller and Wallace (1986. Southwest. Nat. 31:55–64) probably represented combating males. Timing of mating in *Hypsiglena* has been estimated to occur in spring to early autumn based on sperm occurring in the *vas deferentia* from April–September, and size of the sexual segment of the kidneys in spring and summer (Diller and Wallace, *op. cit.*; Goldberg 2001. Texas J. Sci. 53:107–114; Weaver 2010. J. Herpetol. 44:148–152). Our observation is thus consistent with the timing of mating predicted by histological studies. According to Diller and Wallace (*op. cit.*), male *Hypsiglena* from Idaho reached maturity at about 290 mm (SVL) and females at about 400 mm (SVL). However, the authors noted that females reached maturity at a smaller size (307 mm SVL) in more southern localities in Texas and Arizona (Clark and Lieb 1973. Southwest. Nat. 18:248–252). Our body size data are consistent with these numbers.

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***LAMPROPELTIS HOLBROOKI* (Speckled Kingsnake). DIET / OPHIOPHAGY.** *Lampropeltis holbrooki* has been reported to feed on a variety of vertebrates, including snakes and other reptiles (Ernst and Ernst 2003. Snakes of the US and Canada. Smithsonian Institution Press, Washington, D.C. 668 pp.). In Oklahoma, *L. holbrooki* has been reported to feed on watersnakes (Sievert and Sievert 2011. A Field Guide to Oklahoma's Amphibians and Reptiles. Oklahoma Department of Wildlife Conservation, Oklahoma City, Oklahoma. 211 ppp.). Recently, Konvalina et al. (2015. Herpetol. Rev. 46:645) reported an instance *L. holbrooki* eating a *Virginia striatula* (Rough Earthsnake) in adjacent Arkansas. Here, I report a noteworthy instance of *L. holbrooki* feeding on two snakes in southeastern Oklahoma.

Fig. 1. Snakes eaten by *Lampropeltis holbrooki* (bottom). Upper = *Tantilla gracilis*; middle = *Virginia valeriae elegans*.

On 10 May 2015, an adult female (SVL = 620 mm) *L. holbrooki* was found dead in a dog kennel at a residence in Hochatown, McCurtain Co., Oklahoma, USA (34.171077°N, 94.75184°W; WGS 84). It was taken to the laboratory and a mid-ventral incision was made to expose the gastrointestinal contents, which contained two snakes (Fig. 1). One was an adult (SVL = 166 mm) *Tantilla gracilis* (Flat-headed Snake), and the other was an adult (SVL = 240 mm) *Virginia valeriae elegans* (Western Smooth Earthsnake). Based on the partially-digested condition of the snakes, it appears the *V. valeriae* (Fig. 1) was eaten first. All snakes were deposited into the Arkansas State University Museum of Zoology (ASUMZ) Herpetological Collection, State University, Arkansas, USA as ASUMZ 33423–33425. Viosca (1918. *In* Dundee and Rossman 1989. The Amphibians and Reptiles of Louisiana. Louisiana State University Press, Baton Rouge. 300 pp.) reported *L. holbrooki* eating a *V. v. elegans* in Covington, St. Tammany Parish, Louisiana. However, this is the first report of *L. holbrooki* feeding on *T. gracilis* and the second time it has been documented as feeding on *V. v. elegans*.

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***LYCODON AULICUS* (Common Wolf Snake). DIET.** *Lycodon aulicus* is one of the most widespread *Lycodon* species. It is nocturnal and prefers rocks, walls, and other rough surfaces for forging and as diurnal refugia. Like other species of *Lycodon,* it is primarily a gecko and skink feeder (Whitaker and Captain 2004. Snakes of India, The Field Guide. Draco Books. 479 pp.), but also takes small rodents. On 5 August 2015, at 2300 h, one of us (CT) observed an *L. aulicus* preying upon a small bat (family Vespertilionidae) in Ashapura, Porbandar, Gujarat, India (21.63°N, 69.6°E; WGS 84). The snake was found in the process of swallowing the bat headfirst (Fig. 1) and was observed for approximately 35 min, during which time the snake dragged the bat across the floor. Eventually, the snake was disturbed and released the dead bat. However, after discussion with a chiropterologist colleague, we believe the snake would have been able to completely swallow the bat by folding its limbs posteriorly, had it not been disturbed. We are confident that this is the first report of any *Lycodon* preying upon a bat species.

Fig. 1 Adult *Lycodon aulicus* swallowing a Vespertilionidae bat in Porbandar, Gujarat, India.

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***MICRURUS FULVIUS* (Harlequin Coralsnake). DIET.** On 12 October 2015, an adult *Micrurus fulvius* (total length = 760 mm) trapped along a drift fence in sandhill habitat at Camp Blanding Military Reservation, Clay Co., Florida, USA (30.0147°N, 81.9972°W; WGS 84), regurgitated an immature *Coluber flagellum flagellum* (= *Masticophis f. flagellum*; Eastern Coachwhip; SVL = 454 mm; total length = 600 mm) and an adult *Tantilla relicta* (Florida Crowned Snake; SVL = 206 mm; total length = 257 mm). *Micrurus fulvius* primarily feeds upon squamate reptiles, and this represents the first record of predation on *C. flagellum* (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Books, Washington, D.C. 668 pp.). The heads of the two regurgitated snakes were only slightly digested, and we suspect that they were eaten while in the funnel trap, thus it remains unclear how frequently *M. fulvius* feeds on free-ranging *C. flagellum*. The *C. flagellum* (UF 176942) and *T. relicta* (UF 176943) were deposited in the University of Florida Museum of Natural History Herpetology collection.

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***NERODIA SIPEDON* (Northern Watersnake). DIET.** *Nerodia sipedon* has the most diverse diet of any watersnake in the genus *Nerodia* (Gibbons and Dorcas 2004. North American Watersnakes: a Natural History. University of Oklahoma Press, Norman. 438 pp.). Many *N. sipedon* populations feed primarily on fish, and here we report two new fish species in its diet. Data were recorded from a watersnake foraging study investigating snake gut contents using palpation and regurgitation. All snakes containing new diet items were sampled using aquatic funnel traps except for one dissected road kill. Snakes were sampled in 2013 and 2014 at Hardy Slough/Muddy Slough (37.5025°N, 87.4501°W; WGS 84), which is a section of the Sloughs Wildlife Management Area, Henderson Co., Kentucky, USA, and is managed by the Kentucky Department of Fish and Wildlife Resources.

We documented six *N. sipedon* with gut contents containing *Amia calva* (Bowfin). An additional *N. sipedon* (gravid female;

SVL = 717 mm) collected as road kill on 8 September 2013 also contained an *A. calva* (102 mm standard length). To the best of our knowledge, *A. calva* has only been recorded in the congeneric *N. rhombifer* (Diamondback Watersnake; Carter 2015. M.S. thesis, Eastern Illinois University, Charleston. 48 pp.). We also documented eight *N. sipedon* with gut contents containing *Aphredoderus sayanus* (Pirate Perch). *Aphredoderus sayanus* has previously been recorded in the diets of the congeneric *N. fasciata* (Banded Watersnake) and *N. taxispilota* (Brown Watersnake) (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Inst., Washington D.C. 558 pp.; Gibbons and Dorcas, *op. cit.*) but not as prey for *N. sipedon.*

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***NOTHOPSIS RUGOSUS* (Rough Coffee Snake). REPRODUCTION.** *Nothopsis rugosus* is a semi-fossorial species inhabiting lowland rainforests and lower montane wet forests from the Honduran Mosquita to northern Ecuador. The reproductive behavior of the species is poorly known, with few records of its reproductive natural history. Oviparity was reported by several authors (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.; Solorzano 2004. Serpientes de Costa Rica – Snakes of Costa Rica. INBio, Santo Domingo de Heredia, Costa Rica. 792 pp.). Palpated individuals collected between early March and mid October from Costa Rica putatively contained 2–5 eggs inside (Guyer and Donnelly 2005. Amphibians and Reptiles of La Selva, Costa Rica and the Caribbean Slope. University of California Press, Berkeley. 367 pp.). An additional confirmed record of reproduction within this species is a museum specimen (LACM 153777) collected on 12 June 1974, from Heredia Province, Costa Rica, which contained three follicles with a range-average of 12–13 mm and 13 mm ± 0.6 SD (Goldberg 2004. Herpetol. Rev. 35:179).

Herein, I report additional information on reproduction on a female specimen of *N. rugosus* (USNM 561952; SVL = 263 mm, tail length = 110 mm) collected from Urus Tingni Kiamp, Gracias a Dios Province, Honduras (14.9106°N, 84.6803°W, WGS 84; 160 m elev.) on 18 May 2004. Upon dissection, I discovered two elongated oviductal eggs inside. The first follicle measured 22.0 mm (width = 7.3 mm), and the second follicle measured 19.3 mm (width = 6.2 mm). This is the second report of reproduction in a museum specimen of *N. rugosus* and the largest documented oviductal egg size for this species.

Fig. 1. Ovarian follicles discovered inside preserved specimen of *Nothopsis rugosus* (USNM 561952).

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***PHILODRYAS PATAGONIENSIS* (Patagonian Racer). DIET.** The dipsadid *Philodryas patagoniensis* is a diurnal, terrestrial, and fast-moving snake that feeds on a wide range of prey (Sazima and Haddad 1992. *In* Morellato [ed.], História Natural da Serra do Japi: Ecologia e Preservação de uma Área Florestal no Sudeste do Brasil, pp. 212–237. Editora Unicamp, Campinas; Hartmann and Marques 2005. Amphibia-Reptilia 26:25–31). Herein I report the first account of a *P. patagoniensis* consuming *Salvator merianae* (Sauria: Teiidae). At 1240 h on 29 January 2016, at Taboão da Serra, Parque Laguna, São Paulo state, Brazil (23.365352°S, 46.474818°W, WGS 84; 810 m elev.), an adult *P. patagoniensis* (total length > 1 m) was found preying on a juvenile *S. merianae* on the ground (Fig. 1). The lizard (total length ca. 200 mm) was swallowed alive tail-first over the course of approximately 39 sec.

I thank Marcos Roberto de Souza (videographer) and Lucileide Pereira (Qualinjet).

Fig. 1. Adult *Philodryas patagoniensis* ingesting a juvenile *Salvator merianae* at Taboão da Serra, São Paulo, Brazil.

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***PITUOPHIS MELANOLEUCUS MELANOLEUCUS* (Northern Pinesnake). REPRODUCTION/ RITUALISTIC COMBAT/ COURTSHIP BEHAVIOR.** *Pituophis m. melanoleucus* is a large-bodied species inhabiting sandy, pine-oak forests of the Atlantic Coastal Plain, USA, and reaches its northern range limit in the “Pine Barrens” of southern New Jersey. Despite their large size they are extremely secretive, spending the majority of their existence in subterranean burrows. As such, little is known of the taxon’s life history aside from spatial ecology via

PHOTO BY BRIAN ZARATE

Fig. 1. Two large, adult male *Pituophis melanoleucus melanoleucus* engaged in combat, Ocean County, New Jersey, USA.

radio-telemetric studies (e.g., Zappalorti et al. 2015. Herpetologica 71:26–36). Additionally, combat and courtship behavior are rarely documented in *P. melanoleucus* (Beane 2012. Herpetol. Rev. 43:349–350).

At 1430 h on 01 May 2009 (20.5–23.8°C, overcast), Ocean Co., New Jersey we were notified by outdoor recreationists of two large snakes “mating” on an open trail. Upon our arrival, we observed two male *P. m. melanoleucus* engaged in ritualistic combat (Fig. 1). The two were entwined with each attempting to press the other’s head into the sandy substrate, while producing loud hisses characteristic of *Pituophis* spp. (Conant and Collins 1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed. Houghton Mifflin Co., Boston, Massachusetts. 450 pp.). Despite our close proximity, the two were completely oblivious to our presence, and would have certainly made contact with our bodies had we not retreated out of their way. Both individuals were nearly equal in size (total length ca. 180 cm). While the two combatants continued, we searched nearby and discovered a female conspecific (total length ca. 160 cm). Presumably, this was the female over which the two males were combating. We left the males, which were still in active combat, after one hour of observation.

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***RHABDOPHIS CONSPICILLATUS* (Red-bellied Keelback). MORPHOLOGY.** Nuchal glands are specialized defensive organs, first reported in a Japanese natricine snake, *Rhabdophis tigrinus* (Nakamura 1935. Mem. Coll. Sci. Kyoto Imper. Univ. Ser. B. 10:229–240). Similar organs were subsequently described by Smith (1938. Proc. Zool. Soc. Lond. Ser. B. 100:575–583) in nine additional natricine species from three genera, *Rhabdophis*, *Macropisthodon*, and *Balanophis*, which he collectively referred to as nucho-dorsal glands. More recent studies have demonstrated that the nuchal glands of *R. tigrinus* are associated with a defensive system characterized by unique morphological, developmental, physiological, and behavioral features, such as unusual ultrastructure of cells, mesodermal origin, presence of cardiotonic steroids, sequestration of dietary toxin, and associated peculiar antipredator displays (see Mori et al. 2012. Chemoecology 22:187–198 for review).

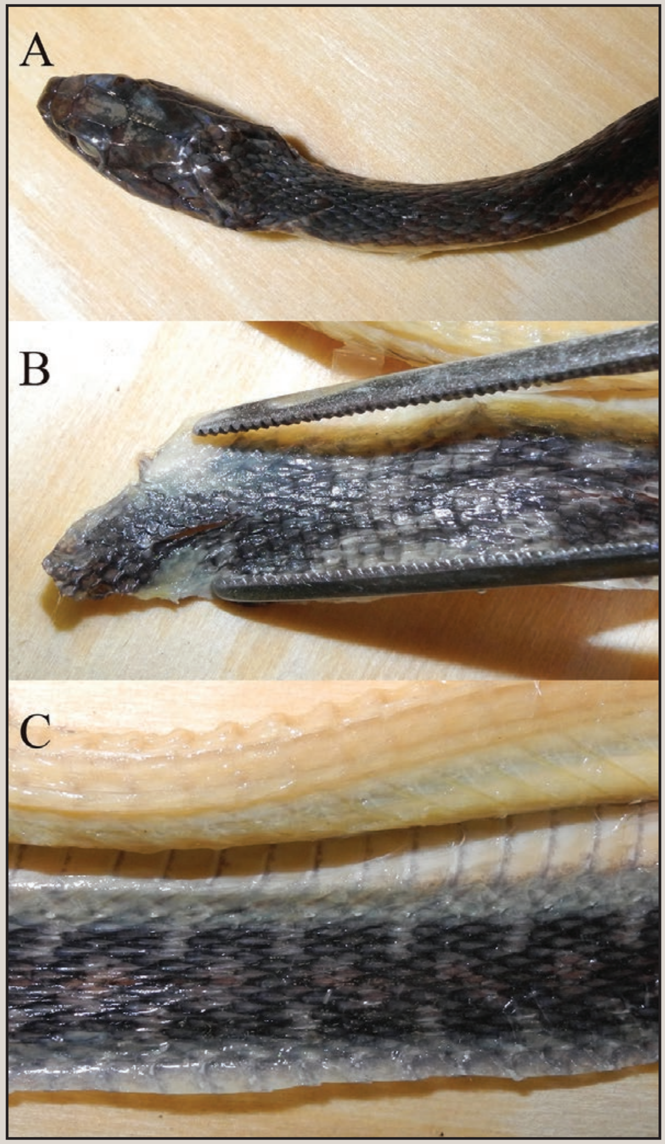

Fig. 1. A) Dorsal neck region of *Rhabdophis conspicillatus* (UNIMAS-SS-0084). B) Interior of the dorsal skin of the neck region of *R. conspicillatus*, showing lack of nuchal glands. C) Interior of the dorsal skin at the midbody of *R. conspicillatus*, showing lack of nucho-dorsal glands.

Mori et al. (2012, *op. cit.*) summarized the occurrence of these organs in snakes and listed 1) a total of 13 species in the above three genera as those that possess the glands, 2) one species of *Macropisthodon* and five species of *Rhabdophis* as those that do not have the glands (but see Mori et al. 2016. Curr. Herpetol. 35:53–58 for the discovery of these glands in *R. adleri*, which had been reported to possess no nuchal glands), and 3) six species of *Rhabdophis* as those that have no information on the glands. Here, we examined the occurrence of the nuchal glands of one of these species, *R. conspicillatus*, which is distributed over the Malay Peninsula, Borneo and adjacent islands of the western Sundas, including Brunei, Malaysia, and Indonesia.

Two preserved specimens (UNIMAS-SS-0084 and SS-0112) and one fresh specimen (UNIMAS-ID-9436) were examined at the museum of the Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak. They were collected as road-kills in Sarawak, Malaysia (Sama Jaya Nature Reserve in

Kuching, Bukit Buan in Bidi, and Gunung Penrissen, respectively) between December 2013 and March 2014. We identified them as *R. conspicillatus* based on morphological characters diagnostic of the species as well as the characteristic white postocular stripe and incomplete white nuchal collar (Günther 1872. Proc. Zool. Soc. Lond. 40:586–600; Stuebing et al. 2014. A Field Guide to the Snakes of Borneo. 2nd Ed. Natural History Publications, Kota Kinabalu, Sabah. 310 pp.). We peeled the dorsal skin off of each specimen from the posterior edge of the parietal scales to the anterior region of the tail, using scissors and a surgical knife and carefully looked for any structure that resembled nuchal glands or nucho-dorsal glands, referring to drawings and photographs available in published articles (e.g., Smith, *op. cit.*; Mori et al. 2016, *op. cit.*). We carefully examined the interior side of the skin immediately posterior to the head to the point of cloaca, but we did not find any structure that looked like nuchal or nucho-dorsal glands in any of the three specimens (Fig. 1). These specimens, further, lacked the small, inconspicuous type of glands, reported in *R. adleri.* We, therefore, conclude that *R. conspicillatus* does not have nuchal glands.

Based on Mori et al. (2012, *op. cit.*) and the correction by Mori et al. (2016, *op. cit.*), this is the fifth species of *Rhabdophis* that has no nuchal glands, at least in some individuals. Confirmation of the presence/absence of the nuchal glands in the remaining *Rhabdophis* species, for which no information of the glands is available, is desired to advance our knowledge of the phylogeny of these snakes and the evolution of these unique defensive organs.

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RHADINAEA DECORATA **(Elegant Leaf Litter Snake). DEFENSIVE BEHAVIOR / DEATH FEIGNING.** Death feigning (thanatosis) is an antipredator behavior that is widespread in animals (Toledo et al. 2011. Ethol. Ecol. Evol 23[1]:1–25). Although the behavior has been reviewed in snakes (Gehlbach 1970. Herpetologica 26:24–34), the prevalence of death feigning in these secretive animals has likely been underestimated. *Rhadinaea decorata* is a small diurnal snake that is widely distributed throughout forested regions of Central America (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.). Although common in many areas, its behavior is not well studied (Savage, *op. cit.*). Herein we report an observation of death feigning in *R. decorata.*

We encountered a juvenile *R. decorata* (SVL ca. 12 cm) within the property of the Sea Turtle Conservancy, Tortuguero, Costa Rica (10.5472568°N, 83.5048544°W, WGS84; elev. 9 m), on 16 September 2012 at ca. 1300 h. The snake was crossing an artificial walkway in the middle of the property, approximately 25 m from the nearest source of cover. Immediately after handling began, the snake went into simulated convulsions, starting with the opening of its mouth (Fig. 1A), seizure-like contractions down the length of its body, and release of musk, culminating with the animal flipping over to its back, before falling from the handler's grasp to the ground, and onto its belly (Fig. 1B). The animal then remained limp and motionless for several minutes, even when prodded. After being placed on top of leaf litter, the snake eventually returned to normal behavior and moved underneath the substrate. To our knowledge this is the first known observation of death feigning in this species. We thank J. Sean Doody for reviewing a draft of this note.

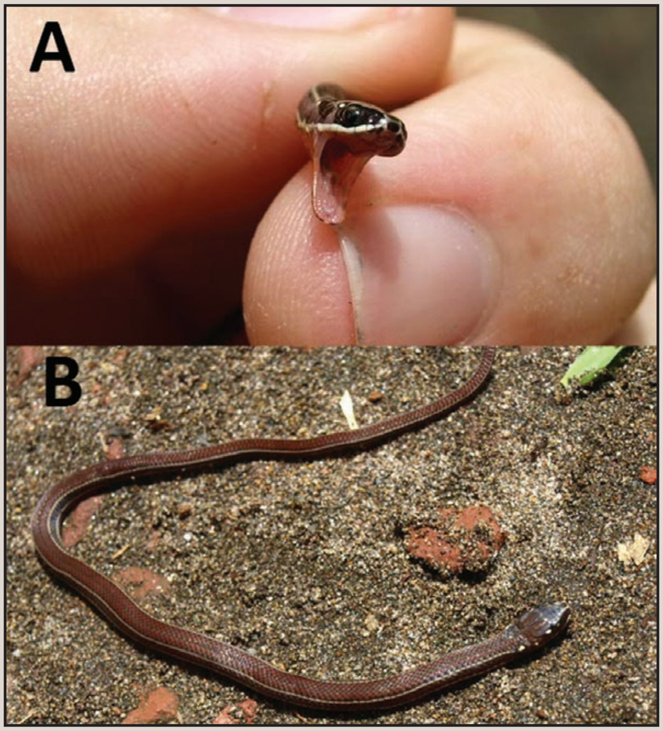

Fig. 1. A) *Rhadinaea decorata* initiating thanatosis behavior during handling. B) Immobile *R. decorata* at the culmination of thanatosis.

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SALVADORA GRAHAMIAE **(Mountain Patch-nosed Snake). WINTER FORAGING.** Little is known about the life history of *Salvadora grahamiae*, despite it being relatively common across its distribution in Arizona, New Mexico, Texas, and adjacent Mexico (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Press, Washington, D.C. 668 pp.). However, foraging behavior and diet composition have been reported on several occasions. From these accounts, *S. grahamiae* is described as a diurnal and active predator of primarily lizards, although small mammals, birds, smaller snakes, lizard, and snake eggs may be consumed occasionally (Tennant 1984. The Snakes of Texas. Texas Monthly Press, Austin. 561 pp.; Werler and Dixon 2000. Texas Snakes: Identification, Distribution, and Natural History. University of Texas Press, Austin. 437 pp.). We add to the knowledge of foraging behavior for this species by providing the first report of feeding during the winter period in far west Texas. For *S. grahamiae* and other snakes in the Chihuahuan Desert of west Texas, early November through early March is generally considered to be the inactive period (Werler and Dixon, *op. cit.*).

Fig. 1. Adult male *Salvadora grahamiae* with recently consumed prey item on 11 December 2015, Indio Mountains Research Station, Hudspeth Co., Texas, USA. The photograph was taken at time of release (ca. 1630 h), thus the prey item was less distinct than when the snake was originally captured at 1450 h.

On 11 December 2015 at 1450 h, on the Indio Mountains Research Station (IMRS) Hudspeth Co., Texas, USA (30.769358°N, 105.009242°W, WGS 84; 1240 m elev.), we collected an adult male *S. grahamiae* (SVL = 692; TL = 232; mass = 88.6 g) with a distinct and recently consumed prey item (Fig. 1). The snake was originally encountered basking in an upland *Bouteloua eriopoda-Agave lechuguilla-Fouquieria splendens* association on this unseasonably warm day (at time of observation: ambient temperature = 24.4°C, surface temperature = 28.3°C). Closer inspection revealed that the snake had a distinct bulge mid-body, indicating recently-consumed prey, most likely a small lizard (possibly *Cophosaurus texanus*). Although no lizards were observed active on this day, the ability of *Salvadora* to use their enlarged rostral scale in the excavation of buried lizards and eggs has been documented (Minton 1959. Southwest. Nat. 3:28–54; Blair 1960. The Rusty Lizard. University of Texas Press, Austin. 185 pp.). Additionally, although we found no confirmed reports of winter feeding in the literature, occasional winter activity due to the wide thermal tolerance of *S. grahamiae* (and other *Salvadora* spp.) is well known (see Ernst and Ernst, *op. cit.*), and individuals have been observed active in every month of the year except January on IMRS (VMS and JDJ, pers. obs.). Our observation suggests that occasional winter activity of *S. grahamiae* in the Trans-Pecos region of Texas is indeed associated with foraging behavior, and that this opportunistic snake may feed throughout the year given appropriate environmental conditions.

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***SEMINATRIX PYGAEA* (Black Swampsnake). PREDATION.** *Seminatrix pygaea* is a small aquatic natricine snake found in the southeastern USA (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Institution Press, Washington D.C. 668 pp.). Relatively few records of predation on *S. pygaea* have been reported in the literature, including one by a mammal, *Dasypus novemcinctus* (Nine-banded Armadillo; Aycrigg et al. 1996. Herpetol. Rev. 27:84) and two by snakes: *Lampropeltis getula* (Eastern Kingsnake; Kean and Tuberville 1995. Herpetol. Rev. 26:103) and *Micrurus fulvius* (Harlequin Coralsnake; Greene 1984. Spec. Publ. Univ. Kansas Mus. Nat. Hist. 10:147–162). The remains of a single *S. pygaea* were collected from a *Haliaeetus leucocephalus* (Bald Eagle) nest (McEwan and Hirth 1980. Condor 82:229–231), although these remains might represent stomach contents of one of the many large predatory fishes also collected in that survey. Crayfish (*Procambarus* spp.) have been reported to kill and consume neonate *S. pygaea* in captivity (Godley 1982. Florida Field Nat. 10:31–36). Dowling (1950. Misc. Publ. Mus. Zool. Univ. Michigan 76:1–38) reported on an adult specimen taken from the stomach of a *Micropterus salmoides* (Largemouth Bass), and suggested that "the chief predators on these snakes are probably water birds, such as herons and egrets." Dowling (*op. cit.*) also mentioned that Ross Allen once saw an *Ardea herodias* (Great Blue Heron) eating a "smooth-scaled snake, either *Seminatrix* or *Liodytes*." More contemporary resources (Gibbons and Dorcas 2004. North American Watersnakes: A Natural History. University of Oklahoma Press, Norman. 438 pp.) presume that wading birds are among the potential predators of this species, which reach very high densities in some wetlands (Willson and Winne 2016. J. Zool. Lond. 298:266–273).

Fig. 1. A) *Seminatrix pygaea* being eaten by *Butorides virescens*. B) *Seminatrix pygaea* forcing its way out of the bill of *Butorides virescens*.

At 1340 h on 13 February 2016, one of us (BR) saw and photographed an adult *S. pygaea* being eaten by a *Butorides virescens* (Green Heron) at Peaceful Waters Sanctuary, Palm Beach Co., Florida, USA (26.632795°N, 80.232824°W; WGS 84). The heron was standing in ca. 8–10 cm of water near the edge of a wetland, in an area with significant submerged aquatic vegetation. It captured the snake (Fig. 1A) while standing in the water, and repeatedly walked back and forth from the water to the adjacent mudflat as it attempted to swallow the snake. The snake coiled its body and thrashed, almost escaping several times whenever it got purchase in the mud with its head. The heron persisted and appeared to tire the snake out, even dropping the snake, which did not attempt to flee, in the mud a few times (but never in the water). The heron managed to swallow the snake completely three times over ca. 13 minutes. The first two times, the snake emerged headfirst from the heron's closed bill (Fig. 1B), but the third time, it did not emerge.

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THAMNOPHIS BRACHYSTOMA **(Short-headed Gartersnake). MOVEMENTS AND SITE FIDELITY.** *Thamnophis brachystoma* is a relatively small (to 578 mm total length; Lethaby 2004. Herpetol. Rev. 35:73) natricine snake endemic to the Allegheny High Plateau of northwestern Pennsylvania and southwestern New York, USA (Price 1978. Bull. Maryland Herpetol. Soc. 14:260–263). The species is found primarily in old fields and meadows and is reportedly extremely abundant within its limited geographic range (Conant 1950. Bull. Chicago Acad. Sci. 9[4]:71–77). Data pertaining to movements and site fidelity by *T. brachystoma* are sparse (Jellen 2010. *In* Steele et al. [eds.], Terrestrial Vertebrates of Pennsylvania: A Complete Guide to Species of Conservation Concern, pp. 69–70. The Johns Hopkins University Press, Baltimore, Maryland). Knowledge of an individual snake's movements is necessary for delineating home ranges, and is critical to any complete understanding of the ecology of a species (Gregory et al. 1987. *In* Seigel et al. [eds.], Snakes: Ecology and Evolutionary Biology, pp. 366–395. Macmillan Publishing Co., New York). Herein, we provide movement and site fidelity data for two urban *T. brachystoma* populations in Erie, Pennsylvania, USA.

During April–August 2011, we used artificial cover objects and existing natural cover (e.g., rocks) to sample two urban *T. brachystoma* populations (Lethaby and Gray 2015. Herpetol. Rev. 46:652). The two sites, Shannon Road and McClelland Park are ca. 1.4 km apart. Snakes were individually marked with a portable cautery unit (Winne et al. 2006. Herpetol. Rev. 37:52–54) and released at the site of capture. For all snakes, the distance (nearest meter) between successive recapture and the last capture was determined to give a minimum distance traveled (Freedman and Catling 1979. Can. Field Nat. 93:399–404). For snakes with multiple recaptures, the minimum distances traveled were summed to give a total distance traveled.

Shannon Road.—Twenty-three males and 33 females were marked. Minimum distance traveled by male *T. brachystoma* at the Shannon Road site averaged 8.2 ± 5.0 m (range 1–10, N = 5), whereas the minimum distance traveled by females averaged 12.5 ± 13.1 m (range 1–37, N = 6). Maximum distance traveled by two males was 10 m in seven days, and the maximum distance traveled by a female was 37 m in 14 days. Site fidelity was observed in males at Shannon Road on four occasions, each involving a single individual using a single cover object on two occasions. Females also displayed site fidelity at Shannon Road, with three individuals using a single cover object twice, three individuals three times, and one snake each using a single cover object four and six times, respectively. Days between cover object usage in males at Shannon Road averaged 22 ± 24 days (range 7–43, N = 4), whereas that of females averaged 20 ± 7 days (range 4–48, N = 17).

McClelland Park.—Forty males and 54 females were marked. Minimum distance traveled by males averaged 23.8 ± 8.7 m (range 1–36, N = 11). Minimum distance traveled by females averaged 19.8 ± 7.7 m (range 1–42, N = 15). Maximum distance traveled by a male was 70 m in 62 days. Maximum distance traveled by a female was 66 m in 21 days. Five male *T. brachystoma* at McClelland Park displayed site fidelity by utilizing a single cover object twice; another male used a single cover object on three occasions. Females also displayed site fidelity at McClelland Park, with four females using a single cover object twice, four females using cover objects three times, and one female using cover objects four times. Days between cover object usage at McClelland Park averaged 11 ± 8 days (range 3–27, N = 7) among males and 15 ± 4 days (range 3–38, N = 15) among females.

No evidence was detected of *T. brachystoma* having traveled between sites. Also, using pooled data, there was no significant difference ($t = 0.011$, $df = 19$, $P = 0.99$) with regards to maximum distance traveled by males and females. Snakes may return to a cover object for many reasons, such as ecdysis, thermoregulation, or to acquire and or digest a meal. All adult female *T. brachystoma* at Shannon Road (N = 7) and McClelland Park (N = 3) that displayed site fidelity were gravid. Of forty instances of site fidelity for which molt condition was recorded, sixteen were of snakes during pre-ecdysis on both captures, whereas 24 were not.

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THAMNOPHIS EQUES **(Mexican Gartersnake). MAXIMUM SIZE.** *Thamnophis eques* has a relatively large geographic distribution in Mexico and the southwestern United States (Rossman et al. 1996. The Garter Snakes: Evolution and Ecology. University of Oklahoma Press, Norman. 332 pp.). On 23 September 2015 in the Parque Sierra Morelos, Toluca, State of Mexico (19.315525°N, 99.690925°W, WGS 84; 2793 m elev.) we found a large female *T. eques* (SVL = 102.1 cm, total length = 124.3 cm, 337.1 g) in pine-cedar forest with an understory consisting of various species of bunch grasses. To our knowledge, the SVL of this individual is the largest reported for Mexican populations (Lago de Chapala: total length = 121.6 cm; Conant 2003. Am. Mus. Novit. 3406:1–64; Lago de Xochimilco: SVL = 91 cm, total length = 110 cm; Lizarraga-Valencia et al. 2015. Herpetol. Rev. 46:652–653). It is only marginally longer than the maximum length reported for U.S. populations (Arizona: total length = 124 cm; Stebbins 2003. A Field Guide to Western Reptiles and Amphibians. 3rd ed. Houghton Mifflin, Boston, Massachusetts. 533 pp.).

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THAMNOPHIS EQUES MEGALOPS **(Northern Mexican Gartersnake). PREDATION.** *Thamnophis eques megalops* is a semi-aquatic mesopredator distributed in Arizona, New Mexico, and

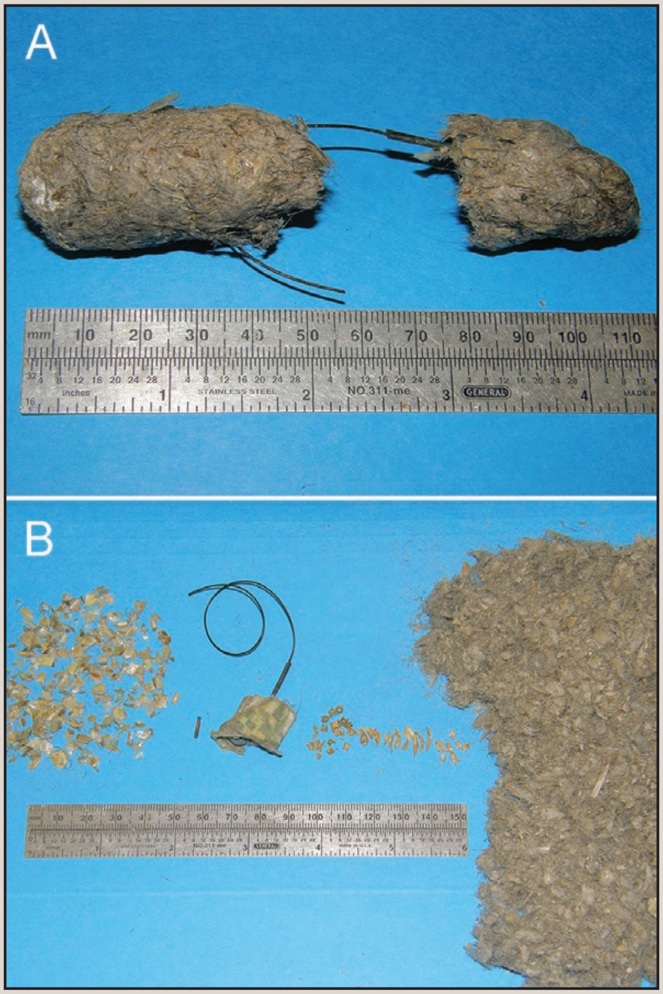

Fig. 1. *Buteo jamaicensis* (Red-tailed Hawk) pellet containing remains from a previously transmittered adult male *Thamnophis eques megalops.* A) Intact end sections of pellet that were connected by the radiotransmitter antenna. B) Dissected pellet contents including (left to right) *T. e. megalops* scales, PIT tag, radiotransmitter attached to duct tape, unidentified sections of rodent vertebrae, and woodrat species (suspected *Neotoma albigula*) incisors, cheek teeth, and hair.

northern Mexico (Rossman et al. 1996. The Garter Snakes: Evolution and Ecology. University of Oklahoma Press, Norman. 332 pp.; Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Books, Washington, DC. 668 pp.). The species has experienced population declines throughout its range in the United States, and was recently listed as threatened under the Endangered Species Act (U.S. Fish and Wildlife Service. 2014. Fed. Reg. 79:38678–38746). Potential predators include multiple species of terrestrial and aquatic vertebrates, yet relatively few confirmed predation records exist (Rosen and Schwalbe 1995. *In* Laroe et al. [eds.], Our Living Resources: A Report to the Nation on the Distribution, Abundance, and Health of U.S. Plants, Animals, and Ecosystems, pp. 452–454. USDI National Biological Service, Washington, D.C.; Brennan et al. 2009. Son. Herpetol. 22:123; Young and Boyarski. 2013. Herpetol. Rev. 44:158–159).

Here we report a case of predation on *T. e. megalops* by a hawk along lower Tonto Creek in Tonto National Forest, Arizona (33.768852°N, 111.257405°W; NAD 83). On 13 December 2015 one of us (IDE) discovered a 1.2-g radio transmitter (SB-2, Holohil Systems Ltd., Carp, Ontario, Canada), previously mounted externally on an adult male snake (Wylie et al. 2011. Herpetol. Rev. 42:187–191), within a regurgitated hawk pellet. The transmitter was 48 m from the last known location for the snake on 9 December 2015, and located approximately 9 m up in a cottonwood tree (*Populus fremontii*), wedged between two branches. The middle section of the pellet was missing, with both end sections connected by the transmitter antenna. The pellet sections were retrieved, measured, and dissected. Pellet sections were cylindrical, gray in coloration, tightly compacted, and dimensions were 36.1 mm in length and 22.3 mm in diameter for the first end section, 49.1 mm in length and 23.6 mm in diameter for the second end section, and approximately 110 mm in total length including the missing middle pellet section (Fig. 1A). Pellet components included the following: *T. e. megalops* scales, the radio transmitter still attached to camouflage Duck® brand duct tape (Wylie et al., *op. cit.*), and a passive integrated transponder (PIT) tag (FDX-B HPT12, BioMark, Boise, Idaho, USA) previously inserted subcutaneously in the gartersnake; incisors, cheek teeth, and hair from a woodrat species (suspected *Neotoma albigula*); and vertebrae sections from unidentified rodent species (Fig. 1B). Bone fragments and teeth were highly corroded from digestive acids and buried within the fur and scale matrix of the pellet, consistent with hawk pellets as described in the literature where small and fragile bones are largely dissolved in the stomach (Errington 1932. Condor 34:75–86). Furthermore, the pellet dimensions are similar to measurements for larger North American hawk species described in previous studies (Fitch et al. 1946. Condor 48:205–237).

We identified Red-tailed Hawk (*Buteo jamaicensis*) at the project site on multiple occasions, including sightings in December 2015. This species uses snakes (including gartersnakes) as prey, sometimes constituting a large portion of total diet (Knight and Erickson 1976. Raptor Res. 10:108–111; Marti and Kochert 1995. Wilson Bull. 107:615–628). We believe that the pellet containing the radio transmitter belonged to *B. jamaicensis*, and to our knowledge, this predation event represents the first confirmed record for any bird species consuming *T. e. megalops*.

We thank Tonto National Forest for providing logistical support. Fieldwork was funded by the Salt River Project. All research was conducted under permits issued by the U.S. Fish and Wildlife Service and Arizona Game and Fish Department, and an approved Northern Arizona University Animal Care and Use Committee protocol.

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THAMNOPHIS ORDINOIDES **(Northwestern Gartersnake). REPRODUCTION.** *Thamnophis ordinoides* is a small gartersnake that ranges from northern California, USA, to southern British Columbia, Canada (Stebbins 2003. A Field Guide to Western Reptiles and Amphibians. 3rd ed. Houghton Mifflin, Boston, Massachusetts. 533 pp.). This species is abundant in city parks in the District of Saanich, British Columbia (48.4592°N, 123.3767°W; WGS 84) at the southern tip of Vancouver Island. The number of embryos a gravid snake is carrying can be estimated by gently palpating its abdomen and these estimates are closely associated with the number of live young, dead young, and

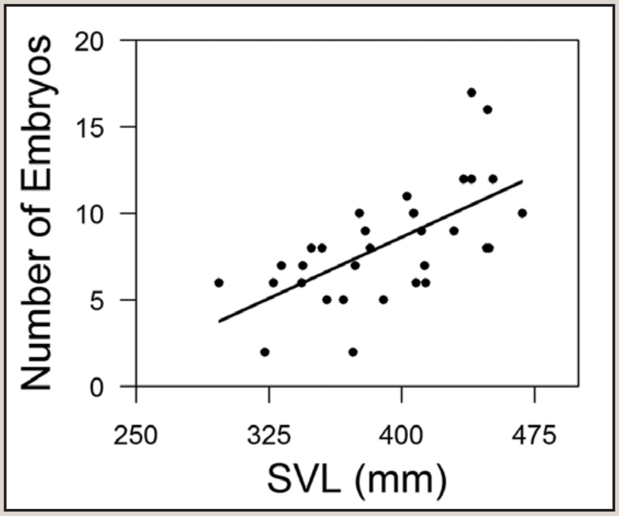

Fig. 1. Plot of number of embryos by SVL for 32 *Thamnophis ordinoides* from Vancouver Island, British Columbia, Canada.

undeveloped embryos after parturition (Farr and Gregory 1991. J. Herpetol. 25:261–268).

We captured 32 gravid *T. ordinoides* at five city parks in Saanich, British Columbia between 7 June and 19 August 2012 (mean SVL = 392 mm ± 45 mm SD, range = 297 – 468 mm). We gently palpated the abdomen of each snake to determine the number of embryos they carried (mean = 8.3 ± 3.3 SD, range = 2–17). In that same time period we captured 22 non-gravid females (mean SVL = 366 mm ± 48 mm SD, range = 305–473 mm), and therefore 59% of females were gravid. To avoid including immature individuals, our sample of non-gravid females only includes individuals with an SVL equal or greater to the smallest gravid female captured. Generally, individuals with a greater SVL carried more embryos (Linear Regression, $P < 0.001$, $R^2 = 0.4$; Fig. 1).

Little has been published regarding reproduction in this species, however, our results are consistent with those from a population of *T. ordinoides* in the Willamette Valley, Oregon, USA, where gravid females carried a mean of 8.2 embryos, and 60% of females captured between June and August were gravid (Stewart 1968. J. Herpetol. 2:71–86). On Vancouver Island, Brodie (1989. Am. Nat. 134:225–238) reported a mean of 5.8 embryos per individual from a sample of 16 gravid females and did not report a gravid to non-gravid ratio.

We thank the British Columbia Ministry of the Environment for research permits, and the Swan Lake/Christmas Hill Nature Sanctuary and District of Saanich for use of their sites. We also thank Patrick T. Gregory for his guidance throughout this project. This work was supported by the National Science and Engineering Research Council of Canada and the University of Victoria.

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***TROPIDOCLONION LINEATUM* (Lined Snake). FIRE MORTALITY.** Prescribed fire is a natural tool for regulating and improving grasslands. Although such techniques improve habitat, fire can be harmful to organisms inhabiting grasslands. A number of snakes have been killed by prescribed fire. In eastern Nebraska, seven *Diadophis punctatus* and two *Coluber constrictor* were killed in a 5-ha prescribed fire, a rather high mortality rate for the limited area burned (Geluso et al. 1986. Am. Midl. Nat. 116:202–205). In general, however, snake mortalities typically are low during searches conducted immediately after prairie fires, with mortalities known from at least nine species in the Great Plains (Bigham et al. 1964. Proc. Oklahoma Acad. Sci. 45:47–50; Erwin and Stasiak 1979. Am. Midl. Nat. 101:247–249; Frese 2003. Herpetol. Rev. 34:159–160).

On 10 May 2014, a *Tropidoclonion lineatum* was observed dead following a prescribed fire on a restored tallgrass prairie on Crane Trust property located south of Gibbon, Buffalo Co., Nebraska, USA (40.70543°N, 98.79637°W; WGS 84). The 12-ha prescribed fire was conducted on 5 May 2014 to facilitate grazing and set back cool-season, invasive grasses. In addition, a *Pituophis catenifer* also was observed killed by the fire in an adjacent 4.5-ha pasture burned on the same day (40.7026°N, 98.8016°W; WGS 84). To our knowledge, this is the first documentation of *T. lineatum* mortality by fire throughout its distribution. We deposited the individual in herpetological collections at the Sternberg Museum of Natural History (FHSM 17108), Fort Hays State University, Hays, Kansas, USA. The specimen was verified by Curtis J. Schmidt.

In Nebraska, *T. lineatum* is most active from late April to October and inhabits prairies and woodland edges (Ballinger et al. 2010. Amphibians and Reptiles of Nebraska. Rusty Lizard Press, Oro Valley, Arizona, 400 pp.). Generally, this secretive and semifossorial snake is nocturnal during summer, but in spring and autumn as well as on cool days, individuals may be crepuscular or diurnal (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Institution Press, Washington D.C. 680 pp.). Tendency for this species to inhabit grassland burned annually (Wilgers and Horne. 2006. J. Herpetol. 40:73–84) and to be somewhat conspicuous as they emerge from hibernation (Fogell 2010. A Field Guide to the Amphibians and Reptiles of Nebraska. University of Nebraska Press, Lincoln. vi + 158 pp.), puts *T. lineatum* at risk of death due to fire only at certain times of the year. Although *T. lineatum* is not considered threatened, to protect this and other reptile species, fires used as a management tool should be implemented prior to snakes emerging from spring hibernacula and during the warmest months of the year to reduce mortalities.

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