NATURAL HISTORY NOTES

CAUDATA — SALAMANDERS

***EURYCEA BISLINEATA* (Northern Two-lined Salamander). NEST GUARDING.** On 21 April 2017, we discovered two nests belonging to *Eurycea bislineata* in streams adjacent to Eastern Kentucky University's Lilley Cornett Woods Appalachian Ecological Research Station in Letcher County, Kentucky, USA. The first nest was located on the underside of a submerged rock in Island Branch (37.08632°N, 82.98456°W, WGS 84). It contained 38 eggs and was attended by a single male (SVL = 47.27 mm; 1.2 g) (Fig. 1). The second nest was on the underside of a submerged rock in Whitaker Branch (37.08876°N, 82.99012°W, WGS 84). It contained 47 eggs and was attended by a female (SVL = 45.81 mm; 1.6 g) and a male (SVL = 48.66 mm; 1.8 g) (Fig. 2). Attendance of nests by females is commonly observed in members of the *E. bislineata* species complex, but published observations of males with nests are thus far limited to *E. junaluska* and *E. aquatica* (Bruce 1982. Copeia 1982:755–762; Graham et al. 2010. IRCF 17:168–172). Although the species observed here is traditionally classified as *E. cirrigera*, molecular phylogenetic data suggest that this name is inappropriate (see 'Lineage D' in Kozak et al. 2006. Mol. Ecol. 15:191–207; Pierson et al., unpubl. data). Instead, we refer to them conservatively as *E. bislineata*. To the best of our knowledge, these observations represent the first evidence of nest attendance by males in this species and suggest that the behavior might be more widespread in the *E. bislineata* species complex.

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Fig. 1. Male Northern Two-lined Salamander (*Eurycea bislineata*) with a nest.

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Fig. 2. Female (left) and male (right) Northern Two-lined Salamanders (*Eurycea bislineata*) with a nest.

***EURYCEA LONGICAUDA* (Long-tailed Salamander). COLOR ABERRATION.** *Eurycea longicauda* patterning is typically characterized by black spotting across the dorsum of the body, and can vary in spot size, number, and presence on the head and tail (Behler and King 1979. The Audubon Society Field Guide to North American Reptiles and Amphibians. Alfred A. Knopf, Inc., New York. 744 pp.). Two dorsolateral lines of spotting are present, generally consisting of larger spots that form a broken line across the body, and extend to cover the lateral sides of the tail as chevrons (Behler and King 1979, *op. cit.*). The lateral region of the body and limbs are covered by heterogeneously sized spots, but are often small (Behler and King 1979, *op. cit.*).

We observed and photographed an adult female *E. longicauda* at 2137 h on 4 May 2016 in Huntingdon County, Pennsylvania, USA (40.538408°N, 77.882875°W; WGS 84) with an aberrant pattern (Fig. 1). The specimen was discovered as it crossed a public road (State Rt. 1005) through mature deciduous forest during a light rain. The individual lacked dorsal spotting and distinct dorsolateral lines or spotting. Further, the individual lacked lateral and limb spotting, but black flecking was present across both; the toes are particularly well pigmented and black. As the pattern progressed posteriorly it began to form small bands, which developed into light and poorly developed chevrons with flecking between each chevron. While melanin-based dorsal patterning appeared to be greatly reduced, the underlying skin coloration (yellow-orange) seemed typical. One previous report on aberrant coloration in *E. longicauda* described an individual that was 45.9% unpatterned, particularly lacking on the lateral sides, hind limbs, and the anterior region of the tail (McCallum et

Fig. 1. Adult female *Eurycea longicauda* with an aberrant pattern found in Huntingdon County, Pennsylvania, USA.

al. 2008. Herpetol. Rev. 39:334). To our knowledge, this aberrant pattern we describe here has not been previously reported in *E. longicauda*, and appears to be rare.

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***EURYCEA LUCIFUGA* (Cave Salamander). COLORATION.** *Eurycea lucifuga* is characterized by its bright orange dorsum flecked with random black spots (Fig. 1A). The function of this particular pattern in this species is unknown, but may be related to aposematic coloration or mimicry. Aberrations of this typical pattern in *E. lucifuga* include leucism (Smith 1985. Herpetol. Rev.16:78) and a condition known as piebald (Neff et al. 2015. Herpetol. Notes 8:599–601), in which pigmentation is absent in some areas. This results in individuals having random patches of light gray/white skin interspersed with the typical orange with black spot pattern. An additional color morph, previously undocumented to our knowledge, is found in individuals with the characteristic bright orange dorsum that lack the black spot pattern (Fig. 1B). Four individuals with this 'spotless' morph have been observed in Sauerkraut Cave (a.k.a. Tom Sawyer, Central State, or Lakeside Cave) in E.P. "Tom" Sawyer State Park, Jefferson County, Kentucky, USA (exact location withheld to reduce potential disturbance and/or vandalism to the cave). The 'spotless' morph is relatively rare in our study population, representing only four out of 1092 individuals, or 0.4% of the population. We are confident that these are in fact *E. lucifuga* individuals because morphologically they look the same, the orange coloration is present on the dorsum, and no other species of similar looking salamanders, e.g., *Eurycea longicauda* (Long-tailed Salamander), have been found in or around this cave over the course of 23 months (March 2015–February 2017) during a study on *E. lucifuga*. The only other species of salamander that have been found in this cave are the Zig-zag Salamander (*Plethodon dorsalis*) and the Streamside Salamander (*Ambystoma barbouri*), both of which occur in very low numbers (<10 individuals have been observed) and are easily distinguished from *E. lucifuga*.

Fig. 1. Two *Eurycea lucifuga* individuals from a cave in Kentucky, USA. A) Typical color and pattern; B) 'Spotless' individual.

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***NOTOPHTHALMUS MERIDIONALIS* (Black-spotted Newt). HABITAT USE.** Subterranean microhabitat use has been well documented in amphibians including certain salamander species (*Plethodon cinereus*, Jaeger et al. 1986. Anim. Behav. 34:860–864; *Ambystoma californiense*, Loredo et al. 1996. J. Herpetol. 30:282–285). Notably, a field study tracking *Notophthalmus viridescens* (which occurs in more mesic environments) with fluorescent powder did not find adults or juveniles using underground microhabitats such as fissures or burrows (Roe and Grayson 2008. J. Herpetol. 42:22–30). *Notophthalmus v. louisianensis* individuals have been found in karst environments, although these instances are considered accidental (Myers 1958. Herpetologica 14:35–36; Briggler and Prather 2006. Am. Midl. Nat. 155:136–148).

Two *Notophthalmus meridionalis* were observed underground in clay fissures on 18 November 2016 at 1002 h at a dried ephemeral pond in Cameron County, Texas, USA (26.03524°N, 97.47375°W; WGS 84). This observation was made using a borescope with an 8 mm camera (PVBOR15, Pyle Audio Inc., Brooklyn, New York.). Individuals were found 15 cm and 20 cm deep, respectively, by measuring the length of the fiber optic stalk in the fissure. This observation is the first documented use of fissure microhabitats by any *Notophthalmus* species.

At another site, we hammered a 2-inch diameter PVC pipe into the ground and extract a clay soil cylinder, leaving a circular hole in the ground to be used as an artificial burrow. On 11 February 2017 at 1835 h, a single *N. meridionalis* juvenile was found with a borescope 25 cm deep in an artificial burrow on the bank of a dried resaca in Cameron County, Texas, USA (25.85043°N, 97.39151°W, WGS 84). This is the first published observation of a salamander occupying an artificial burrow used as a passive trap. These novel detection techniques may prove valuable in discovering and monitoring cryptic salamander species.

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***NOTOPHTHALMUS PERSTRIATUS* (Striped Newt). PREDATION.** Primarily as a result of habitat loss and alteration by land conversion and fire suppression, the Striped Newt of Georgia and Florida, USA, was recently added to the federal Endangered Species Act candidate list (Federal Register 2011. 76:32911–32929). This formal status indicates that listing as "threatened" is warranted, but is currently precluded by higher listing priorities. Despite great attention to this species by federal and state wildlife agencies charged with its conservation, and several in-depth and published field research studies (e.g., Johnson 2002. Southeast. Nat. 1:381–402), many important aspects of this salamander's natural history remain largely unknown, including terrestrial habitat use, home range, clutch size, and predators.

On 17 August 2017, while dip-netting a known breeding pond at Sandhills Wildlife Management Area in Taylor County, Georgia, USA (32.578094°N, 84.269962°W; WGS 84) with several other colleagues, I scooped up a Giant Water Bug (*Lethocerus uhleri*) that had in its grasp a limp and lifeless larviform (late larva or developing paedomorph) Striped Newt. Giant Water Bugs are common inhabitants of isolated wetlands in the southeastern United States, and because of their large size, they are fierce predators of aquatic prey that few other invertebrates are capable of subduing, including fish, tadpoles, and frogs. Prey are impaled by their rostrum which injects digestive enzymes and liquefies internal tissues for consumption (Pennak 1978. Fresh-water Invertebrates of the United States. John Wiley and Sons, New York. 803 pp.).

To the best of my knowledge, this represents the first documented observation of predation on any life stage of the Striped Newt (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press. Washington, D.C. 587 pp.). Because Giant Water Bugs are frequent co-inhabitants of Striped Newt breeding wetlands (pers. obs.), they are likely an important predator of larvae, paedomorphs, and breeding adults.

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***TARICHA GRANULOSA* (Rough-skinned Newt). PREDATION.** On 10 March 2017, Chantal Jacques, a keen Canadian bird photographer, observed a female Hooded Merganser (*Lophodytes cucullatus*) catching and swallowing an adult *Taricha granulosa* (Fig. 1) at the west pond next to the Elk/Beaver Lake, Capital Regional District Park on Vancouver Island, British Columbia, Canada (48.30350°N, 123.23580°W; WGS 84). Her husband John Costello had previously witnessed a Great Blue Heron (*Ardea herodias*) taking a newt from the pond. The bird was further noted to be around that area for several days without displaying apparent ill effects. One month later, on 7 April 2017, she also observed and photographed a Hooded Merganser at a pond located on the premise of the Royal Roads University, Vancouver Island (48.25540°N, 123.28240°W, WGS 84) also capturing and eating a Rough-Skinned Newt.

PHOTO BY CHANTAL JACQUES

Fig. 1. Hooded Merganser (*Lophodytes cucullatus*) catching and eating a *Taricha granulosa* on Vancouver Island, British Columbia, Canada.

Newts of the genus *Taricha* are well known to contain tetrodotoxin (TTX) in their skin and body, a lethal neurotoxin which specifically blocks voltage-gated sodium channels of excitable membranes (Brodie et al. 1974. Copeia 1974:506–511; Hanifin 2010. Mar. Drugs 8:577–593). Despite this effective chemical defense, Common Gartersnakes (*Thamnophis sirtalis*) regularly feed on these newts. They evolved resistance to the toxin (Geffeney et al. 2005. Nature 434:759–765; Feldman et al. 2009. Proc. Natl Acad. Sci. USA 106:13415–13420), but birds and mammals are extremely susceptible to TTX. However, toxicity of the newts has been found to be highly variable within and between populations. Particularly, *T. granulosa* specimens from Vancouver Island have been found to be much less toxic when compared to populations from Oregon, USA (Hanifin et al. 2008. PLoS Biol. 6:e60). This was confirmed by our own studies. On 29 March 2012, we collected two female specimens at the Durrance Lake, Vancouver Island (48.32520°N, 123.28400°W), a location not far from the Elk/Beaver Lake area. Both specimens were sacrificed for TTX-analysis using post-column liquid-chromatography fluorescent-detection (Shoji et al. 2001. Anal. Biochem. 209:10–17). In the methanolic whole body extract of one specimen (9.4 g body weight) there was no TTX, in that of the second specimen (6.8 g) a low amount of (0.0053 mg) TTX was detected.

These data support the assumption that the newts the two Hooded Mergansers and the Great Blue Heron ate contained toxin concentrations too low to elicit ill effects. Fellers et al. (2008. Herpetol. Rev. 38:317–318) came to the same conclusion when they observed an immature Great Blue Heron catching and eating three newts over a period of 45 min. in a pond at Point Reyes National Seashore, Marin County, California, USA. The same applies to River Otters (*Lontra canadensis*) seen predating *T. granulosa* near Crater Lake National Park in Oregon, USA (Stokes et al. 2015. Northwest. Nat. 96:13–21). Analysis of TTX in newts from these locations also revealed low toxin concentrations rendering *T. granulosa* vulnerable for predation.

Specimens were obtained under permit VI11-73288.

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ANURA — FROGS

***ANAXYRUS AMERICANUS* (American Toad). MICROHABITAT.** Here, I report observations of *Anaxyrus americanus* climbing on sandstone rocks and cliffs up to several meters off the ground. Between 1600 h and 1700 h on 9 and 16 July 1986, a large male *A. americanus* was observed foraging in a crevice of a rock outcrop near Hwy 90 and 1.6 km from the Cumberland River in Whitley County, Kentucky, USA (specific locations withheld due to conservation concerns). The rock crevice was approximately 2.1 m from the ground and would require some adept climbing and moving along a rock shelf several feet horizontally to reach it. This was an unexpected location for an American Toad and appeared to be the same toad in both instances. Climatic conditions were similar in both instances in that the air temp was over 32°C and very humid. At 1400 h on 13 Sep 1987, an adult *A. americanus* was observed in a large crevice 1 m up in a rock outcrop about 1.2 km from the other location, also near Hwy 90 in Whitley County, Kentucky. The crevice was in a rock outcrop behind a beach on the Cumberland River. It had rained earlier and the temp was 22–23°C. At 1600 h on 17 September 2001 (air temperature 22°C), another adult *A. americanus* was found on a rock ledge 1 m from the ground near Bark Camp Creek off Forest Service Rd 193 in Whitley County At 2000 h on 5 April 2001 (air temperature 22°C) in the city of Corbin, Whitley County, an adult *A. americanus* fell for a distance of 5–6 m from a rock cliff and landed on leaves next to the observer. The toad remained still for 15 min. and then hopped away. The ability to sustain such falls may allow toads to make a quick retreat or comedown from precarious ledges that are a few meters off the ground. There are no reports of *A. americanus* associated with rock cliffs (Dodd 2013. Frogs of the United States and Canada. John Hopkins University Press, Baltimore, Maryland. 982 pp.). They have been found in limestone caves, but with no reports of climbing (Dodd 2013, *op. cit.*).

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***ANAXYRUS TERRESTRIS* (Southern Toad). AVIAN PREDATION.** Known predators of adult and juvenile *Anaxyris terrestris* include several species of snakes (Dodd 2013. Frogs of the United States and Canada. Johns Hopkins University Press, Baltimore, Maryland. 982 pp.; Stevenson et al. 2010. Southeast. Nat. 9:1–8), *Deirochelys reticularia* (Jackson 2004. Herpetol. Rev. 35:380–381), *Osteopilus septentrionalis* (Meshaka 2001. The Cuban Treefrog in Florida: Life History of a Successful Colonizing Species. University of Florida Press, Gainesville. 121 pp.), Black-crowned Night Herons (Jones et al. 2010. Herpetol. Rev. 41:334–335), Cattle Egrets (Fogarty and Hetrick 1973. The Auk 90:268–280), and Giant Water Bugs (McCoy 2003. Herpetol. Rev. 34:135–136). Here, we describe predation behavior on *A. terrestris* by three species of wading birds and add two new species of avian predators.

On 2 June 2008, we observed multiple predation events on a breeding aggregation of *A. terrestris* by several Cattle Egrets (*Bubulcus ibis*) in Marion County, Florida, USA (29.15093°N, 82.41925°W; WGS 84). At 0745 h we found a dead adult female toad laying at the edge of a back yard pond (13.5 × 6.5 m, 1 m depth at its deepest point). The dead gravid female had puncture wounds on the belly and throat; but she had not been eaten. A second dead toad was found on the other side of the pond, but this one had been fully eviscerated, and its intestines and eggs had been removed. At 0850 h, we startled a Cattle Egret that was resting on the rail of a deck which dropped another dead adult female toad. It too, was fully eviscerated with all abdominal organs missing. Shortly thereafter we observed two more adult Egrets flying away from the backyard pond, each carrying a toad in its beak. One of the Egrets dropped a male toad which had puncture wounds on the left side from which a portion of the intestines had emerged. We found two other female toads by the pond edge that had been opened ventrally, but not fully eviscerated. Female toads loaded with egg strings may have been too heavy for the Egret's wing-loading capacity, but they were able to fly with the smaller and lighter males. It appeared that none of the toads was swallowed whole, but were stabbed by the Egret's beak and partially eviscerated. Other predators are known to kill toads in this manner to avoid ingesting poison from the paratoid glands (Olson 1989. Copeia 1989:391–397; Woodward and Mitchell 1990. Southwest. Nat. 35:449–450).

Between 0845 and 0905 h on 7 June 2013, at a 3.5 × 1.5 m garden pool in Columbia County, Florida, USA (29.843589°N, 82.649310°W; WGS 84) we observed a Cattle Egret capture one of two calling male *A. terrestris* sitting on a ledge, and within 10 min. a Tri-colored Heron (*Egretta tricolor*) swooped down and captured the other one. The birds could have only been attracted to the toads by their vocalizations because the pool is under a full hardwood tree canopy.

On 27 January 2014 we observed a group of 20–25 American White Ibis (*Eudocimus albus*), including seven juveniles, at Mackay Island National Wildlife Refuge, Currituck County, North Carolina, USA (36.53088°N, 75.99007°W; WGS 84) probing into the sandy soil to the full length of their slender bills. The air temperature was 4°C and most of the snow from a recent storm had melted. The Ibis were pulling up and swallowing hibernating *A. terrestris* (Fig. 1). We observed one adult and one juvenile bird extract and swallow toads intact before the flock was disturbed and flew away. Given the length of White Ibis bills (Kushlan 1977. Wilson Bull. 89:92–98), the toads were hibernating at a depth of approximately 14–15 cm.

Fig. 1. American White Ibis (*Eudocimus albus*) consuming an adult *Anaxyrus terrestris* in Mackay Island National Wildlife Refuge, North Carolina.

Many birds detect prey by sound (Bell 1979. J. New York Entomol. Soc. 87:126–127; Tuttle and Ryan 1981. Science 214:677–

678). The predation events in Florida occurred because the birds heard the toads calling and were able to pinpoint their locations. Cattle egrets appear to be a primary predator of *A. terrestris*. Fogarty and Hetrick's (*op. cit.*) study of Cattle Egret diets in south Florida yielded 225 juvenile and 42 adult toads in 841 birds. White Ibis uses nonvisual tactile probing and surface pecking to find prey (Safran et al. 2000. Condor 102:211–215). Thus, *A. terrestris* was an opportunistic prey for this species.

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***ANAXYRUS WOODHOUSII* (Woodhouse's Toad). PREDATION.** On the evening of 6 September 2008, we observed and photographed an *Anaxyrus woodhousii* in the process of swallowing a neonate *Crotalus viridis* (Prairie Rattlesnake) near the city of Amarillo, Potter County, Texas, USA (35.27746°N; 101.80901°W, WGS 84; elev. 1058 m). We watched the toad from 2110 h to 2125 and photographed the toad consuming all but the posterior end of the snake from 2110 to 2114 h (Fig. 1). Several *A. woodhousii* gathered on the porch each night to feed on invertebrates that were attracted to the porch lights. Our observation is evidence that, as prey generalists, *A. woodhousii* may eat anything of appropriate size that they encounter in the terrestrial environment (Mitchell 1992. Banisteria 1:13–15). Depredation of rattlesnakes by amphibians appears to be a rare (and probably opportunistic) event. Although consumption of *C. adamanteus* (Eastern Diamond-backed Rattlesnake) by large ranid frogs has occasionally been documented, a recent review of depredation of *C. viridis* lists only mammals, birds, and snakes as predators of this species (Ernst and Ernst 2012. Venomous Reptiles of the United States, Canada, and Northern Mexico, Volume 2, *Crotalus*, John Hopkins University Press, Baltimore, Maryland. 391 pp.).

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***BUERGERIA ROBUSTA* (Robust Buerger's Frog). DIET.** *Buergeria robusta* is an endemic tree frog of Taiwan, inhabiting subtropical forests of low hills throughout the island. *Buergeria robusta* has been frequently observed feeding on flying insects within the canopy (pers. obs.), and a high percentage of Coleoptera and Diptera were found in their stomachs (Do and Lue 1982. J. Taiwan Mus. 25:225–234). In this note I describe an unusual event of *B. robusta* predating *Japalura swinhonis*, an endemic agamid arboreal lizard of Taiwan.

At 1515 h on 23 May 2017, during a field trip to suburban woods east of Taichung City, Taiwan (24.15750°N, 120.82388°E, WGS 84; elev. 536 m), I spotted an adult female *B. robusta* that predated a juvenile *J. swinhonis* in a bush 1 m above the ground. The hind legs and tail of the *J. swinhonis* were protruding from the mouth of the *B. robusta*. Female *B. robusta* are the largest treefrogs in Taiwan, and may reach 77 mm of SVL, according to specimens in our collection, making swallowing a juvenile *Japalura* lizard possible. This is the first record of *B. robusta* feeding on an arboreal lizard.

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***LITHOBATES CAPITO* (Gopher Frog). TADPOLE MORPHOLOGY.** *Lithobates capito* is a rare ranid from the southeastern U.S. that has experienced declines associated with habitat loss

Fig. 1. Comparison of larval morphology of *Lithobates capito* vs. *L. sphenocephalus*. A) Ventral morphology; top *L. sphenocephalus*, bottom *L. capito*. B) Tail fin morphology; top *L. capito*, bottom *L. sphenocephalus*. C) Ventral oral morphology; left *L. capito*, right *L. sphenocephalus*. D) Lateral oral morphology; left *L. capito*, right *L. sphenocephalus*.

throughout its known distribution. It is a species of conservation concern in all states where it occurs (Dodd 2013. Frogs of the United States and Canada. The Johns Hopkins University Press, Baltimore, Maryland. 982 pp.). Monitoring populations and surveying for this species is challenging because male choruses are difficult to detect (e.g., they are relatively quiet) and occur only briefly after winter and spring rains. Non-breeding adults are very difficult to find because they are fossorial. Surveys for egg masses and tadpoles are easier but complicated by the presence of *Lithobates sphenocephalus* (Southern Leopard Frog), a congener with very similar breeding requirements, phenology, and egg and tadpole morphology. The survey tool eDNA can be used to detect the presence of *L. capito* (McKee et al. 2015. J. Fish Wildl. Manag. 6:498–510; J. Godwin, unpubl. data) but increases resource costs. Although dichotomous keys are available for distinguishing the tadpoles of *L. capito* vs. *L. sphenocephalus* (Altig 1970. Herpetologica 26:180–207; Gregoire 2005. Tadpoles of the United States Coastal Plain. USGS Survey Report. Florida Integrated Science Center. 60 pp.; Altig and McDiarmid 2015. Handbook of Larval Amphibians of the United States and Canada. Cornell University Press, Ithaca, New York. 345 pp.), a simple, illustrated key comparing gross physical differences between the two species' tadpoles is needed (Fig. 1) and will be useful for researchers, especially given Dodd's (*op. cit.*) mention that distinguishing them may be impossible. Such a key, based upon Gregoire (*op. cit.*), is provided below. The author has found these features to be most reliable and easy to observe in the field, and has > 25 years experience conducting surveys for *L. capito*.

1a) Intestinal coil not observable through ventral skin, belly light to cream; tail fin with high arch at dorsal insertion; reduced oral papillae – *L. capito*

1b) Intestinal coil observable through ventral skin, belly dark; tail fin with low to medium arch at dorsal insertion; enlarged oral papillae – *L. sphenocephalus*.

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***PHYLLOBATES LUGUBRIS* (Lovely Poison Frog). PREDATOR-PREY INTERACTIONS.** A wide variety of invertebrates and vertebrates prey upon anurans (Toledo 2005. Herpetol. Rev. 36:395–400), yet relatively little is known about predators of chemically defended frogs. Poison frogs contain skin alkaloids, which are thought to be effective at deterring potential predators due to their unpalatable nature (for review, see Saporito et al. 2012. Chemoecology 22:159–168). Anecdotal reports of successful predation upon dendrobatid poison frogs (Dendrobatidae) include an ant, fish, amphibian, and bird, as well as several spiders and snakes (Santos and Cannatella 2011. Proc. Natl. Acad. Sci. 108:6175–6180; Alvarado et al. 2012. Herpetol. Rev. 44:298; Lenger et al. 2014. Herpetol. Notes 7:83–84). Herein, we report a successful predation event on the dendrobatid poison frog *Phyllobates lugubris* by the snake *Coniophanes fissidens* (Yellowbelly Snake).

At 1015 h on 7 October 2015, we observed an adult *P. lugubris* being chased, captured, and subdued by a *C. fissidens* on the soil of the forest floor near Guayacan, Limon, in northeastern Costa Rica (10.024460°N, 83.537174°W; WGS 84). The snake consumed the frog entirely, and appeared unimpaired and unharmed after the predation event. *Phyllobates lugubris* is a conspicuously striped, alkaloid-containing, diurnal frog that inhabits the Caribbean lowland rainforest, and marginally, premontane wet forest from extreme southeastern Nicaragua, through Costa Rica, and into northwestern Panama (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.). Adult *Coniophanes fissidens* are leaf-litter dwelling snakes that are most active during the day and early evening, and are found within the geographic range of *P. lugubris* (Savage, *op. cit.*). The diet of *C. fissidens* is reported to contain a diversity of small vertebrates, including frogs, lizards, snakes, salamanders, and lizard and frog eggs (Savage, *op. cit.*). *Coniophanes fissidens* is also a reported predator upon another dendrobatid, the strawberry poison frog *Oophaga pumilio,* at the La Selva Biological Station in northeastern Costa Rica (Saporito et al. 2007. Copeia 2007:1006–1011), suggesting that this snake may be resistant or tolerant to the effects of alkaloid-based chemical defenses of dendrobatid frogs.

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***RANA AURORA* (Northern Red-legged Frog). EGG INCUBATION PERIOD.** Data on the incubation period of *Rana aurora* eggs under field conditions are scarce, being limited to two published accounts. The most thorough is that of Storm (1960. Herpetologica 16:251–259), who reported on a series of seven *R. aurora* egg masses laid in a small pond in northwestern Oregon (elev. 72 m). The incubation period of these masses were as follows: 35 days (1 mass), 42 days (1 mass), 44 days (1 mass), 49 days (2 masses), and ≥ 50 days (2 masses). Subsequently, Brown (1975. Northwest Sci. 49:241–246) reported that the incubation period of 35 *R. aurora* egg masses laid in a pond in northwestern Washington (elev. 120 m) required, on average, just over 35 days. Based on these two accounts, the incubation period for *R. aurora* eggs under field conditions is 35–50 days. Here, we provide data which reduce the minimum incubation period by 2.5 weeks (18 days) from that reported previously. Here, incubation period is defined as the period of time between egg deposition/fertilization (Gosner stage 1; Gosner 1960. Herpetologica 16:183–190) and the complete emergence of embryos from the egg jelly (Gosner stage 20–22 at this site).

During ongoing studies of *R. aurora* in the Tualatin River Basin, Washington County, Oregon, USA (45.50470°N, 122.99000°W, WGS 84; elev. 39 m), we have observed a range of incubation periods under field conditions. Our observations during the winter of 2015 are typical. In 2015, we monitored the development of 91 *R. aurora* egg masses laid in a floodplain wetland adjacent to the Tualatin River. These egg masses were laid between 14 January and 11 February. The time required for complete hatching of these masses was between 17 and 48 days (mean = 30 days; Fig. 1). Incubation period was inversely related to spawn date: the eggs which were laid first (14–23 January) experienced the longest incubation period (mean = 37 days, range = 25–48 days); those which were laid later (06–11 Feb.) experienced the shortest (mean = 26 days, range = 17–33 days). This difference was probably due to water temperature: measured water temperatures at egg masses increased during the egg development interval. During January, they averaged 7.2°C (range: 4.0–11.1°C); during February, 9.7°C (range: 5.5–14.0°C). Our data extend the documented incubation period of *R.*

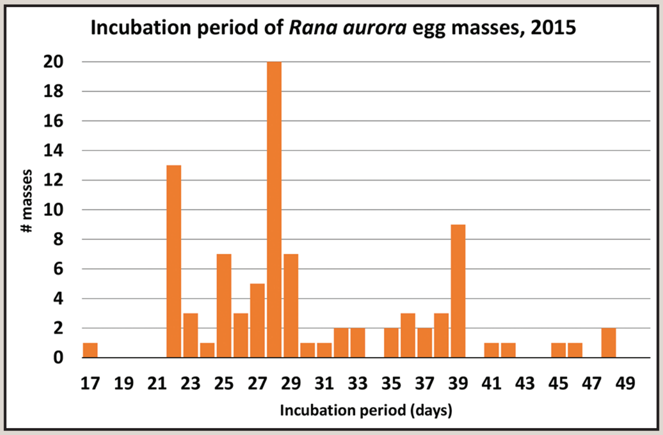

Fig. 1. Incubation period of 91 *Rana aurora* egg masses in a northwest Oregon wetland, 2015.

aurora eggs under field conditions (from 35–50 days) to between 17 and 50 days.

Compared to other North American ranids, *R. aurora* exhibits a relatively long interval for embryonic development, apparently due to the species' habit of breeding in late winter when the water is cold (Storm 1960, *op. cit.*; Licht 1969. Can. J. Zool. 47:1287–1299). In laboratory experiments, eggs incubated at warmer temperatures developed much more quickly: while embryonic development at a constant 4.2°C required 83 days, it was completed in 14.6 days at 12°C, and required only 6.6 days at 19.7°C. (Nussbaum et al. 1983. Amphibians and Reptiles of the Pacific Northwest, University of Idaho Press, Moscow, Idaho. 332 pp.). This illustrates the innate capacity of *R. aurora* embryos for rapid development, and suggests that temperature is indeed the determining factor. We note that water temperature at breeding sites varies widely due to a number of factors, including year (i.e., weather), water source, breeding site depth and exposure, and elevation. Consequently, the actual incubation period exhibited in a field setting will depend on environmental conditions, and we expect it to be even more variable than reported here.

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***RHINELLA ARENARUM* (Common Toad). AVIAN PREDATION.** *Rhinella arenarum* is a medium-sized toad that inhabits in Argentina, Bolivia, Brazil, Paraguay, and Uruguay (Bionda et al 2015. Acta Herpetol. 10:55–62). In San Juan, Argentina, it occurs in various natural and anthropic environments. Here we report the first observation of predation on *R. arenarum* by *Buteo magnirostris* (Roadside Hawk).

At 1347 h on 19 September 2016, near the mouth of San Juan River, Zonda, San Juan Province, Argentina (31.487994°S, 68.688794°W, WGS 84; elev. 776 m), we observed a Roadside Hawk flying and carrying an adult *R. arenarum* in its talons (Fig. 1). Although it is known that *B. magnirostris* feeds on amphibians (Beltzer 1990. Ornitol. Neotrop. 1:3–8; Panasci and Whitacre 2000. Wilson Bull. 112:555–558; Baladrón et al 2011. J. Raptor Res. 45:257–261), our observation is the first record of predation on *R. arenarum* by *B. magnirostris.*

Fig. 1. *Buteo magnirostris* (Roadside Hawk) with an adult *Rhinella arenarum* in its talons, from Zonda Department, San Juan, Argentina.

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***RHINELLA MAJOR* (Granulated Toad). PREDATION.** Anurans are key elements of both terrestrial and aquatic food chains, being prey for a great variety of invertebrates, especially when they are aggregated at breeding sites (Wells 2010. The Ecology and Behavior of Amphibians. University of Chicago Press, Chicago, Illinois. 1162 pp.). Approximately 68 species of adults anurans have been documented as prey for 57 species of invertebrates (Toledo 2005. Herpetol. Rev. 36:395–400). Here, we communicate a case of predation on an adult male of *Rhinella major* (Bufonidae) by a *Lethocerus indicus* (Giant Water Bug; Hemiptera: Belostomatidae). At 1934 h on 27 January 2017, a *L. indicus* was recorded preying on an adult male *R. major* in a temporary pond (10 cm deep) surrounded by secondary forest at Universidade Federal do Amapá, municipality of Macapá, Amapá state, Brazil (0.00640°S, 51.08550°W; WGS 84). During the time of observation, *L. indicus* was grabbing the toad by the gular region. After this, the *L. indicus* completely submerged for 7 min. and continued feeding on the *R. major* supported on the vegetation of the bottom. The observation was recorded on video and is kept in the media files of the Herpetological Collection at the Federal University of Amapá (accession number CECCAMPOS 00001). This record suggests that, when available, adult toads species like *R. major* may constitute important components of the diet of *L. indicus.* This is the first known documented predation of *R. major* by *L. indicus.*

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***SPEA BOMBIFRONS* (Plains Spadefoot). ANISOCORIA.** Anisocoria is a condition characterized by an unequal size of the eyes' pupils. Herein we report the occurrence of anisocoria in a *Spea bombifrons*. On 30 January 2016, a specimen was collected on North Wallace Rd in Hidalgo County, Texas, USA (26.504976°N, 98.5154800°W). The specimen, an adult *S. bombifrons* (40.8 mm SVL) possessed unequal size of the pupils. When exposed to daylight and darkness the right pupil would shrink or expand, respectively. By contrast, the left pupil would not dilate when exposed to darkness nor noticeably shrink when exposed to daylight. Most unilateral ophthalmic abnormalities documented in frogs are suggestive of trauma or focal disease (Ballard and Cheek 2003. Exotic Animal Medicine for the Veterinary Technician. Blackwell Publishing, Hoboken, New Jersey. 379 pp.). Stimulation or damage to sensory nerves is known to cause pupil dilation (Klopper 1951. Acta. Physiol. Pharmacol. Neerl. 2:81–83) as are subcutaneous drug injections and direct exposure to certain chemicals (Meltzer and Auer 1904. Am. J. Physiol. 11:449–454; Wright and Whitaker, 2001. Amphibian Medicine and Captive Husbandry. Krieger Publishing, Malabar, Florida. 449 pp.). Based upon examination in the field and subsequent examination of the preserved specimen there are no obvious external injuries. However, it remains unclear if the condition resulted from traumatic injury, association with disease or exposure to chemicals. Additionally we are unable to ascertain if this case of anisocoria was of recent origin or a longer held affliction.

The specimen was deposited at the Amphibian and Reptile Diversity Research Center at the University of Texas at Arlington (UTA A 63794) and was collected under Texas Parks and Wildlife Scientific Permit number SPR-0913-130. An in-vivo image of the frog was deposited in the UTA Digital Collection (UTADC 8758).

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***SPHAEROTHECA BREVICEPS* (Indian Burrowing Frog) and *UPERODON SYSTOMA* (Marbled Balloon Frog) INTERSPECIFIC AMPLEXUS.** At 2200 h on 16 June 2016, near Billur Village of Jath Tehsil in Sangli District, Maharashtra state, India (16.59070°N, 75.10780°E, WGS 84; 726 m elev.), we recorded an unusual interspecies amplexus between a *Sphaerotheca breviceps* (Dicroglossidae) male with *Uprodon systoma* (Microhylidae) female (Fig. 1) in temporary rain water pool near a road side. *Sphaerotheca breviceps* and *U. systoma* are widespread species in South Asia found in the drier region of India. Both are excellent burrowers that bury themselves in loose soil. They breed in ephemeral and permanent water bodies and also in modified areas such as agricultural land. At this site both species are reproductively active simultaneously, although *U. systoma* is active during the early monsoon period (June–July) while *S. breviceps* breed only after occasional heavy rain (Daniel 2002. The Book of Indian Reptiles and Amphibians. Oxford University Press, Oxford. 238 pp.). When the breeding season of two or more species overlaps in space and time together, amplexus between two different species may occur (Hobel 2005. Herpetol. Rev. 35:55–56). Due to irregular rainfall during the monsoon, availability of mating sites and number of mates in both species is low and probably resulted in the observed interspecies amplexus.

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TESTUDINES — TURTLES

***CARETTOCHELYS INSCULPTA* (Pig-nosed Turtle). SCAVENGING.** Accurately determining the complete diet of turtle species can be difficult. Dissections of many individuals are often not permitted or wise (e.g., in threatened species). Stomach flushing, while effective, can underestimate the prevalence of animal prey in which mostly soft tissues are ingested, compared to those with harder parts such as insect exoskeletons or mollusk shells, or plant material with cell walls. Yet, infrequent dietary items can be energetically important to individual animals (Greene 1986. Fieldiana Zool. 31:1–12). Direct observations of feeding can thus be valuable in understanding full dietary breadth. *Carettochelys insculpta* is a highly aquatic turtle found in southern New Guinea and a few rivers in northern Australia (Cogger 2000. Amphibians and Reptiles of Australia. Reed New Holland, Sydney. 796 pp.). In Australia it is omnivorous, but primarily herbivorous (Georges and Kennett 1989. Wildl. Res. 16:323–335). Herein I report observations of *C. insculpta* scavenging on wallaby carcasses.

The Agile Wallaby is a small (16–27 kg) macropod inhabiting floodplains in northern Australia (Van Dyck and Strahan 2008. Mammals of Australia. Reed New Holland, Sydney. 887 pp.). This species prefers to drink free water (Bell 1973. Mammalia 37:527–544), and visits rivers, streams, and billabongs during the dry season, bringing it into contact with predatory crocodiles (Doody 2007. Ethology 113:128–136; Steer and Doody 2009. Anim. Behav. 78:1071–1078). In the Daly River, the Saltwater Crocodile, *Crocodylus porosus*, and perhaps large individuals of the Freshwater Crocodile, *C. johnstoni*, prey upon the wallabies (Doody et al. 2007, *op. cit.*, and references therein; R. Somaweera, unpubl. data). However, the size of most individual crocodiles prohibits consuming the entire wallaby in one feeding bout (Webb and Manolis 1989. Crocodiles of Australia. Reed, Sydney. 160 pp.), and so the carcasses are cached (Doody et al. 2009, *op. cit.*). Some are guarded, but many are left at the river's edge or on snags in the river, where the crocodile can return to feed on them. The unguarded caches are vulnerable to theft from other animals, however, including other crocodiles and turtles in the water, and on land by Dingos (*Canis lupus*), White-bellied Sea Eagles (*Haliaeetus leucogaster*), Black Kites (*Milvus migrans*), Whistling Kites (*Haliastur sphenurus*), and Yellow-spotted Monitor Lizards (*Varanus panoptes*) (S. Doody, unpubl. obs.).

Between 2000 and 2007, during the dry season, I observed 41 floating carcasses of Agile Wallabies (*Macropus agilis*) in the Daly River, Northern Territory, Australia (including 28 reported in Doody et al. 2009. Herpetol. Rev. 40:26–28). The river stretch extended from approximately 20 km upstream of Oolloo Crossing (14.071093°S, 131.251378°E; WGS 84), downstream to the junction of the Douglas River. I recorded 47 *C. insculpta* scavenging on 25 wallaby carcasses; the majority of the observations were during the day, but *C. insculpta* were also observed feeding on carcasses at dusk and after dark. The number of turtles scavenging a single carcass ranged from one to five. All observed turtles were adults. Although some turtles could be sexed from the boat in shallow water, many could not, but I observed both sexes feeding on carcasses. Behaviorally, turtles nuzzled the carcasses and bit pieces from them, sometimes using their front limbs against the carcass for leverage. In most cases the boat disturbed the turtles, causing them to quickly swim away. In several cases turtles followed carcasses that were floating downstream with the current. Our research crew exploited the turtles' fondness for wallaby meat by using roadkill wallabies as bait in hoop nets, and capture success was high (Doody 2002. The Ecology and Sex Determination in the Pig-nosed Turtle, *Carettochelys insculpta*, in the Wet-dry Tropics of Northern Australia. Ph.D. Thesis, University of Canberra. 242 pp.).

My observations, coupled with unpublished observations of *C. insculpta* feeding on three wallaby carcasses by Heaphy (1990. The Ecology of the Pig-nosed Turtle, *Carettochelys insculpta*, in Northern Australia. Ph.D. Thesis, University of Canberra. 550 pp.), suggest that scavenged animal matter may be important to this primarily herbivorous species, at least in Australia. Although the majority of its dry-season diet in Australia is plant material, especially the fruits and leaves of figs (*Ficus*), flowers (*Melaleuca*), and ribbonweed (*Vallisneria*), small molluscs and aquatic insects are eaten, and fish and flying foxes (*Pteropus*) are probably taken as carrion (Georges and Kennett 1989. Aust. Wildl. Res. 16:323–335). Two studies flushed the stomachs of Daly River *C. insculpta* to determine diet. Heaphy (1990, *op. cit.*) stomach-flushed 93 individuals, finding mainly *Vallisneria* spp. (97% occurrence, 87% by volume), figs (15%, 2.6%), and molluscs (75%, 3.9%). Welsh (1999. Resource Partitioning among the Freshwater Turtles of the Daly River, Northern Territory. Honors thesis, University of Canberra) flushed 74 individuals, also finding mainly *Vallisneria* spp. and molluscs. Either the consumption of meat from wallaby carcasses occurs too infrequently to be have been detected in stomach-flushing studies, and/or the soft, readily digestible parts were not evident. Although I cannot discern between these two hypotheses, our observations of carcass feeding contribute to a more complete knowledge of the diet of *C. insculpta* in Australia. The affinity of *C. insculpta* for wallaby meat probably indicates a role for high-protein items in their metabolism. More broadly, these observations highlight the value of direct feeding observations as a supplement to quantitative dietary studies using stomach flushing, fecal analysis, and other methods.

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***CLEMMYS GUTTATA* (Spotted Turtle). LONGEVITY.** Based on survivorship estimates from a 24-year mark-recapture study with *Clemmys guttata*, Litzgus (2006. Copeia 2006:281–288) estimated that longevity could be as high as 65 years for males and 110 years for females. However, recaptures of individuals across many years could provide valuable support for these estimates and, unfortunately, such observations are rare in the wild. Here we report on two observations of *C. guttata* originally captured and marked as adults in 1989, and recaptured 28 years later.

At 1100 h on 21 April 2017, we observed a *C. guttata* male basking on the side of a small, forested seasonal pool (Fort Belvoir Military Installation, Fairfax County, Virginia, USA: 77.136199°W, 38.733331°N; WGS 84). This male was originally captured on 26 April 1989, and given a unique ID by filing notches into the marginals (Ernst 1974. Trans. Kentucky Acad. Sci. 35:27–28). Upon initial capture, the male's max plastron length (MPL: 94.1 mm) suggested that he was likely an adult (Ernst 1970. Herpetologica 26:228–232; Litzgus 2006, *op. cit.*). We measured the male's plastron length to 92 mm, and his carapace and plastron were worn completely smooth (Fig. 1). If the male was an adult during the 1989 capture, then the turtle is now a minimum of 39 years old. We then observed a second *C. guttata* at 1200 h, active under leaf litter in a small, forested seasonal pool (77.135384°W, 38.731479°N; WGS 84). This female was originally captured and marked on 6 April 1989. Upon initial capture, the female's max plastron length (MPL: 101.6 mm) suggested that she was likely an adult (Ernst 1970, *op. cit.*; Litzgus 2006, *op. cit.*). We measured the female's plastron length to 100 mm, and her carapace and plastron were also worn completely smooth. If the female was an adult at the 1989 capture, then the turtle is now a minimum of 40 years old. Although GPS coordinates for the initial captures were not available, the turtles were captured on an adjoining property, located approximately 1000–4500 m (straight-line distance) from the recapture locations.

Fig. 1. A male *Clemmys guttata*, originally captured as an adult in 1989 and recaptured in 2017.

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***EMYS ORBICULARIS* (European Pond Turtle). ECTOPARASITES.** European Pond Turtles are often parasitized by the leech *Placobdella costata* (Ayres and Alvarez 2008. Acta Biol. Univ, Daugavpiliensis 8:53–55). During parasite monitoring of *E. orbicularis* populations from northwestern Spain, turtles were captured using shrimp traps on the muddy shore of a forest pond near the Tioira River, Ourense province, Spain (42.1440°N, 7.3856°W, ETRS 89; 508 m. elev.), from May to September 2015. Turtles were identified and checked for anomalies and parasites. Leeches were stored in a plastic tube and were sent to the laboratory to be identified.

Two *Emys orbicularis* were captured during the summer of 2015 with leeches on their bodies. A male presented with seven leeches, and a female presented with six. Leeches were identified as *Helobdella stagnalis* due to the presence of a chitinized nuchal scute (Sawyer 1986. *In* R. T. Sawyer [ed.], Leech Biology and Behavior, pp. 419–793. Science Publications, Oxford).

Further research would be necessary to determine whether *H. stagnalis* parasitized these turtles or if this represents a symbiotic or commensal relationship.

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***GLYPTEMYS INSCULPTA* (Wood Turtle). FEMALE-FEMALE AGGRESSION AT NEST SITE.** There are records of male-male, male-female, and female-male *Glyptemys insculpta* aggression (Barzilay 1979. J. Herpetol. 14: 89–91; Brewster and Brewster 1988. Bull. Chicago Herpetol. Soc. 23:144), but apparently no reports have been published of female-female aggression. Fairly regular male-female aggression and one instance of female-male aggression was observed in a small, captive population of *G. insculpta* (Brewster and Brewster 1988, *op. cit.*). Each of the aforementioned records occurred during courtship. Aggressive female-female behavior may be less common, and females have been observed to share nest sites without interaction (Harding and Bloomer 1979. Bull. New York Herpetol. Soc. 15:9–26).

At ca. 1930 h on 13 June 2017, while conducting a *G. insculpta* nesting survey on the Wisconsin River in Oneida County, Wisconsin, we observed a single large female *G. insculpta* (Female A) exhibiting nesting behavior. While Female A was in the process of excavating, a second, smaller female *G. insculpta* (Female B) approached the open, sandy area along a two-track road. The open area was ca. 5.0 m × 5.0 m with a substrate of predominately sand and traces of pea size gravel, surrounded by dense brush and forest, more than 50 m from the river. A small creek runs along the other side of the two-track road ca. 15 m from the open area and is the nearest waterway and the most likely route of approach. Female B excavated several shallow holes while approaching Female A, who appeared to be in the process of excavating a nest. When Female B approached Female A, they came together nose to nose for ca. 30–45 sec. At that point, Female B began exhibiting aggressive behavior toward Female A, chasing her around the site with mouth open, trying to bite her legs and tail. Female B eventually chased Female A off the site entirely, and then returned to the hole that Female A had excavated and began digging there herself. We observed for ca. 20 min more, at which point Female B left the nest site without depositing eggs. When Female B exited the open sandy area, she was captured, and confirmed to be gravid. Female A was also captured ca. 3 m from the site and confirmed gravid. We returned the next morning ca. 0800 h, 14 June 2017, and found Female B in the process of finishing a nest. We confirmed there were eggs in the nest. We collected non-invasive measurements, pit-tagged, and then released Female B.

We had been monitoring the nest site every night and on rainy mornings since 6 June 2017. We had observed Female A at the nest site for two nights and one morning prior to this observed interaction, but this account describes the first time we observed Female B at this nest site.

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***GRAPTEMYS FLAVIMACULATA* (Yellow-blotched Sawback). SHELL ABNORMALITY AND LONG-TERM SITE FIDELITY.** Recent literature examples of shell abnormalities in the genus *Graptemys* are typically associated with kyphosis of the spine (Selman and Jones 2012. Chelon. Conserv. Biol. 11:259–261; Louque et al. 2015. Herpetol. Rev. 46:81). However, relatively little has been reported on other developmental shell abnormalities in the genus (but see Carpenter 1958. Herpetologica 14:116). Along with a lack of information on shell abnormalities, little is known of species of *Graptemys* regarding long-term site fidelity of individuals (Jones 1996. J. Herpetol. 30:376–385). Currently, 14 *Graptemys* species are recognized, with *G. flavimaculata* being endemic to the Pascagoula River and its tributaries of southern Mississippi, USA (Lindeman 2015. The Map Turtle and Sawback Atlas: Ecology, Evolution, Distribution, and Conservation. Oklahoma University Press, Norman. 460 pp.). Herein, I describe a male *G. flavimaculata* with a shell abnormality that was captured three times in the same location over a 2.5-year period.

On 27 September 2005, a juvenile male *G. flavimaculata* (ID: R2-L8) was captured during sampling efforts on the Leaf River (Forrest County, Mississippi, USA). R2-L8 had a plastron length of 5.8 cm and a body mass of 25 g. Upon closer examination, R2-L8's plastron had a scoliosis-like appearance (Fig. 1A). This was primarily manifested through the longer midline lengths of the left pectoral and abdominal scutes in comparison to the right side counterparts, while the left femoral scute was shorter relative to the right femoral scute. The result was a plastron midline in the shape of a shallow "S." The carapace was also slightly misshapen (i.e., right rear carapace slightly compressed toward midline; left side of carapace slightly projecting out), but this is not readily evident via dorsal photograph (Fig. 1B). Even though both the plastron and carapace were abnormal, the carapace was not kyphotic.

Following the September 2005 capture, R2-L8 was recaptured twice in the same area on 2 August 2007 and 16 April 2008, and the shell abnormalties persisted during both of these capture events. R2-L8's plastron length was similar for both recapture events (7.7 cm), but there was a slight decline in body mass between the 2007 (90 g) and 2008 capture events (75 g). The basking location where the individual was captured was the same branch in 2005 and 2008, but it was a slightly different nearby snag in 2007 (within GPS accuracy ≤ 4.5 m).

Reports of shell abnormalities are becoming more commonly reported by researchers, especially in the genus *Graptemys*. However, there is no information to date on developmental shell abnormalities reported in *G. flavimaculata*. Kyphosis has been reported in the sister taxon, *G. oculifera* (Selman and Jones, *op. cit.*) and a more distant member of the genus, *G. sabinensis* (Louque et al., *op. cit.*). The present observation is relatively similar to a *Terrapene carolina* (Eastern Box Turtle) recently reported as having deformities of both the plastron and carapace (Palis 2017. Herpetol. Rev. 48:181).

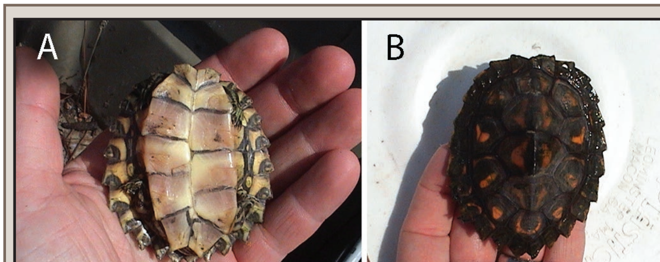

Fig. 1. Ventral (A) and dorsal (B) views of a male *Graptemys flavimaculata* (R2-L8) exhibiting shell abnormalities of the plastron and carapace.

Along with the shell abnormality, R2-L8 exhibited a high level of basking site fidelity over 2.5 years (932 days). Because this animal was not being tracked in the intervening periods, it is unknown how much movement the animal made beyond this small area. However, Jones (*op. cit.*) detailed a telemetered male that moved ~10 km but was later recaptured on the same basking structure 9 months later. The observations reported herein and by Jones (*op. cit.*) indicate that *Graptemys* individuals may have high affinities to certain basking structures, and their affinity may occur over a long period of time if that structure remains available in the environment. Thus, this observation further underscores of the importance of maintaining deadwood basking structures in rivers for *G. flavimaculata* and other southeastern *Graptemys* species.

The observations reported herein were completed in association with the dissertation work of WS at The University of Southern Mississippi and was approved by the USFWS, MDWFP, and the USM Institutional Animal Care and Use Committee (IACUC #07032201).

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***MACROCHELYS TEMMINCKII* (Alligator Snapping Turtle). HOOK, MONOFILAMENT LINE, AND SINKER.** Alligator Snapping Turtles are known to consume a variety of digestible and indigestible objects; some of the more unusual non-food items include cardboard, fishhooks, rocks, rubber, and wood (Ernst and Lovich 2009. Turtles of the United States and Canada. Johns Hopkins University Press, Baltimore, Maryland. 827 pp.) in addition to monofilament line wrapped around fish-head baits (Sloan et al. 1996. Chelon. Conserv. Biol. 2:96–99). Herein, we report on another incident involving monofilament line.

While trapping for *Macrochelys temminckii* on 27 June 2013 in Salado Creek, Independence County, Arkansas, USA (35.685197°N, 91.567394°W, WGS 84; 69 m elev.) as part of a long-term, mark-release investigation on this species (Trauth et al. 2016. J. Arkansas Acad. Sci. 70:235–247), we captured a male turtle (standard carapace length = 31.3 cm; plastron length = 24.2 cm; 7.7 kg) that possessed a monofilament line of around 20 cm in length trailing from its vent. A gentle tugging of the line did not dislodge its internal attachment, which, presumably, was secured by a hook. Among the plausible scenarios to explain the aforementioned condition, we speculate that the turtle consumed a fish that had already swallowed a fisherman's baited hook. Prior to consumption, the fish could have entangled itself in a submerged rootwad (a very common submergent feature in this creek), leading to the breakage of the monofilament line. The turtle could have then eaten the fish without the hook becoming embedded in its alimentary tract until partial or complete digestion of the fish had occurred. Additional foodstuffs traveling through the alimentary tract of the turtle could have then forced the monofilament line out the vent.

We thank the Arkansas Game and Fish Commission, and especially Kelly Irwin, for written permission to trap Alligator Snapping Turtles in Salado Creek through the authority of annual scientific collection permits to SET.

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***PSEUDEMYS GORZUGI* (Rio Grande Cooter). MAXIMUM CLUTCH SIZE.** *Pseudemys gorzugi* is a relatively large riverine turtle native to New Mexico and Texas within the United States of America (USA), with its range extending to Tamaulipas, Nuevo León, and Coahuila in Mexico. This is one of the least studied freshwater turtle species in North America, and very little is known about their reproductive ecology. On 13 June 2017, we captured a female *P. gorzugi* (265 mm straight line carapace length) via snorkeling at Camp Washington Ranch pond in Eddy County, New Mexico, USA (32.114469°N, 104.457804°W; WGS 84). The female was transferred to Albuquerque Biological Park for inclusion in a newly established captive breeding program. A radiograph revealed that the female was gravid, carrying 12 eggs (Fig. 1). On 9 July 2017, she deposited all twelve eggs. This is the third confirmed account of *P. gorzugi* clutch size and also the largest reported clutch size for the species. Mean egg length was 40.3 mm (SD = 0.26), mean egg width was 31.1 mm (SD = 0.13), and mean egg mass was 16.2 g (SD = 0.16). Previous accounts all come from New Mexico and include a female with a carapace length of 240 mm which deposited nine eggs in May with mean egg length of 42 mm and mean egg width of 31 mm (Degenhardt et al. 1996. Amphibians and reptiles of New Mexico. University of New Mexico Press, Albuquerque, New Mexico. 431 pp.), and a female with a carapace length of 242 mm that deposited ten eggs in

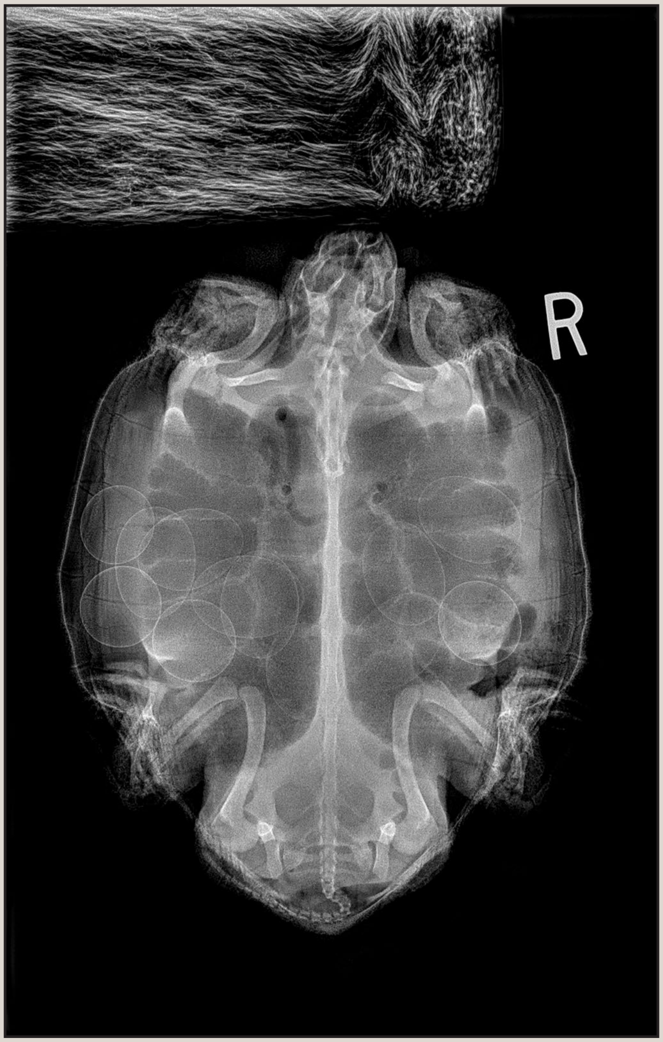

Fig. 1. A radiograph of a gravid adult female *Pseudemys gorzugi* bearing 12 eggs. Individual was caught on 13 June 2017 in Eddy County, New Mexico.

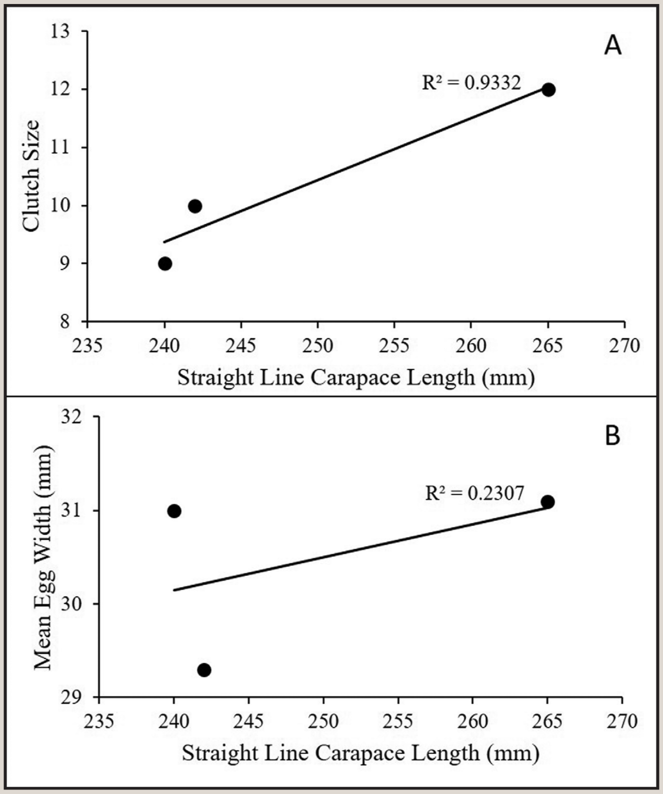

Fig. 2. Clutch size versus female carapace length (A) and mean egg width versus female carapace length (B) of *Pseudemys gorzugi*.

June with mean egg width of 29.3 mm (SD 1.1; Lovich et al. 2016. West. N. Am. Nat. 76:291–297). We additionally note the possible increase in clutch size (Fig. 2A) but not necessarily egg size (Fig. 2B) with increase in female size. From these accounts, we can assume that the nesting season of *P. gorzugi* in New Mexico is between May and July.

This research was approved by the landowner, New Mexico Department of Game and Fish issued to Eastern New Mexico University (Permit Authorization No. 3621) and Albuquerque Biological Park (Permit Authorization No. 3533), and Eastern New Mexico University IACUC (Approval #03-02/2016). This work was supported in part by the Share with Wildlife Program at New Mexico Department of Game and Fish and State Wildlife Grant T-32-4, #18.

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***PSEUDEMYS GORZUGI* (Rio Grande Cooter). INGESTED FISH HOOK.** Recent studies have shown that the prevalence of fish hook ingestion by freshwater turtles can range from 0 to 33% depending on the species and location (Steen et al. 2014. PLoS ONE 9: e91368). Freshwater turtles are vulnerable to recreational fishing and there is an increased risk of mortality in freshwater turtles that have ingested hooks (Steen and Robinson 2017. Conserv. Biol. doi:10.1111/cobi.12926). On 12 July 2017, we captured a female *Pseudemys gorzugi* (carapace length = 151 mm) via snorkeling at the Cottonwood Day Use Area (34.09547°N, 104.46755°W; WGS 84) along the Black River in Eddy County, New Mexico, USA. The site is managed by the Bureau of Land Management (BLM) and is often used by the public for recreational activities. The captured turtle had a fishing line protruding from its mouth and upon further investigation, a hook could be seen in the back of the throat. Given that many anglers use the site for recreational fishing, the turtle was likely an accidental by-catch. We took the turtle to the Desert Willow Wildlife Rehabilitation Center in Carlsbad, New Mexico, where a radiograph revealed the position of the hook. The hook was surgically removed and turtle released at the site of capture. Our observation is the first evidence of fish hook ingestion by *P. gorzugi*, believed to be a predominantly herbivorous species, and suggests potential negative effects of recreational fishing on this conservation sensitive species. The species is currently listed as threatened in New Mexico and is awaiting the decision for federal listing by the US Fish and Wildlife Service. Further observations on the prevalence of fish hook ingestion by *P. gorzugi* along the Black River, and evaluating the mortality rates caused by hook ingestion, will help clarify this additional threat to the species' sustainability.

This research was approved by BLM, New Mexico Department of Game and Fish (Permit Authorization No. 3621), and Eastern New Mexico University IACUC (Approval #03-02/2016). This work was supported in part by the Share with Wildlife Program at New Mexico Department of Game and Fish and State Wildlife Grant T-32-4, #18.

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***TRACHEMYS SCRIPTA ELEGANS* (Red-Eared Slider). ABNORMAL SHELL MORPHOLOGY WITH KYPHOSCOLIOSIS.** Kyphosis is a spinal deformity (Rhodin et al. 1984. Brit. J. Herpetol. 6:369–373) that typically presents as an exaggerated doming of the carapace (Taylor and Mendyk 2017. Herpetol. Rev. 48:418–419) and has been described in numerous chelonian species, as reviewed by Plymale et al. 1978 (Southwest. Nat. 23:457–462). Several observations note this condition in *Podocnemis erythrocephala* (Red-Headed Amazon River Turtle; Bernhard et al. 2012. Herpetol. Rev. 43:639), *Graptemys sabinensis* (Sabine Map Turtle; Louque et al. 2015. Herpetol. Rev. 46:81), *Podocnemis sextuberculata* (Six-tubercled Amazon River Turtle; Perrone et al. 2016. Herpetol. Rev. 47:287, and *Apalone ferox* (Florida Softshell Turtle; Taylor and Mendyk 2017, *op. cit.)*. A recent study documented growth in one juvenile kyphotic *Graptemys oculifera* (Ringed Sawback; Selman and Jones 2012. Chelon. Conserv. Biol. 11:259–261); two recaptured adults had negligible growth in a long term mark-recapture study.

Kyphoscoliosis is a condition that includes both dorso-ventral and lateral undulations of the spine, and is less common than kyphosis, but has been described in *Deirochelys reticularia* (Florida Chicken Turtle; Mitchell and Johnston 2014. Herpetol. Rev. 45:312), and *Pseudemys suwanniensis* (Suwanee Cooter; Mitchell and Johnston 2016. Herpetol. Rev. 47:127–128). Herein we describe an extremely deformed *Trachemys scripta elegans* with severe spinal deformity suggestive of kyphoscoliosis.

Trachemys s. elegans is a locally abundant turtle species occurring throughout most of Louisiana (Boundy and Carr 2017. Amphibians & Reptiles of Louisiana. An Identification and Reference Guide. Louisiana State University Press, Baton Rouge. 386 pp.). Kyphosis has been reported in *T. s. elegans*, in which it appears to be rare (identified in 0.06% of 21,786 specimens;

Fig. 1. *Trachemys scripta elegans* with kyphoscoliosis.

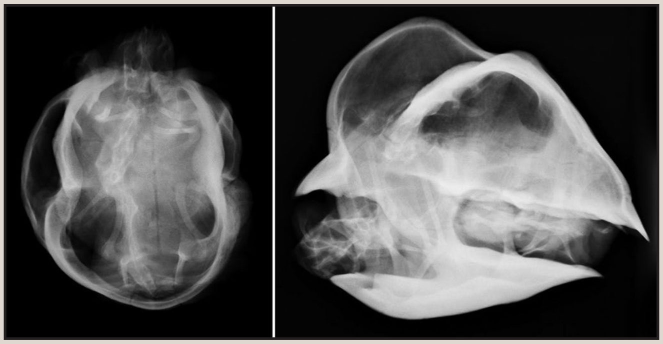

Fig. 2. Radiographs of *Trachemys scripta elegans* with kyphoscoliosis; anterior-posterior view on left and lateral view on right.

Tucker et al. 2007. Herpetol. Rev. 38:337–338). In mid-June 2017, an abnormal *T. s. elegans* was observed by a resident in Vermilion Parish in southwest Louisiana. The turtle was seen in a shallow crawfish pond between the towns of Kaplan and Gueydan. The water in the pond was estimated to be "a few inches" deep and muddy; the turtle's domed carapace was readily visible above the water line. On 12 July 2017, we obtained the specimen which we determined to be an adult female, and took measurements and photos (Fig. 1). The carapace length was 13.0 cm, shell height was 10.3 cm, carapace width was 10.7 cm at the widest point and 8.9 cm at the narrowest point; and the mass was 845 g. The digits of the right forelimb were absent but the forelimb stump was well-healed. The carapace had two large protuberances, the plastron was convex with some mild abrasions possibly due to recent confinement; otherwise the turtle appeared healthy and mobile. In addition to the shell deformities, the misshapen shell may have precluded complete forelimb retraction, making the distal limb more susceptible to consumption by a predator. Also, the neck retracted abnormally into the shell, with the head rotated ca. 45° off-center (Fig. 1), likely as a result of the deformities.

Radiographs were obtained (Fig. 2) from a local veterinary clinic, and we believe the findings are consistent with kyphoscoliosis. Surprisingly the spinal column did not completely follow either protuberance, which contained mostly free air, thus the cause of portions of the shell deformity is unclear. Although the specimen was collected during the breeding season for this species, we did not note any hard-shelled eggs on the radiographs. Plymale et al. 1978 (*op. cit.*) suggested kyphosis could be a barrier to successful copulation, however a kyphotic female *A. spinifera* was described as gravid (Burke 1994. Herpetol. Rev. 25:23, and noted in Taylor and Mendyk 2017, *op. cit.*).

Little is known about the etiology of kyphosis, but suspected causes are reviewed in Plymale et al. 1978 (*op. cit.*) and several hypotheses are discussed in Tucker et al. 2007 (*op. cit.*). Distorted shells in turtles can be due to metabolic bone disease or prior trauma, and scute abnormalities can be congential or secondary to metabolic bone disease (Boyer 1996; Turtles, Tortoises, and Terrapins. *In* Mader. Reptile Medicine and Surgery. W. B. Saunders Co., Philadelphia, Pennsylvania. 512 pp.). Shell deformities causing an hourglass or figure-eight like appearance with transverse constriction of the carapace and plastron have been caused in this species after entrapment in a nylon band (Odum 1985. Herpetol. Rev. 16:113) and a rubber "O" ring (McLeod 1994. Herpetol. Rev. 25:116–117); a similar observation was noted in *Chelydra serpentina* (Snapping Turtle) with constriction caused by a plastic ring (Dietz and Ferri 2003. Herpetol. Rev. 34:56). The extreme shell abnormalities seen in the specimen described herein may have been congenital or possibly secondary to prior entrapment in a foreign object, but the precise cause is unknown.

We thank Lonnie Campbell for bringing this specimen to our attention and Martin Richard for capture of the turtle. We greatly appreciate the assistance of Dr. Jeff Aguillard and staff of Bayou South Animal Clinic (Lake Charles, Louisiana) for assistance with radiographs.

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CROCODILIA — CROCODILIANS

***CAIMAN LATIROSTRIS* (Broad-snouted Caiman). ZOONOSIS.** *Caiman latirostris* occupies different trophic levels ranging from secondary consumer to top-chain predator (Soares et al. 2011. Check List 7:290–298). Therefore, these animals can play an important ecological role in the control of aquatic trophic chains in wetlands. According to the International Union for Conservation of Nature criteria (IUCN 2017), this species is classified as "low risk, least concern" because it has a wide geographic distribution among continental aquatic environments in Argentina, Bolivia, Paraguay, Uruguay, and Brazil. Currently, habitat loss is the main threat to *C. latirostris* populations. However, hunting is still an important contributing factor for population reductions and is associated with public health problems that can occur when local human populations consume these animals, because the meat can carry opportunistic microorganisms that act as sources of infection. Our intent in this note is to bring to attention the risk of zoonosis by fungi present in the gastrointestinal tract of *C. latirostris*; these microorganisms can contaminate caiman meat and may cause severe infections in immunosuppressed individuals.

To investigate the presence of zoonotic pathogenic fungi in the oral and cloacal regions, we swabbed these areas on 30 free-living *C. latirostris* living in a secondary forest in Espírito Santo State in southeastern Brazil (20.2366°S, 40.2358°W). Caimans were captured with a noose at night. Each caiman was restrained and its mouth closed with tape before swabbing. Each swab was then inoculated onto agar plates containing specific media to permit the identification of different fungal types. Caimans were released immediately after swabbing.

After incubation, 30% of these samples (9 out of 30 individuals) were fungi-positive. Among them, three mouth and cloaca

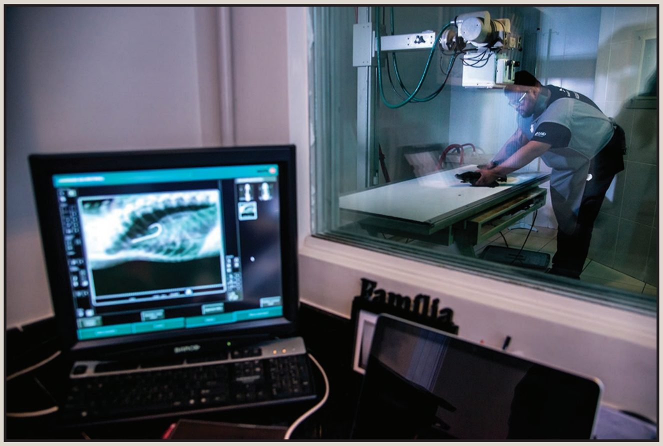

Fig. 1. Illegal *Caiman latirostris* hunting with hook and line is a common practice in Brazil. This caiman was rescued in May 2017 at our study site at Espírito Santo in southern Brazil. The hook can be seen in the esophagus region on the radiographic image.

samples were positive for *Penicillium* spp., two cloaca samples were positive for *Candida* spp. and *Aspergillus* spp., and one cloaca sample was positive for *Paecilomyces* spp. and *Fusarium* spp. The fungi *Aspergillus* sp., *Penicillium* spp. and *Fusarium* spp. are considered important mycotoxin producers, which are the toxins responsible for transient or chronic poisoning if ingested by humans or animals. These mycotoxins can trigger renal, hepatic, circulatory, and gastrointestinal problems as well as nervous system disorders (Vecchia and Castilhos-fortes 2007. Ciênc. Aliment. 27:324–327). Infections by *Candida* spp., which usually only cause oral cavity infections, can initiate systemic infection in immunocompromised patients and can then become a serious public health problem in hospitals (Giolo and Svidzinski 2010. Bras. Patol. Med. Lab. 46:225–234). The fungi from *Paecilomyces* spp. are well known as pathogens in animals, but their role in human diseases may have been underestimated. Studies show the role of these fungi in ophthalmic, pulmonary, nasal sinus, heart, and skin problems in humans (Nogueira et al. 2012. Brasília Med.49:221–224).

Brazilian law (Law No. 5.197 from January 3rd, 1967, amended by Law No. 7.653 from February 12th, 1988) prohibits caiman hunting. However, the mere existence of a law does not guarantee the absence of hunting; in fact, hunting is still a common activity (Fig. 1) and caiman meat has been commercialized under precarious hygienic conditions (Coutinho et al. 2013. Biod. Bras. 3:13–20). The data presented here reinforce the need for increased awareness in the human population about the risks of caiman meat consumption and intensification of hunting control, including the application of severe penalties by the corresponding Brazilian authorities for those who commit this type of hunting crime.

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***CROCODYLUS ACUTUS* (American Crocodile). DIET.** The American Crocodile is a widely distributed species ranging from the north Pacific coast of Mexico south to Ecuador and the Atlantic coast from Florida south to Colombia and the Caribbean (Thobjarnarson et al. 2006. Biol. Conserv. 128:25–36). The diet of the American Crocodile in marine environments is known to be diverse and includes insects, mollusks, crustaceans, fish, birds, reptiles and mammals (Platt et al. 2013. J. Herpetol. 47:1–10). Here we report a unique secondary prey composition recovered from defecation piles of a marine population of *C. acutus*.

During March 2017, we surveyed *Crocodylus acutus* on Cayo Centro Island in the atoll of Banco Chinchorro Biosphere Reserve, Yucatán, México (18.58688°N, 87.31155°W; WGS 84). This population lives in small lagoons surrounded by mangrove trees within the island (approx. 5 km long and 1 km wide). The water salinity of the mangrove has a mean of 52.9 ppt and a range of 30 ppt to 61 ppt (Charruau et al. 2005. Herpetol. Rev. 36:390–395). Numerous tracks of large crocodiles were located exiting the mangrove swamp and entering the sea over beaches.

Between the shore and mangrove, we found five large scat piles measuring approximately 15 m^2. Each was devoid of vegetation and had a light-green colored matrix. The piles were covered with hard parts of partially digested animals, including coral fragments, gastropods, and bivalves (Fig. 1). Numerous undigested malacostracean parts were also recovered in the piles. The recovered items ranged in size: coral fragments (0.4–5.9 cm), bivalves (0.6–6.9 cm), malacostraceans (1.4–8.2 cm), and gastropods (0.3–6.9 cm). All malacostracean parts showed no signs of acid etching, suggesting they are remains of individuals captured on the piles by birds. Terrestrial crabs are common at the site and there are no non-avian terrestrial vertebrates that would have fed on them.

Although several small lizards are present, the only large-bodied terrestrial animal on the island are iguanas (*Iguana iguana*). The mangrove swamp is also populated only by small fishes. These circumstances make it likely that large juveniles and adult *C. acutus* are feeding on the barrier reef surrounding the island. The coral fragments and small gastropods and bivalves suggest the crocodiles are feeding in the reef, and that the corals and mollusks are probably secondary prey rather than targeted prey. The reef has an active Caribbean Spiny Lobster (*Panulirus agus*) fishery with several carcasses observed in the reef in the upper size range of 60 cm long. We suspect the large crocodiles are feeding on these large lobsters in the reef while accidentally consuming coral fragments and small molluscs. Unexpectedly, we did not find any fish or bird remnants within the scats. A stomach flushing study of marine dwelling *C. acutus* populations in coastal Belize recorded a low abundance of fish and birds, but a high abundance of insects and crustaceans in juveniles and crustaceans in adults (Platt et al., *op. cit.)*. The same study also recorded several non-food items, including hard seeds, wood pieces, vegetation, parasites, and coral fragments in approximately one third of sampled large juveniles and adults, although the diversity of these non-food items were not published.

As compared to coastal populations, the Banco Chinchorro American crocodile population has been reported to have a smaller snout length to snout width ratio, which may represent an adaptation to feed on hard prey (Labarre et al. 2017. Zoomorphology 136:387–401). This is supported by the Banco Chinchorro population's genetic isolation (Rodriguez et al. 2008. J. Exp. Zool. A 309A:674:686; Cedeño Vazquez et al. 2008. J. Exp.

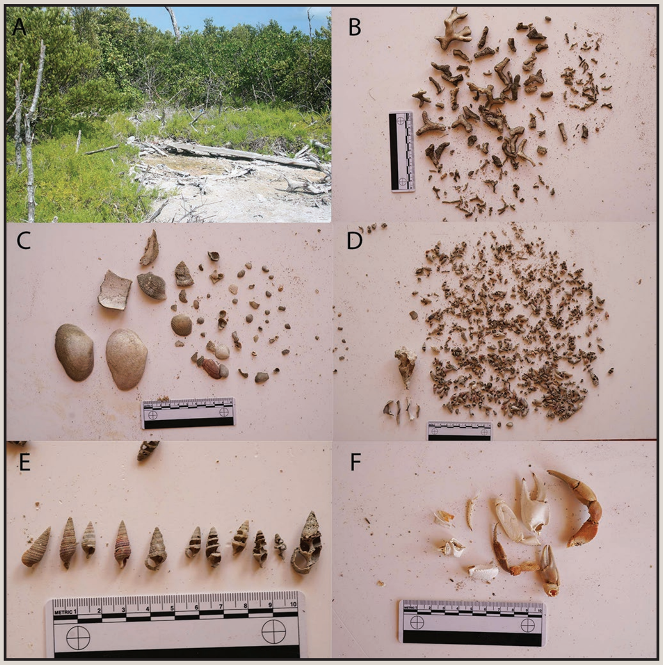

Fig. 1. Sampling site at Banco Chinchorro Atoll where we retrieved crocodile scats (A) containing coral reef fragments (B), bivalves (C), gastropods (D), gastropods with acid edging (E), and malacostraceans (F).

Zool. A 309A:661–673) and possible geographic isolation product of ocean currents (Carrillo et al. 2015. Cont. Shelf Res. 109:164–176.). The morphological, genetic and possible geographic differences could be driving this unique diet and foraging adaptations of the Banco Chinchorro *C. acutus*.

These observations raise novel questions about the ecology of the *C. acutus*.

How far and for how long do the crocodiles within Banco Chinchorro feed on the reefs? How does the lobster fishery impact the health of the crocodile population? What other animals do these crocodiles target for prey? These questions may be critical for maintaining this insular population and will require further study.

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RHYNCHOCEPHALIA — TUATARA

***SPHENODON PUNCTATUS* (Tuatara). PIT-TAG LOSS.** Permanent identification of individual animals aids biological study and conservation management, enabling data collection on many aspects of biology such as longevity, reproductive output and survival. Our main observations are from a translocation of 87 *Sphenodon punctatus* to rokonui Ecosanctuary (45.77°S, 170.60°E) near Dunedin, New Zealand (Jarvie et al. 2014. Anim. Conserv. 17 Supplement S1: 48–55). Between 16 October and 3 December 2012, 15 adult males, 15 adult females, and 57 juveniles were translocated directly from wild or captive stocks. Adults ranged in SVL from 176–259 mm and juveniles from 106–169 mm (thus, juveniles were approximately half-grown). Prior to release, tuatara were photographed (for a photo-ID library) and had a passive integrated transponder tag (PIT-tags; 11 mm × 2 mm; AVID Identification Systems, Norco, California, USA) inserted subcutaneously into the lateral abdomen using a PIT-tag applicator (Allflex, Capalaba, Queensland, Australia) just anterior to the left hind limb for individual identification (Jarvie et al. 2014. Herpetol. Rev. 45:417–421). The insertion site for the PIT-tag was sealed with surgical glue (containing cyanoacrylate). Juveniles from captive stocks had already been toe-clipped.

During five years of monitoring the translocated population, we recaptured 85 of the 87 released tuataras. We identified tuatara with PIT-tags on 99.4% of occasions. However, two juveniles recaptured during the fourth year since release (6 February and 5 March 2016) did not have PIT-tags (apparent from both a physical examination and a PIT-tag reader scan). Toe-clips and the photographs confirmed the identity of these two juveniles. One of these animals had been recaptured twice previously (11 September 2013 and 17 January 2014) with the PIT-tag protruding (apparently from the insertion site) on each occasion. The animal was also identified twice in the third year since release (3 and 15 January 2015) with a PIT-tag scanner deployed at a retreat (Jarvie et al. 2015. J Zool. 297:184–197). In earlier recaptures of both animals during the first year after release, PIT-tags were still positioned subcutaneously and were not protruding (30 March and 15 April 2013). Three other juveniles (recaptured 27 February 2014 and 5 or 6 February 2017) have been found with PIT-tags protruding (again, apparently from the insertion site). Thus, imminent or known PIT-tag loss is apparent in 5/57 = 9% of tuatara that were juveniles at release (SVL from 109 to 168 mm). The most likely cause of loss appears to be rejection of the PIT-tag through the insertion site, sometimes years after insertion.

Additional observations reveal PIT-tag loss from adult tuatara translocated to ZEALANDIA™ (formerly Karori Sanctuary; 41.28°S, 174.77°E) near Wellington, New Zealand. Between 2005 and 2007, 200 adults were released after insertion of PIT-tags using the same method as at rokonui Ecosanctuary. During monitoring in 2015, 49 of the founder adults were recaptured. Six of these recaptured adults had lost their PIT-tags and one had a non-functional PIT-tag that could not be read (thus, 7/200 = 3.5% of the released adults had known marking failure).

Although we were able to identify the tuatara at rokonui Ecosanctuary via other means, PIT-tag loss (or loss of function) could represent the loss of important biological information if an individual could not be identified. PIT-tag loss following only a few years is particularly problematic for tuatara given that their potential lifespan is 100 years. Our observations suggest for tuatara that subcutaneous insertion of PIT-tags for permanent identification is not effective for all individuals (either juveniles or adults) in the long-term.

PIT-tag loss (or loss of tag function) is known from other reptiles (Plummer and Ferner 2012. *In* McDiarmid et al. [eds.], Reptile Biodiversity: Standard Methods for Inventory and Monitoring, pp. 143–150. University of California Press, Berkeley), including loss following the subcutaneous insertion of PIT-tags into New Zealand's largest extant gecko (*Hoplodactylus duvaucelii*; van Winkel, pers. comm. *In* Lettink and Hare 2016 *In* Chapple [ed.], New Zealand Lizards, pp. 269–291. Springer, Switzerland). Possible reasons for loss include the distance the PIT-tag is inserted or how well the PIT-tag is held in place while withdrawing the injector needle. Intraperitoneal rather than subcutaneous insertion may be an alternative technique to reduce tag loss in tuatara; however, the method is more invasive and in some snakes species tag loss still occurs (Jemison et al. 1995. J. Herpetol. 29:129–132). Due to animal welfare concerns and negative public perception of toe-clipping (Mellor et al. 2004; New Zealand Department of Conservation, Wellington; Perry et al. 2011. J Herpetol. 45:547–555), we are currently investigating whether natural markings or other features of tuatara remain stable over time to identify individual animals via the more time-consuming method of photo-identification.

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SQUAMATA — LIZARDS

***ANOLIS EQUESTRIS* (Cuban Knight Anole). ENVIRONMENTALLY CUED HATCHING.** Embryo hatching in response to imminent predation has been documented in *Agalychnis callidryas* (Warkentin 2005. Anim Behav. 70:59–71), and is considered a form of environmentally cued hatching (ECH). Recently, more attention has been directed at this phenomenon in reptiles. ECH has been reported in several lizard species, but many of these observations are anecdotal and the vast majority of lizard species lack any observations at all, anecdotal or otherwise (Doody 2012. Int. Comp. Biol. 1:49–61). One study demonstrated ECH in the eggs of the skink *Lamprophis delicata* induced by simulating egg predation, and described the hatching as "explosive" because the embryos hatched in seconds and subsequently sprinted from the egg (Doody et al. 2013. Copeia 2013:160–165).

Lizards belonging to the genus *Anolis* have been used extensively as model organisms in ecology and evolutionary biology, but despite the volume of research dedicated to this genus, ECH remains almost totally unexplored. Anecdotal evidence exists for *Norops sagrei* suggesting ECH, although whether this is attributable to physical disturbance or saltwater immersion is unclear (Losos et al. 2003. Oecologia 137:360–362). Here we describe a possible incident of ECH in response to perceived predation in *Anolis equestris*.

At 2130 h on 6 January 2015 in Miami, Florida, USA (25.757°N, 80.416°W; WGS 84), AH and WV excavated an egg from an aboveground plastic pot containing semi-dry potting soil and cow manure. The pot was in a residential yard alongside a wooden fence. The egg was ca. 15 cm deep in the soil, and shared the pot with a jalapeno plant (*Capsicum* sp.). Upon discovery, the egg was gently pinched between the index finger and the thumb and removed from the soil. The egg was held for ca. 1 minute when an individual *A. equestris* rapidly hatched from the egg (ca. 5 seconds) and jumped from AH's hand to the ground, where it remained motionless ca. 30 cm from AH's foot.

The rapidity and circumstances of the hatching suggests ECH in response to perceived predation. This is the first observation of ECH in *A. equestris* and suggests further investigation of ECH in response to predation among *Anolis* is worthwhile. The implications for this behavior are particularly interesting for *Anolis* because members of this genus generally lay a single egg, and are not necessarily communal nesters (Losos 2009. Lizards in an Evolutionary Tree: Ecology and Adaptive Radiation of Anoles. University of California Press, Berkeley, California. 528 pp.).

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***ANOLIS SAGREI* (Brown Anole). COMMUNAL NESTING.** Communal nesting is common and widespread in lizards (Doody et al. 2009. Quart. Rev. Biol. 84:229–252), and appears to be widespread in anoles (reviewed in Doody et al., *op. cit.*; Alfonso et al. 2012. Herpetol. Notes 5:73–77; Robinson et al. 2014. Reptiles and Amphibians 21:71–72). Surprisingly, however, it has not been reported for *Anolis sagrei*, despite the increasing range of that species and its exceptional abundance. This species is native to Cuba and the Bahamas, and introduced into most of peninsular Florida, other Caribbean Islands, and parts of the U.S. gulf states, Central America, Hawaii, and Taiwan (Meshaka et al. 2004. The Exotic Amphibians and Reptiles of Florida. Krieger Publishing, Melbourne, Florida. 166 pp.). Here we report communal nesting in *A. sagrei* in southern Florida.

At ~1400 h on 25 August 2017 we found eggs and eggshells of *A. sagrei* in between stacked bricks (log concrete edger®) in a backyard in St. Petersburg, Florida (27.72876°N, 82.63675°W). Each brick was 40 cm long × 7 cm wide × 14 cm tall, and the bricks were on their sides stacked four deep by four across. There were small spaces in between the brick layers due to their shape (when viewed from above, each brick standing on end appeared as seven rounded areas connected by a slightly thinner area; thus, stacking them created tight spaces in which lizards could enter). The bricks were located against the west-facing wall of a house, and thus received sunlight in the afternoon but not in the morning; however, the backyard possessed some shading canopy cover. The bricks were stacked on top of concrete slabs, and so were ~30–60 cm above ground, and had been there, undisturbed, for 5+ years. We found seven intact eggs and 34 hatched eggshells, including 23 from this year and 11 that were likely from the previous year, as evidenced by their yellowish-brownish color compared to the whitish eggshells from the present year. The egg distributions across the bricks were: three together within 5 cm of one another, two together within 3 cm of one another, and the last two were solitary. Many of the eggshells were displaced as the bricks were moved, precluding our ability to determine their spatial arrangement. The spaces between the bricks were moist and the eggs appeared healthy. Invertebrates near the eggs included pillbugs (Armandillidiidae), slugs (Gastropoda), and ants (Hymenoptera).

One egg hatched on 28 August, and a second egg hatched on 15 September, confirming species identification. Although the other eggs were not incubated, there are no other anole species present in the backyard, and *A. sagrei* is extremely abundant there. The only other small lizard species present is the gecko *Hemidactylus turcicus*, which has a larger, broader egg. Such commonness undoubtedly increases the frequency of communal nesting, as can the availability of suitable nest sites (Doody et al., *op. cit.*). However, conspecific attraction to eggs has been revealed in other small lizard species in the laboratory (e.g., Radder and Shine 2007. J. Anim. Ecol. 76:881–887; Paull 2010. Honours Thesis, Monash University, Melbourne, Australia), indicating that our communal nest and others may involve true social interactions. Laboratory trials should reveal whether mothers of this species are attracted to conspecific eggs.

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***ANOLIS SAGREI* (Brown Anole) and *LEIOCEPHALUS CARINATUS* (Northern Curlytail Lizard). ECTOPARASITES.** Both *Anolis sagrei* and *Leiocephalus carinatus* are relatively small lizards that are indigenous to the Bahamas and Cuba. *Anolis sagrei* has also been introduced to several other islands and regions, especially in the Western Hemisphere, and *L. carinatus* has been introduced to Florida. Chiggers collected in the Bahamas have not previously been identified to species (Brennan 1967. Stud. Fauna Curacao Carib. Islands 24:146–156). In this note, we report two species of chiggers from the Bahamas, one species associated with *A. sagrei*, and the other with *L. carinatus*.

In connection with a study of the costs of reproduction in *A. sagrei*, larval chiggers were counted on reproductive males and females of this lizard at Regatta Point, Great Exuma in the Bahamas (23.50°N, 75.75°W) in 2013 by Reedy et al. (2016. Biol. J. Linn. Soc. 117:516–527). Chiggers were not identified during that study but voucher specimens (N = 6) were retained in vials containing 95% ethanol. These chiggers were later cleared in lactophenol, slide-mounted in Hoyer's medium, and ringed with glyptal (Walter and Krantz 2009. A Manual of Acarology, 3rd edition. Texas Tech University Press, Lubbock, Texas. 807 pp.). Examination of the slide-mounted chiggers using a high power-phase-contrast binocular BH-2 Olympus microscope (Olympus Corporation of the Americas, Center Valley, Pennsylvania) revealed that they belong to the genus *Eutrombicula*. Detailed examination of the gnathosoma, palpal claw, scutum shape, and scutum setation, identified them as *E. anguliscuta*. *Eutrombicula anguliscuta* was described in 2004 from Cuba based on collections from seven species of lizards (*Anolis bartschi* [West Cuban Anole], *A. chamaeleonides* [Short-Bearded Anole], *A. equestris* [Knight Anole], *A. sagrei*, *Leiocephalus cubensis* [Cuban Curlytail Lizard], *L. macropus* [Monte Verde Curlytail Lizard], and *L. stictigaster* [Cabo Corrientes Curlytail Lizard]) and two species of bats (*Nyctiellus lepidus* [Gervais's Funnel-eared Bat] and *Pteronotus macleayii* [MacLeay's Moustached Bat]) (Daniel and Stekolnikov 2004. Folia Parasitol. 51:359–366).

During June 2016, larval chiggers were observed parasitizing a population of *L. carinatus* on a small un-named island (23.4279°N, 75.8857°W) in the Bahamas. Many of these chiggers were attached inside skin invaginations, sometimes referred to as "mite pockets" (Arnold 2008. Biol. J. Linn. Soc. 29:1–21) behind the ears on each side of the body (Fig. 1). Chiggers (N = 5) were stored in 95% ethanol and later cleared and slide-mounted, as described above. These specimens also belong to the genus *Eutrombicula* and were identified as *E. leiocephali*. This chigger was described in 2004 from Cuba where it was reported from three species of lizards (*L. carinatus*, *L. macropus*, and *L. raviceps* [Mountain Curlytail Lizard]) (Daniel and Stekolnikov, *op. cit.*).

Several faunal elements are shared between Cuba and the Bahamas (Matos-Maraví et al. 2014. BMC Evol. Biol. 14:199), including the lizard hosts and chiggers reported in this note from the Bahamas. Geologically, most of the Bahamian islands and Cays were repeatedly submerged during the past 0.5–4 million years and Cuba was fragmented into separate landmasses until ~6 million years ago. Therefore, a common origin of these lizards and chiggers on the same landmass during a previous ice age or a landbridge dispersal mechanism between the Bahamas and Cuba does not seem plausible. With respect to the two bat host species recorded for *E. anguliscuta* by Daniel and Stekolnikov (*op. cit.*), *N. lepidus* is endemic to Cuba and the Bahamas, whereas *P. macleayii* is endemic to Cuba and Jamaica (Simmons 2005. *In* Wilson and Reeder [eds.], Mammal Species of the World: A Taxonomic and Geographic Reference, 3rd edition, pp. 312–529. Johns Hopkins University Press, Baltimore, Maryland). Therefore, if *N. lepidus* still migrates or flies between Cuba and the Bahamas, this host could act as a link for transferring *E. anguliscuta* between these two island groups where both lizards and bats could be parasitized. Other mechanisms would be implicated for lizard dispersal between the Bahamas and Cuba.

Slide-mounted, voucher chigger specimens from this study are deposited in the Entomology Collection at Georgia Southern University, Statesboro, Georgia, USA (accession numbers: L3798 and L3799).

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***ASPIDOSCELIS SEXLINEATA SEXLINEATA* (Eastern Six-lined Racerunner). PREDATION.** *Aspidoscelis sexlineata sexlineata* occurs throughout the southeastern U.S. in open dry habitats, especially sandhills, scrub, dunes, and disturbed sites (Gibbons et al. 2009. Lizards and Crocodilians of the Southeast. University of Georgia Press, Athens. 235 pp.). Predators include salamanders (Camper 1986. Herpetol. Rev. 17:19), other lizards (Gibbons et al., *op. cit.*), and snakes (Halstead et al. 2008. Copeia 2008:897–908). Birds and mammals have been mentioned generally as potential predators, but specific details are lacking. I report here the first documented case of *Falco sparverius paulus* (Southeastern American Kestrel) preying on *A. sexlineata*.

Fig. 1. Freshly killed *Aspidoscelis sexlineata sexlineata* in a *Falco sparverius* (American Kestrel) nest.

On 3 April 2012, I found an adult female kestrel incubating five eggs in a nest box located ca. 12 km SW of Williston, Levy County, Florida, USA. When the female kestrel flushed off the nest, I discovered the bloody remains of a freshly killed *A. sexlineata* (Fig. 1), presumably delivered by the adult male kestrel to its mate (Smallwood and Bird 2002. The Birds of North America No. 602). The lizard was missing its head and half of its tail. The nest box was located 4.6 m above ground on a utility pole surrounded by pastures interspersed with patches of sandhill pine forest. It is surprising that *A. sexlineata* has not been recorded in the diet of *F. sparverius* in Florida given that the two species have extensive spatial and temporal overlap in their habitat use. In contrast, *Anolis* spp. and *Sceloporous* spp. are commonly observed kestrel prey items in Florida (Smallwood and Bird, *op. cit.*; pers. obs.). It is possible that *A. sexlineata* is an important but previously undocumented prey item for kestrels under certain environmental conditions. Further study is needed to determine whether the well documented running speed and vigilance behavior of *A. sexlineata* (Trauth and McAllister 1996. Cat. Amer. Amphib. Rept. 628:1–12) protect it from capture by kestrels and other predatory birds.

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ASPIDOSCELIS SEXLINEATUS VIRIDIS **(Prairie Racerunner). SECOND EXTREME COLOR VARIANT.** We recently reported the occurrence of a rare color variant in *Aspidoscelis sexlineatus viridis* (spelling of specific name based on Steyskal 1971. Proc. Biol. Soc. Washington 84:7–11) from western Nebraska (Trauth et al. 2015. Herpetol. Rev. 46:254–255). The color pattern of this unusual adult female (Arkansas State University Museum of Zoology = ASUMZ 33235) was considered unique in that it lacked the normal green suffusion on the head and anterior region of the body. Moreover, the ventrolateral, lateral, and vertebral striping pattern of this individual was faint, being less conspicuous compared to striping normally seen in this taxon. At that time we mentioned that our collective examination of >10,000 specimens and numerous photographs of *A. sexlineatus* from many parts of its vast geographic range in the United States (Trauth 1980. Ph.D. Dissertation, Auburn University, Auburn, Alabama. 201 pp.; Trauth 1992. Texas J. Sci. 44:437–443; Trauth and McAllister 1996. Cat. Amer. Amphib. Rept.: 628.1–628.12) and Mexico (Pérez-Ramos 2010. Southwest Nat. 55:419–225) yielded no additional specimens with a similar color and body striping morphology. Herein, we report on a second color variant of Prairie Racerunner, inadvertently overlooked by one of us, that is morphologically similar to the Nebraska specimen.

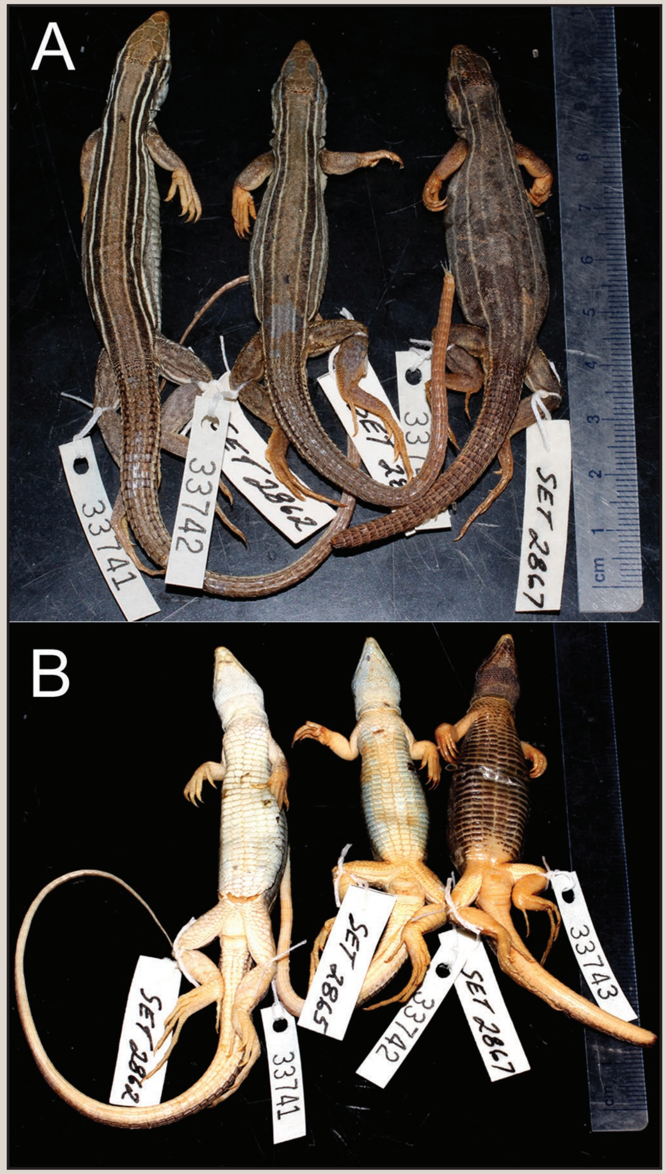

Fig. 1. Dorsal (A) and ventral (B) color patterns of normal female (ASUMZ 33741) and male (ASUMZ 33742) *Aspidoscelis sexlineatus viridis* in contrast to the variant female (ASUMZ 33743). (ASUMZ 33742 was collected at the same site as ASUMZ 33743, whereas ASUMZ 33741 was collected 27 km NW of ASUMZ 33743.)

On 26 June 1978, one of us (SET) unearthed an adult female *A. s. viridis* from a retreat in a west-facing, red clay roadcut along US Highway 167, ~ 0.8 km S Ash Flat (36.217994°N, 91.60822°W, WGS 84; 182 m elev.), Sharp County, Arkansas, USA. The specimen was logged at that time as being "melanistic" according to a description documented in field notes of SET and was placed in a holding bag along with two other specimens of the same subspecies taken from the same site. These three lizards became a subsample of 12 lizards collected in a two-county area on that day. All lizards were processed within 24 h using a standard museum specimen protocol for lizards—sacrificed with a pleuroperitoneal injection of a dilute solution of sodium pentobarbital, fixed in 10% formalin for two days, and then preserved in 70% ethanol for permanent storage.

In a recent re-examination of this particular lizard subsample, the unusual female (SET 2867) along with two other specimens (SET 2862 and 2865) were retagged as ASUMZ 33743 and ASUMZ 33741–33742, respectively (Fig. 1). The dorsal color pattern in ASUMZ 33743 (SVL = 67 mm; incomplete tail) corresponded well with the description of the Nebraska variant female (Trauth et al., *op. cit.*); i.e., there was an absence of the green suffusion on the head and anterior body, which is typically present in adult males and females of *A. s. viridis* (Fig. 1A). Also, the striping pattern (ventral to dorsal) of ASUMZ 33743 matched well with that of ASUMZ 33235 (pair of barely visible ventrolaterals, three pairs of primary stripes, and a secondary vertebral stripe). The striking ground color, apparent between the stripes (termed fields), consisted of shades of dark brown (Fig. 1A) rather than the hues of green suffusions on tan or light brown characteristic of normal adult males and females of *A. s. viridis* (Trauth et al., *op. cit.*). A dusky black pigmentation, also present in the scalation of the thoracic and abdominal surfaces of ASUMZ 33743 coincided with the ventral distribution of pigmentation on the entire venter of ASUMZ 33235. Data for the following meristic variables in ASUMZ 33743 were also within the range of variation for *A. s. viridis* from Arkansas (Trauth 1980, *op. cit.*; JMW, unpubl.): granules = scales around midbody, 83; granules from occipital scales to first row of caudal scales, 211; granules between the paravertebral stripes, 17; femoral pores, 15 left/16 right; subdigital lamellae of longest digit of each pes, 25 left/25 right; circumorbital scales series on each side, 4 left/5 right; and lateral supraocular granules, 16 left/14 right. Finally, enlarged yolked ovarian follicles were possessed by ASUMZ 33743: 1 left/2 right.

A typical preserved adult female from the subsample collected near the Sharp County site had an immaculate all white ventral surface (Fig. 1B). A male (ASUMZ 33742) collected along with the color variant from the Sharp County site also had a predominantly white venter with evidence of faint hues of blue laterally in the thoracic and abdominal region (Fig. 2B). In addition, ASUMZ 33743 had a dusky black chin and throat similar to Nebraska color variant, a feature that has not been observed in the normal color pattern of any other species in the *A. sexlineatus* species group in the United States.

The extreme dorsal and ventral color patterns of ASUMZ 33235 and 33743 were combined with normal features of both scutellation and meristic variables for this species. In both specimens, the mesoptychial scales bordering the gular fold were abruptly enlarged, and the postantebrachial scales on the posterior aspects of the forearms were only slightly enlarged from granular size. Although the causation of the extreme color pattern variation in ASUMZ 33235 and 33743 cannot be ascertained, there are only two possible explanations for its common existence. Either it was the product of a rare non-genetic developmental anomaly, from which normally patterned offspring would be expected, or it is the result of one or more mutations, from which the aberrant pattern could be perpetuated in future generations had reproduction occurred.

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***AURIVELA LONGICAUDA* (Long-tailed Whiptail). PREDATION.** Arthropods are potential predators of smaller reptiles and amphibians, with numerous reports in the literature (Armas 2000. Rev. Iber. Aracnol. 3:87–88; Barbo et al. 2009. Herpetol. Notes 2:99–100; Bauer 1990. Herpetol. Rev. 21:83–87; Jehle et al. 1996. Herpetozoa 9:157–159; Manzanilla et al., 2008. Bol. Soc. Entomol. Aragon 42:317–319; McCormick and Polis 1982. Biol. Rev. 57:29–58). In particular, spiders are known to capture and consume vertebrates (including rodents, birds, frogs, snakes, and lizards) both in webs (Cokendolpher 1978. J. Arachnol. 5:184; Groves and Groves 1978. Bull. Maryland Herpetol. Soc. 14:44–46; Konig 1987. Herpetofauna 9:6–8; Neill 1948. Herpetologica 28:200), and in the case of terrestrial species, directly on the ground or in burrows. *Lycosa poliostoma* (Araneomorphae) is a spider distributed in Brazil, Paraguay, Uruguay, and Argentina. Several authors have made various contributions on the biology of the species (Bertka 1880. Mém. Cour. Acad. Belg. 43:1–120; Boeris 1889. Atti. Soc. Nat. Modena, Mem. 8:123–135; Capocasale 1971. Rev. Brasil. Biol. 31:367–370); however, there are still uncertainties about taxonomy, distribution, and habits.

On 9 October 2015, during the course of an investigation to monitor herpetofauna at Monte-Chaco (30.7306ºS, 67.4859°W; 3331 m elev.) in La Majadita, Valle Fértil, San Juan, Argentina, we found an adult *L. poliostoma* feeding on an adult male *Aurivela longicauda* inside a pit-fall trap (Fig. 1). The lizard, which had a length of 47.1 mm, exhibited a right dorsolateral injury. The collected spider and lizard were deposited in the Museo de Ciencias Naturales de la Universidad Nacional de San Juan (UNSJ) (*Lycosa polyostoma*), and in the Herpetological Collection of the UNSJ (UNSJ-2258), respectively. Although it is possible that the lizard died before the spider began consuming it, this is unlikely because spiders tend to prey upon live prey.

Although there are many reports of *Lycosa* preying upon toads (McCormick and Polis, *op. cit.*; Owen and Johnson 1997. Herpetol. Rev. 28:200), there is just one report of wolf spiders preying upon lizards (Maffei et al. 2010. Herpetol. Notes 3:167–170); our case is the second documented predation on lizards by *Lycosa*. Furthermore, even though there are previous records on predator-prey interactions between spiders and lizards, this is the first documented record of the predation of *A. longicauda* by an arachnid.

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Fig. 1. *Lycosa poliostoma* preying upon an adult male *Aurivela longicauda*.

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BUNOPUS BLANFORDII **(Blanford's Rock Gecko). REPRODUCTION.** *Bunopus blanfordii* occurs in Israel and Jordan (Uetz et al. 2017. The Reptile Database. http://www.reptile-database.org, accessed 4 April 2017). The status of *B. blanfordii* remains unclear and it may be conspecific with *Bunopus tuberculatus*, However, until further study, *B. blanfordii* is considered valid (Bauer et. al. 2013. Zootaxa 3599:301–324). Bar and Haimovitch (2011. A Field Guide to Reptiles and Amphibians of Israel. Pazbar Ltd, Herzliya, Israel. 245 pp.) reported multiple clutches of two eggs were laid each year by *B. blanfordii* (as *B. tuberculatus*) in Israel. In this note we present additional information on the reproductive cycle of *B. blanfordii* from Israel based on a histological examination of museum specimens.

The gonads of 16 adults of *B. blanfordii* consisting of nine males (mean SVL = 40.3 mm ± 5.9 SD, range = 28–47 mm) and seven females (mean SVL = 46.6 mm ± 5.9 SD, range = 38–53 mm) from Israel deposited in the Steinhardt Museum of Natural History (TAUM), Tel Aviv University were histologically examined. These were all from the A'rava Valley Region: TAUM 573, 1278, 1802, 1803, 1809, 1810, 2189, 2190, 2225, 2233, 3345, 5089, 5090, 10021, 10929, 13002. *Bunopus blanfordii* were collected 1950 to 1985. The lower part of the body cavity was opened and the left testis or ovary was removed. Histological sections were cut at 5 µm and stained by Harris hematoxylin followed by eosin counterstain. Histology slides were deposited at TAUM.

Two stages were present in the *B. blanfordii* testis cycle: 1) Spermiogenesis, in which the seminiferous tubules are bordered by sperm or clusters of metamorphosing spermatids; 2) Regressed, germinal epithelium within the seminiferous tubules is reduced to a few layers of spermatogonia and interspersed Sertoli cells. Males in spermiogenesis were by month: March (N = 1), April (N = 5), May (N = 1), July (N = 1). The one October male had a regressed testis. The smallest reproductively active male (TAUM 3345) measured only 28 mm SVL and was collected in April. The rate of sperm production in this small male was not as high as seen in testes of larger males in which the inner border of each seminiferous tubule was lined by sperm or metamorphosing spermatids. Nevertheless, there was at least one cluster of sperm in virtually all seminiferous tubules of TAUM 3345.

Two stages were present in the ovarian cycle of *B. blanfordii*: 1) Quiescent, no yolk deposition was present: April (N = 2), May (N = 1), October (N = 1), November (N = 2); 2) Oviductal eggs, two were present in TAUM 1810 (SVL = 52 mm), collected in April. In view of our small female sample (N = 7) we did not report a minimum size for female reproductive activity.

We thank Shai Meiri (TAUM) for permission to examine *B. blanfordii* and the National Collections of Natural History at Tel Aviv University for providing the *B. blanfordii* to examine.

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CRYPTOBLEPHARUS BUCHANANII **(Fence Skink). BEE HOTELS AS RESOURCES.** Bee or insect hotels, also known as bee condos or, in the scientific literature, "trap nests," are installed as a resource to encourage cavity-nesting hymenopterans to nest. Not only are bee hotels useful for scientific purposes for monitoring species diversity, abundance, and reproductive output of native bees and their natural enemies, but the installation of these hotels can boost bee numbers given that nest sites are often limiting (e.g., Torné-Noguera et al. 2014. PLoS ONE 9: e97255). Adult female bees gather food provisions for the offspring, deposit the provisions in the cavity, and then lay eggs. Typically a number of cells, each containing one food provision with an egg, are laid, the number being dependent on the species and the depth of the tube.

Despite good intentions, many bee hotels are not designed by bee scientists, and the proliferation of bee hotels being sold in various gardening venues have questionable value for supporting their intended occupants. For example, given that most cavity-nesting bees are smaller than honeybees, holes of diameters larger than 10 mm are unlikely to be occupied by bees (Prendergast, unpubl. data). This does not mean, however, that they are useless and will remain barren, as we describe below.

These observations occurred at a commercially manufactured bee hotel located on a tree at about 1 m high in the corner of a vegetable garden near the outdoor eating area of the Kings Park Biodiversity and Conservation Centre in Kings Park Botanic Gardens, Western Australia (31.57210°S, 115.59345°E).

Cryptoblepharus buchananii (SVL 45 mm) are common lizards endemic to Western Australia, with a distribution concentrated in the southwest region. On 26 May 2017 at about midday, two *C. buchananii* were observed, one occupying a large (approx. 2-cm diameter) bamboo tube, the other occupying a crevice between bamboo tubes that were part of a bee hotel. Both had partly emerged, and appeared to be basking, apparently taking advantage of the safety the crevices provided. A second observation occurred on 20 June 2017. One *C. buchananii* was observed basking, with almost half of its body protruding from one of the largest bamboo tubes. When approached, rather than flee, it retreated back into the end of the tube and curled up, suggesting that *C. buchananii* was using the bamboo tube as a refuge. A few hours later, the bee hotel was checked again and a *C. buchananii*, presumably the same one, was still present, but had moved into a crack at the bottom of the hotel between two bamboo tubes. A third observation on 26 June 2017 revealed three *C. buchananii* at the bee hotel (Fig 1.)

The recorded daily temperature extremes at the time of the first observation were 19°C/8°C and 22°C/8°C for the two following observations. Under cooler winter temperatures the

FIG. 1. *Cryptoblepharus buchananii* using a bee hotel for shelter (left); three *C. buchananii* using both bamboo tubes and cracks between them at the same bee hotel (right).

bee hotel may provide a safe, insulated place for *C. buchananii* to rest in between foraging bouts and at night, as well as a high, thermally-favorable and safe location for them to bask in. The design of the bee hotel was ill-suited to bees, and none of the bamboo tubes or holes drilled in the lower part of the hotel showed evidence that bees had nested in them, but ants–a known prey item of *C. buchananii* (Pianka and Harp 2011. WA Nat. 28:43–49), were observed nesting in some of the bamboo tubes; however, no observations of predation by *C. buchananii* on ants were observed, as has been observed for anoles, *Anolis sagrei*, predating on caterpillars at bee hotels (Bateman 2012. Herpetol. Rev. 43:641–642).

Despite substantial urban development in the southwest of WA, *C. buchananii* appears to be resilient to these changes and can be considered an urban adapter. They are one of the most commonly encountered skink species in the region, abundant in bushland and in urban gardens where they may find many of the resources (food, basking sites, etc.) that they need; however, in many gardens 'natural' shelter such as dead branches and peeling bark on moribund trees may be limited. In such cases the provision of bee hotels may be highly beneficial to *C. buchananii*, providing shelter and basking opportunities.

Our observations indicate that bee hotels can serve as valuable habitat for hosting other species, not just Hymenoptera, but even vertebrate taxa like small skinks. Whether these *C. buchananii* are displaying novel behaviour, or whether the utilisation of bee hotels is a fairly common phenomenon is unknown. Citizen science projects, which encourage people to report the "other" bee hotel check-ins, may provide further information.

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***DRACO CORNUTUS* (Horned Flying Lizard). REPRODUCTION.** *Draco cornutus*, known from Sumatra, Borneo, Java, the Bangunan Archipelago, and the Sulu Archipelago, Philippines, is reported to produce clutches of 3–4 eggs (Das 2010. A Field Guide to the Reptiles of South-East Asia, Myanmar, Thailand, Laos, Cambodia, Vietnam, Peninsular Malaysia, Singapore, Sumatra, Borneo, Java, Bali. New Holland Publishers [UK] Ltd, London. 376 pp.). In this note I provide additional information on the reproductive biology of *D. cornutus* from a histological examination of gonads from museum specimens.

A sample of 23 *D. cornutus* collected between 1947 and 1991 consisting of 8 adult males (mean SVL = 70.4 mm ± 2.4 SD, range = 66–73 mm), 13 adult females (mean SVL = 77.5 mm ± 4.6 SD, range = 71–83 mm), and one juvenile (SVL = 48 mm) collected in Sarawak and Sabah, Borneo, Malaysia, was examined from the herpetology collection of the Field Museum of Natural History (FMNH), Chicago, Illinois, USA. The following *D. cornutus* were examined by Division: Sarawak: First, FMNH 67330, 673232; Kuching, FMNH 71566; Miri, FMNH 67335, 120034, 128321, 129472, 129474; Third, FMNH 138422; Forth, FMNH 150609, 150610, 150614, 150619, 150620, 158774, 158775–158777; Seventh, FMNH 221424, 221428, 221429; Sabah: Interior, FMNH 235160; Tawau, FMNH 248963.

For histological examination, the left gonad was removed to examine for yolk deposition or corpora lutea in females, and to identify the stage of the testicular cycle in males. Counts were made of enlarging follicles (> 5 mm) or oviductal eggs. Tissues were embedded in paraffin, sectioned at 5 µm, and stained with hematoxylin followed by eosin counterstain. Histology slides were deposited at FMNH.

Table 1. Monthly stages in the ovarian cycle of 13 adult female *Draco cornutus* from Sarawak and Sabah, Borneo. *One ovary contains a corpus luteum from a previously deposited egg.

Month	N	Quiescent	Early yolk deposition	Enlarged follicles > 5 mm	Oviductal eggs
February	1	1	0	0	0
March	1	1	0	0	0
April	1	0	0	0	1
May	1	0	0	0	1
June	1	0	0	1	0
July	1	0	0	0	1
August	1	0	0	1	0
September	1	0	0	0	1
October	2	1*	1	0	0
November	2	1	0	0	1
December	1	1	0	0	1

The only stage noted in the testis cycle was spermiogenesis in which the seminiferous tubules were lined by sperm or clusters of metamorphosing spermatids. Monthly samples (one male in each month) were: February, March, May, June, July, August, October; (two males) December. The smallest reproductively active male (FMNH 120034) measured 66 mm SVL and was from August. Extended periods of spermiogenesis have been reported for other *Draco* species (Inger and Greenberg 1966. Ecology 47:1007–1021; Goldberg and Grismer 2015. Hamadryad 37:117–121) and may be typical for *Draco* males.

Four stages were present in the ovarian cycle of *D. cornutus* (Table 1): 1) Quiescent, no yolk deposition; 2) Early yolk deposition, basophilic yolk granules in the ooplasm; 3) Enlarged ovarian follicles > 5 mm diameter; 4) Oviductal eggs. Mean clutch size (N = 8) = 3.0 ± 1.2 SD, range = 1–4. One and two eggs are new minimum clutch sizes for *D. cornutus*. The smallest reproductively active *D. cornutus* female measured 71 mm SVL (FMNH 129474) contained three enlarged ovarian follicles (> 5 mm) and was from June. *Draco cornutus* females exhibited reproductive activity in 9/11 (82%) of the months sampled. One female from October with quiescent ovaries (Table 1) contained a corpus luteum indicative of recent reproduction. Despite my small monthly sample sizes, it is evident that *D. cornutus* females exhibit an extended period of reproductive activity. This is in keeping with previous information on *Draco* female reproduction: (Inger and Greenberg, *op. cit.*; Goldberg and Grismer, *op. cit.*). I did not find evidence of *D. cornutus* producing multiple clutches, however, this has been reported for other species of *Draco*: *D. melanopogon, D. quinquefasciatus* (Inger and Greenberg, *op. cit.*), *D. blanfordii, D. formosus, D. maximus, D. sumatranus* (Goldberg and Grismer, *op. cit.*), and *D. volans* (Auffenberg 1980. Bull. Florida St. Mus. 25:40–156).

I thank A. Resetar (FMNH) for permission to examine *D. cornutus*.

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***EUTROPIS ALLAPALLENSIS* (Allapalli Grass Skink). CLOACAL PROLAPSE.** Cloacal prolapses have been reported in a variety of reptilian species including crocodilians, chelonians, snakes, and lizards (Hedley and Eatwell 2014. J. Small Anim. Pract. 55:265–268). The skink *Eutropis allapallensis* is endemic to India and is reported from the following states: Gujarat, Maharashtra, Goa, Kerala, and Tamil Nadu (Uetz et al. 2017. The Reptile Database. http://www.reptile-database.org; accessed 20 October 2017). Herein we report an observation of cloacal prolapse in *E. allapallensis*.

At ca. 1030 h on 13 November 2016, during a morning field session to document reptiles in a dry deciduous forest patch near Dhulda village in Dang, Gujarat, India (20.9558°N, 73.6595°E; WGS 84), we found an *E. allapallensis* (SVL = 48 mm) with some everted tissues on its cloaca (Fig. 1A). The specimen was brought to the field station for further observation. On closer inspection we noticed that it was suffering from a cloacal prolapse with some fecal matter attached to the cloacal mucosa (Fig. 1B). The prolapsed tissue was washed with normal saline and we applied an ice cube on it with gentle pressure for about 2 minutes and the prolapsed cloacal tissues reduced smoothly (Fig. 1C). The specimen was kept under observation for a couple of hours and then released back at the site of capture. To our knowledge, this is the first report of cloacal prolapse in *E. allapallensis*.

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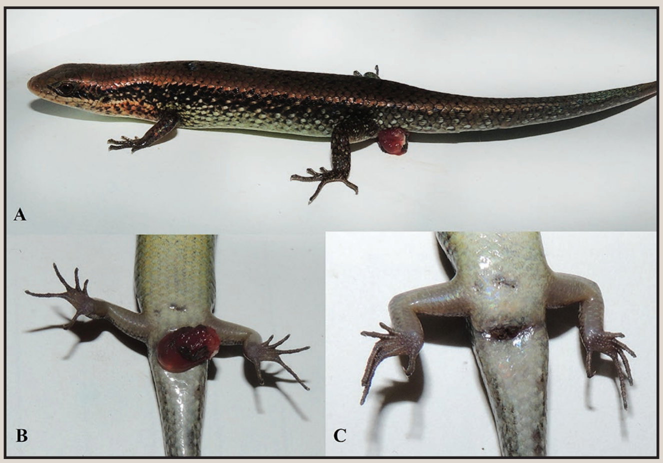

Fig. 1. A) *Eutropis allapallensis* with everted cloacal tissue. B) Enlarged view of cloacal prolapse in *E. allapallensis*. C) Complete reduction in cloacal prolapse.

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***HEMIDACTYLUS MABOUIA* (Tropical House Gecko). ECTOPARASITISM.** The geckonid lizard *Hemidactylus mabouia* is a nocturnal medium-sized species (SVL = ca. 67.9 mm) that is commonly found in anthropic environments and is native from tropical Africa and widely distributed in the tropics of South America, Central America, and Caribbean (Vanzolini et al. 1980. Répteis das Caatingas. Academia Brasileira de Ciências. Rio de Janeiro. 161pp.). Some previous studies revealed the composition of ectoparasites present in *H. mabouia* (Rivera et al. 2003. Caribb. J. Sci. 39:321–326; Corn et al. 2011. J. Med. Entomol. 48:94–100), but information on external parasites in this species is scarce for South America, and especially for Brazil, where this species is considered invasive and associated with human buildings (Rocha et al. 2011. Zoologia 28:747–754). We report herein an infestation in *H. mabouia* by the ectoparasite *Amblyomma* sp.

Fig. 1. Parasitism in an adult male *Hemidactylus mabouia* by two larval *Amblyomma* sp.

During field work at 2145 h on 29 August 2017 we observed two ticks from the genus *Amblyomma* sp. attached to the ventral surface on the skull of one individual *H. mabouia* (SVL = 57 mm; 5 g) found in an urban area in the municipality of Santana, Amapá State, Brazil (0.0501ºS, 51.1490ºW; WGS84). The ticks were observed as two red dots located near the labial region of the lizard (Fig. 1) and were collected for morphological analysis in laboratory (Clifford and Anastos 1960. J. Parasitol. 46:567–578). The ticks were identified as larval forms in the genus *Amblyomma*. Our study represents the first report of parasitism in *H. mabouia* by a tick of the genus *Amblyomma*, and thus enhances the knowledge on ectoparasitism for this species.

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***KENTROPYX ALTAMAZONICA* (Cocha Whiptail). HABITAT USE.** *Kentropyx altamazonica* is a small teiid lizard often associated with waterways and seasonally flooded forest (Ribeiro-Júnior and Amaral 2016. Zootaxa 4205:401–430). It is distributed in the Amazon Basin, mainly across lowland humid forest along the larger rivers. It is a diurnal, heliothermic species, basking and foraging in floating leaf litter above ground, on logs, low vegetation, and floating trunks (Vitt et al. 2001. Can. J. Zool. 79:1855–1865). However, there are no records of *K. altamazonica* foraging in *Victoria amazonica* (Giant Waterlily). This Amazon native plant is the largest of the waterlily species, occupying both flood plains and riverine environments. Its leaves can reach more than three meters in diameter (Prance 1974. Act. Amaz. 4:5–8).Herein we report the first record of use of *V. amazonica* as a foraging site by *K. altamazonica*.

Fig. 1. A–B) Two individual *Kentropyx altamazonica* foraging in *Victoria amazonica*; C) another individual climbing a *Cecropia latiloba* trunk; and D) flooaded environment where the observations occurred.

At 1241 h on 5 May 2017, in a floodplain habitat of Lake Catalão (3.1630°S, 59.9080°W; WGS 84), located near the confluence of the Negro and Solimões rivers, Iranduba municipality, Amazonas, Brazil, at least five individuals of *K. altamazonica* were observed foraging on an ephemeral island mainly formed by *V. amazonica.* The agglomeration was located near *Cecropia latiloba* trees and another flooded forest area with canopy above water. One individual lizard climbed a *C. latilobia* trunk with the approximation of our motorboat and the others hid among leaves of *V. amazonica.* All individuals were mainly using the gaps between the leaves, and the surface of these leaves was used only to move from one gap to another. The use of *V. amazonica* as a foraging site may be due to the greater availability of insects in its leaves when in a flooded habitat, but also by the size and stability of them, compared to other surfaces.

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***LEIOCEPHALUS CARINATUS* (Northern Curlytail Lizard). GOPHER TORTOISE BURROW ASSOCIATE.** *Gopherus polyphemus* (Gopher Tortoise) is a keystone species, in part because their burrows host a large number of facultative and obligate commensal species (Jackson and Milstrey 1989. *In* Diemer et al. [eds.], Proceedings of the Gopher Tortoise Relocation Symposium, pp. 86–98. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida). Several aggressive invasive lizards have recently been noted inside Gopher Tortoise burrows (Engeman et al. 2011 Curr. Zool. 57:599–612). *Leiocephalus carinatus armouri* is expanding its distribution into much of peninsular Florida, particularly in areas where roads, sidewalks, and other hard structures are juxtaposed with sandy soil and plantings of shrubbery or low ground cover vegetation (Meshaka et al. 2005 Southeast. Nat. 4:521–526; Moore and Smith 2005 Natural Area News 10:1,4). Curlytail Lizards have been spreading around the Jupiter,

Fig. 1. *Leiocephalus carinatus* inside Gopher Tortoise burrow.

Florida community for the last decade (JAM, pers. obs.), and it has been proposed that *L. carinatus* could expand into natural areas by following sidewalks and roadways (Moore and Smith 2005, *op. cit.*). We have been studying Gopher Tortoise ecology at a site in the Abacoa Greenway in Jupiter, Florida (see Wetterer and Moore 2005. Florida Entomol. 88:349–354 for a site description). To our knowledge, *L. carinatus* has not been noted previously in Gopher Tortoise burrows, but we have now observed on several occasions Curlytail Lizards running into Gopher Tortoise burrows upon our approach. Most of those burrows were within 15 m of sidewalks alongside a road. We have also found *L. carinatus* inside tortoise burrows (Fig. 1). Immediately after taking this photo, the *L. carinatus* scampered over the carapace of the tortoise and ran deeper into the burrow. One significant point of this photo is that this particular burrow is 180 m from the nearest sidewalk. Tortoise burrows are possibly allowing *L. carinatus* to gain entry into more interior portions of the natural area. Tortoise burrows might provide forage for *L. carinatus* by virtue of the arthropod fauna also found within the burrows.

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***LEIOCEPHALUS CARINATUS* (Northern Curly-tailed Lizard). DIET.** *Leiocephalus carinatus* is native to the Little Bahama Bank, Great Bahama Bank, Cayman Islands, and Cuba (Schwartz and Henderson 1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. University of Florida Press, Gainesville, Florida. 720 pp.). The species was intentionally introduced in Florida in the 1940s through the release of 20 pairs of lizards in Palm Beach County (Weigl et al 1969. Copeia 1969:841–842). *Leiocephalus carinatus* has been described as mostly insectivorous in Florida, feeding primarily on beetles, roaches, and ants (Meshaka et al 2004. The Exotic Amphibians and Reptiles of Florida. Krieger Publishing Company, Malabar, Florida. 155 pp.). In their native range, *L carinatus* consumes vegetation such as flowers and fruits (Schoener et al 1982. Oecologia 53:160–169). However, to our knowledge there is no report

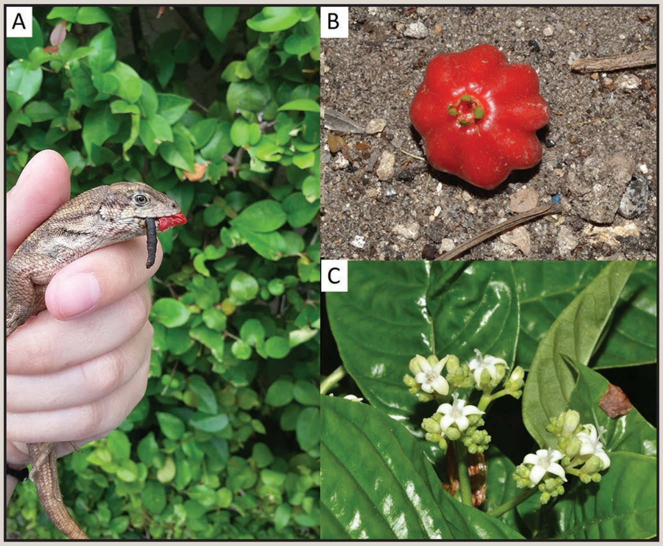

Fig. 1. A) *Leiocephalus carinatus* consuming a fruit of *Eugenia uniflora*; B) mature fruit of *Eugenia uniflora* at Plantation, Broward County, Florida; C) inflorescence of *Eugenia uniflora* at Plantation, Broward County, Florida.

of herbivory in Florida. Here we report *L. carinatus* feeding on vegetation, invertebrates, and three species of small vertebrates (one frog and two lizards) in Florida.

Individuals (N = 364) were captured with a noose or glue traps between April 2015 and October 2015 in Broward County, Florida, USA (26.26069°N, 80.24944°W, WGS 84; 3.35 m elev.), and were euthanized via injection of tricaine methansulfonate (MS222). We use a dissecting scissors to cut the lizards open along the mid-ventral body axis and carefully removed the GI tract. We rinsed the GI tracts with water into a petri dish and then examined gut contents.

To the best of our knowledge, we report the first instance of predation on anurans by *L. carinatus*. We found the remains of a small frog in the stomach of one of our study lizards. We presume it was *Eleutherodactylus planirostris* (Greenhouse Fog) but the frog was quite digested so we cannot be certain. However, *E. planirostris* is a ground-dwelling frog commonly observed in the same locations where our *L. carinatus* were collected, and we have not seen other frog species at these sites. We also recovered the identifiable remains of a juvenile *Anolis sagrei* (Brown Anole) in the same location. Similarly, on 20 July 2016 also in Broward County (26.227122°N, 80.205374°W, WGS 84; 3.35m elev.), we found a juvenile *L. carinatus* in the stomach of an adult conspecific.

Additionally, on 18 April 2016 in Plantation, Broward County (26.147762°N, 80.286271°W, WGS 84; 2.44 m elev.), we observed an adult male (SVL = 9.05 cm) consuming the fruit of *Eugenia uniflora* (Surinam Cherry) (Fig. 1). The lizard was also eating a lepidopteran larva. *Eugenia uniflora* is native to South America and was introduced into south Florida as an ornamental plant (Gordon and Thomas 1997. *In* Simberloff et al. [eds.], Strangers in Paradise: Impact and Management of Nonindigenous Species in Florida, pp. 21–38. Island Press, Washington, D.C.). It is considered an invasive species that may have spread over Florida because of its tolerance of a wide range of environmental conditions (Staples and Herbst 2005. Tropical Garden Flora: Plants Cultivated in the Hawaiian Islands and other Tropical Places. Bishop Museum Press, Honolulu, Hawaii. 918 pp.). Because this plant is not only used by *L. carinatus* as a food source but also as refugia, it may have played a role in facilitating the colonization of this lizard in south Florida. In addition, on 16 June 2016, in the same location, we found the remains of a second juvenile *A. sagrei* in one of the stomachs of our sample of lizards. Finally, on 17 October 2016 we observed a juvenile *L. carinatus* eating a *Lumbricus* sp. (earthworm); to our knowledge, our observation is the first report of consumption of this prey item for *L. carinatus*.

We thank Kathryn Sieving and David Pais for helping to identify the Surinam Cherry, and Juan Salvador Mendoza-Roldán for his assistance.

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***LEIOCEPHALUS CUBENSIS* (Cuban Curlytail Lizard). SEXUAL DISPLAY BEHAVIOR.** Sexual display behavior is common in lizards, and is mainly associated with mate acquisition and male-male confrontation (Andersson 1994. Sexual Selection. Princeton University Press, Princeton, New Jersey. 624 pp.). In the genus *Leiocephalus*, this phenomenon is more intense during antagonistic encounters between males, is composed of different postures and movements of the body and head, and has been recorded in some species inhabiting islands of the Bahamas and Hispaniola (*L. inaguae*, *L. personatus*, and *L. schreibersii*; Noble and Bradley 1933. Annals New York Acad. Sci. 35:25–100). However, for many species antagonistic behavioral data are lacking, as is the case of the endemic *L. cubensis* (Rodríguez-Schettino et al. 2013. Smithson. Herpetol. Inf. Serv. 144:1–96). Here, we describe the aggressive intrasexual behavior between two adult males of *L. cubensis*.

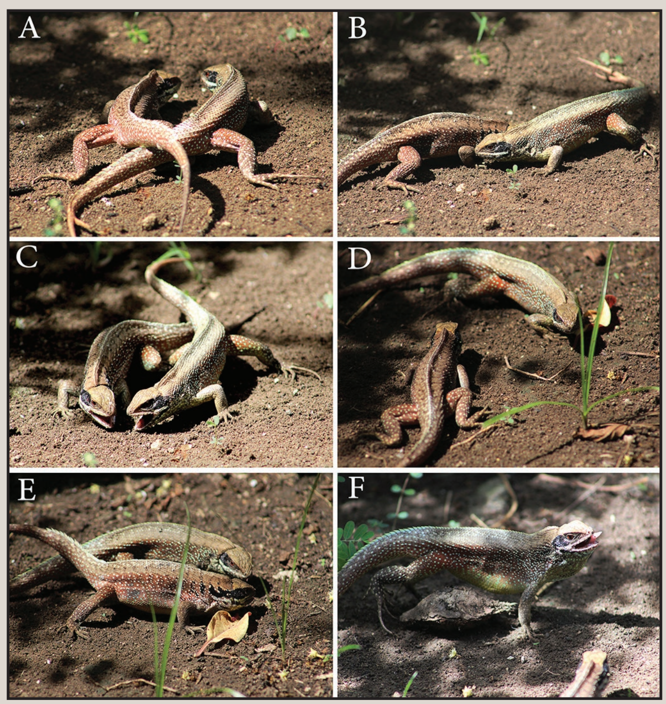

Fig. 1. Components of agonistic intrasexual behavior between two males of *Leiocephalus cubensis*. A) Initial lateral position with tails crossed. B) Face-to-face position. C) Open-mouthed displays. D) Circular movements (presumably opponent evaluation). E) Arched bodies, raised dorsal crests and tail. F) Tongue display.

At approximately 1235 h on 14 July 2016 one of us (LAAJ) observed male-male confrontation of *L. cubensis* in Palma Soriano, province of Santiago de Cuba, Cuba (20.20565°N, 75.99093°W, WGS 84; 163 m elev.). Prior to the confrontation, a male was observed chasing other males (of smaller size), presumably reflecting territorial behavior. The confrontation occurred when one male of similar size did not flee the area. Both males immediately adopted a lateral position, crossing and moving the tails on each side for approximately one minute (Fig. 1A). The lizards subsequently separated, assumed a face-to-face stance (Fig. 1B), and continued to move sideways until tails were once again crossed and mouths were open (Fig. 1C). These behaviors were repeated for approximately two more minutes, while moving from one side to another in a circular fashion (Fig. 1D), with heads pointed down, bodies arched, dorsal crests extended, and tails raised in a straight line with the body (Fig. 1E). The males rarely separated, but when they did, they extended their four limbs, showed their tongues and performed a lateral flattening that highlighted conspicuous coloration on the flanks (Fig. 1F). The confrontation lasted approximately three min, and ended when one of the males fled the area.

The observed male-male confrontation within *L. cubensis* is very similar to those observed in other species of the genus. In general, the agonistic behavior in *Leiocephalus* is considered "largely bluff," given that bites apparently never happen (Noble and Bradley 1933, *op. cit.*). *Leiocephalus* are known to be saurophagus, which suggests a strong bite force (Schoener et al. 1982. Oecologia 53:160–169; Milera 1984. Misc. Zool. 22:2). Perhaps a disinclination to bite has been favored by natural selection, thereby reducing the possiblity of severe injuries caused by aggressive combat.

In contrast, the elongation of limbs and dorso-lateral compression are conserved behavioral traits throughout other lizard families including Phrynosomatidae (Carpenter and Murphy 1978. Contr. Biol. Geol. Milwaukee Publ. Mus. 18:1–71) and Agamidae (Carpenter 1970. Copeia 1970:497–505). Similarly, the tongue display during male agonistic interactions has been recorded in the Scincidae (Carpenter and Murphy 1978, *op. cit.*) and Agamidae (*Goniocephalus*; Murphy et al 1978. J. Herpetol. 12:455–460), and is also widely distributed in *Anolis* species (Schwenk and Mayer 1991. *In* Losos and Mayer [eds.], Anolis Newsletter IV, pp. 131–140. National Museum of Natural History, Smithsonian Institution, Washington, D.C.). The conservative components of agonistic intrasexual behavior suggest that intrasexual selection could have an important role in the evolution of diverse lizard families.

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***LEPIDODACTYLUS MOESTUS* (Micronesian Scaly-toed Gecko). REPRODUCTION.** *Lepidodactylus moestus* occurs in Micronesia, from Palau east through the Caroline Islands to the Marshall Islands (Buden and Taborosi 2016. Reptiles of the Federated States of Micronesia. Island Research and Education Initiative, Kolonia, Federated States of Micronesia, Pohnpei. 311 pp.). *Lepidodactylus moestus* is nocturnal and was common on *Scaevola* shrubs and buildings on Yap State, Federated States of Micronesia (Buden and Taborosi, *op. cit.*). *Lepidodactylus moestus* females commonly produce clutches of two eggs (Zug 2013. Reptiles and Amphibians of the Pacific Islands, A Comprehensive Guide. University of California Press, Berkeley. 306 pp.). In this note, I provide additional information on *L. moestus* reproduction gathered from a histological examination of museum specimens.

A sample of 48 *L. moestus* consisting of 27 males (mean SVL = 35. 4 mm ± 2.6 SD, range = 30–40 mm) and 21 females (mean SVL = 35.9 mm ± 2.4 SD, range = 30–40 mm) from Oceania collected between 1991 and 2015, were borrowed from the herpetology collection of the California Academy of Sciences (CAS), San Francisco, California, USA. The following *G. moestus* were examined by island: Kosrae Island (5.3096°N, 162.9815°E; WGS 84) (N =1) CAS 181167; Marshall Islands (7.1315°N, 171.1845°E; WGS 84) (N = 3) CAS 191107, 191235, 191243; Palau Islands (7.5150°N, 134.5825°E; WGS 84) (N = 45) CAS 122505, 236322, 236460, 236461, 236607, 236623, 236996, 236997, 237057, 237058, 237745, 237746, 237756, 237757, 237885, 237886, 248057, 248058, 248081, 248665, 248666, 248679, 249026, 249027, 249175, 249215, 249221, 249299, 249300, 249344, 251555, 251656, 251684, 251685, 251850, 253003, 253102, 254699, 254714, 254715, 255022, 257428, 257845, 257846.

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. Enlarged follicles (> 4 mm) or oviductal eggs were counted. Histology slides were deposited at CAS.

The only stage present in the testis cycle was spermiogenesis (= sperm formation) in which the seminiferous tubules were lined by sperm or groups of metamorphosing spermatids. *Lepidodactylus moestus* males in this stage were found throughout the year: January (N = 2); January–February (N = 1); February (N = 1); March (N = 2); April (N = 3); May (N = 2); June (N = 2*); July (N = 1); August (N = 4); September (N = 2); October (N = 2); November (N = 2); December (N = 3); *one June male slide (CAS 254714) did not contain a testis, however since the sperm-filled epididymis was present, I counted this *L. moestus*

TABLE 1. Monthly stages in the ovarian cycle of 21 *Lepidodactylus moestus* from Oceania.

Month	N	Quiescent	Early yolk deposition	Enlarged follicles > 4 mm	Oviductal eggs
January	2	1	0	0	1
February	1	0	1	0	0
March	3	2	0	1	0
April	2	0	1	0	1
May	1	0	0	0	1
June	2	1	0	0	1
August	3	2	0	1	0
September	2	0	0	1	1
October	1	0	0	1	0
November	2	0	1	0	1
December	2	0	0	0	2

as a spermiogenic male. The smallest reproductively active male (spermiogenesis) measured 30 mm SVL (CAS 253003) and was collected in October.

Four stages were noted in the ovarian cycle (Table 1): 1) quiescent, no yolk deposition; 2) early yolk deposition (basophilic granules in ooplasm); 3) enlarged follicles > 3 mm; 4) oviductal eggs. Mean clutch size (N = 12) was 1.67 ± 0.49, range = 1–2. The smallest reproductively active females measured 33 mm SVL: CAS 236461, one oviductal egg; CAS 236997, early yd; CAS 237885, two enlarged follicles > 3 mm. One slightly smaller female with quiescent ovaries (SVL = 30 mm, CAS 248666) was arbitrarily considered as an adult.

The presence of reproductively active males in twelve months and female reproductive activity in eleven months (no July sample was available) indicates *L. moestus* reproduces throughout the year. Year-round reproduction appears to be common in lizards from Oceania (Goldberg and Kraus 2012. Russian J. Herpetol. 19:199–202).

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***MICROLOPHUS BIVITTATUS* (San Cristóbal Lava Lizard). DIET.** The diet of *Microlophus* lizards is variable and the primary foraging mode largely reflects differences in habitat, ranging from primarily herbivory to primarily carnivory (Fariña et al. 2008. J. Anim. Ecol. 77:458–468). Diets of *Microlophus* of the Galápagos Islands are incompletely known and only for a small number of species. Galápagos *Microlophus* species are primarily insectivorous but will opportunistically ingest spiders, centipedes, other vertebrates, and vegetation that includes flowers, fruits, seeds, and pollen (Stebbins et al. 1967. Ecology 48:839–851; Werner 1978 Tierpsychol. 47:337–395l; Schluter 1984. Oikos 43:291–300; East 1995. Noticias de Galapagos 55:8–14). Body size variation among Galápagos *Microlophus* does not seem to be an adaptation to variation in prey size as large prey items have been infrequently reported, even for the species with the largest average body sizes (Schluter, *op. cit.*). Relatively large prey items of Galápagos *Microlophus* include centipedes in all species studied, newly hatched finches in *M. delanonis* on Isla Española (Werner, *op. cit.*), and in *M. indefatigabilis* on Isla Santa Cruz, small geckos and tails of conspecifics (Stebbins et al., *op. cit.*) and smaller conspecifics by relatively large adult males (J. Rowe, pers. obs.; Lewbart et al. 2017. Herpetol. Rev. 48: this issue). Conspecific tails and integuments have been reported in the guts of *M. pacifica* on Isla Pinzón (Schluter 1984). Here we report the first accounts of the diet of *M. bivittatus* on Isla San Cristóbal.

During spatial ecology and genetic studies of *M. bivittatus* on Isla San Cristóbal, we opportunistically observed individuals foraging and chance regurgitations that were unintentionally induced during lizard sampling between March 2015 and August 2017. Ingestion of plant material included fruits of Palo Santo trees (*Bursera graveolens*) and leaflets of Jerusalem Thorn (*Parkinsonia aculeata*; Fig. 1A and B, respectively). Most frequently, lizards were observed foraging on small insects such as ants (Fig. 1C) and occasionally on crickets, moths, spiders, and dragonflies (Fig. 1D–F). Of particular interest was a small Galápagos Giant Centipede (*Scolopendra galapagoensis*; Fig. 1H) that was ingested by a male *M. bivittatus* (83 mm SVL and weighed 23.6 g). The centipede measured 80 mm total length and weighed 2.3 g although the terminal caudal segment

Fig. 1. Diet of *Microlophus bivittatus* on San Cristóbal, Galápagos, Ecuador: A) consumption of fruit from *Bursera graveolens*; B) browsing on leaflets from *Parkinsonia aculeate*; C) ants recovered from the stomach of a necropsied lizard we found dead on a road; D) cricket consumption; E) feeding on moth; F) spider ingestion; G) dragonfly comsumption; and H) an adult male lizard with a regurgitated centipede.

was missing. Our observation is unusual as the centipede represented approximately 96% of the SVL, and 10% of the mass of the lizard. Similarly, Stebbins et al. (*op. cit.*) observed a female *M. indefatigabilis* (average SVL of 63 mm) attempting to ingest a *S. galapagoensis* that measured in excess of 100 mm. Clearly, our observations illustrate the potential for *M. bivittatus* to ingest formidable but potentially energetically profitable prey items such as centipedes, as well as ubiquitous but less energetically profitable food items such as small insects and plant matter.

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***MICROLOPHUS INDEFATIGABILIS* (Lava Lizard). DIET.** Lava lizards are a diverse group of nine small terrestrial species inhabiting most of the Galápagos archipelago (Benavides et al. 2009. Evolution 63:1606–1626). The species found on the small island of Daphne Major has been classified as *Microlophus indefatigabilis* and occurs on Santa Cruz, Santa Fe, and over a dozen small islands surrounding the larger island of Santa Cruz (Jordan and Snell 2008. Mol. Ecol. 17:1224–1237). Lava lizards are known to be omnivores consuming primarily arthropods and plant material (Stebbins et al. 1967. Ecology 48:839–851; Schluter 1984. Oikos 43:291–300; East 1995. Noticias de Galapagos 55:8–14). Schluter (*op. cit.*) examined the stomach contents of 60 lava lizards on the island of Pinta at two different sites and two different

Fig. 1. Adult male *Microlophus indefatigabilis* consuming a juvenile of the same species.

times of year. The predominant food item by number was ants, but, numerous other arthropods, berries, flowers, and leaves were consumed. One stomach contained part of a lava lizard tail and another some lava lizard skin. Close relatives of lava lizards (*Tropidurus* spp.) are known to consume amphibians and reptiles as part of their diet (Van Sluys et al 2004. J. Herpetol. 38:606–611; Ribeiro and Freire 2009. Herpetol. Rev. 40:228; Pergentino et al 2017. Herpetol. Notes 10:225–228). Cannibalism among lava lizards of the Galápagos is known by Galápagos naturalists and has been mentioned in the popular literature. However, the scientific literature is lacking reports of actual observations or evidence for this type of feeding behavior among lava lizards. Stebbins et al (*op. cit.*) reported finding a gecko in the stomach of one lava lizard. A photograph of a lava lizard eating another lizard of its own kind on Fernandina Island appears in a book (Jackson 1993. Galapagos: A Natural History. University of Calgary Press, Calgary, Alberta), and one of us (CAV) has observed that adult lava lizards occasionally prey upon juveniles of its own species on Santa Cruz Island.

On 28 June 2017 an adult *M. indefatigabilis* was observed grasping a juvenile conspecific in its jaws (Fig. 1). The animals disappeared before complete ingestion could be observed. This is the first reported case of any species of lava lizard (*Microlophus* spp.) predating a member of its own species. in the central Galápagos archipelago.

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***PARVOSCINCUS STEEREI* (Steere's Sphenomorphus). REPRODUCTION.** *Parvoscincus steerei* is endemic to the Philippines (Brown et al. 2013. ZooKeys 266:1–120) where it is distributed on numerous islands (Uetz et al. 2017. The Reptile Database. http://www.reptile-database.org). It is found across a wide variety of habitats but is most common in leaf litter and woody debris (Brown et al., *op. cit.*). Brown and Alcala (1980. Silliman Univ. Nat. Sci. Monogr. Ser. 2:1–264) gave body size (SVL) of mature males of *P. steerei* (as *Sphenomorphus steerei*) as 26.4–36.0 mm and females as 27.5–35.5 mm. Seven hatchlings of *P. steerei* (as *S. steerei*) measured 13.2–15.2 mm SVL (Brown and Alcala, *op. cit.*). Gaulke (2011. The Herpetofauna of Panay Island, Philippines. Edition Chimaira, Frankfurt am Main, Germany. 390 pp.) reported a *P. steerei* (as *S. steerei*) hatchling that measured 16 mm (SVL). Alcala (1986. Guide to Philippine Flora and Fauna. Amphibians and Reptiles, X. Natural Resources Management Center, Ministry of Natural Resources and University of Philippines, Quezon City, Philippines. 195 pp.) published size data of 27–36 mm (SVL) for mature specimens of *P. steerei* (as *S. steerei*). In this note I present the first histological information on the *P. steerei* reproductive cycle.

Table 1. Monthly stages in the ovarian cycle of 11 *Parvoscincus steerei* females from the Philippine Islands.

Month	N	Yolk deposition	Enlarging follicles > 2 mm	Oviductal eggs
February	2	0	1	1
March	3	1	1	1
May	3	0	0	3
June	2	0	1	1
July	1	0	0	1

The gonads of 19 adult *P. steerei* consisting of eight males (mean SVL = 31.6 mm ± 4.8 SD, range = 27–42 mm) and 11 females (mean SVL = 31.1 mm ± 3.3 SD, range = 28–39 mm) collected in the Philippine Islands during 2014 and 2016 were histologically examined. The above *P. steerei* are within the range of mature *P. steerei* in Brown and Alcala (*op. cit.*). *Parvoscincus steerei* were deposited in the herpetology collection of the Sam Noble Oklahoma Museum of Natural History (OMNH), the University of Oklahoma, Norman, USA (by island): Luzon Island: OMNH 45069, 45085, 45086, 45097, 45106, 45115, 45116, 45118, 45120, 45486–45488, 45491, 45493, 45495, 45496, 45504, 45505; Samar Island: OMNH 44707, 44713. 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. Slides of testes were examined to determine the stage of the testicular cycle. Slides of ovaries were examined for yolk deposition. Enlarged follicles = yolking (> 2 mm) were counted. Histology slides were deposited at OMNH.

Males from the following months were examined: February (N = 2), March (N = 2), May (N = 1), June (N = 3). All males were undergoing spermiogenesis in which the seminiferous tubules were lined by sperm or clusters of metamorphosing spermatids. The smallest reproductively active male (spermiogenesis) measured 27 mm (OMNH 45115) and was collected in February.

Three stages were present in the ovarian cycle of *P. steerei* (Table 1): 1) Yolk deposition, ooplasm contains basophilic granules; 2) Enlarging follicles > 2 mm; 3) Oviductal eggs. The smallest reproductively active females both measured 28 mm SVL and were collected on Luzon Island in February (OMNH 45118, one oviductal egg; OMNH 45120, one enlarged follicle, 3 mm). Mean clutch size (N = 10) was 1.1 ± 0.32 SD, range = 1–2. Examination of *P. steerei* from additional months is needed before the sequence of events in the reproductive cycle can be ascertained.

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PHRYNOSOMA HERNANDESI **(Greater Short-Horned Lizard). PREDATION.** *Phrynosoma hernandesi* is a broadly but patchily distributed lizard that nears its northern range limit in southern Saskatchewan, Canada. Due to its generally low density and cryptic nature, few predation events have been recorded for this species. Considering its size and limited defenses it is likely to be preyed upon opportunistically by a variety of vertebrate predators. Here we present an observation of avian predation.

On 25 August 2013, in the west block of Grasslands National Park (GNP) in Saskatchewan, Canada (49.241965°N, 107.733582°E), 11 *P. hernandesi* were observed impaled on the barbs of a wire fence in the caching style typical of *Lanius ludovicianus* (Loggerhead Shrike). We visited the site three days later and observed the nine remaining lizards more closely. Lizards were impaled on the 3rd wire of a five-wire fence, 91 cm above ground-level, where the top two wires are smooth and the bottom 3 wires are barbed. Lizards were impaled through the dorsum and into the thoracic cavity, through the thick skin at the nape of the neck or through the throat into the skull (Fig. 1). The impaled lizards were in various stages of consumption, some were relatively untouched while others had the thoracic and abdominal cavities opened presumably to extract viscera. Many were dehydrated and likely were no longer being eaten. Those lizards captured by shrikes represented neonates, juveniles, and adult males but no adult females were observed. Grasshoppers (orthoptera) were also present impaled on the fence. Lizard observations were restricted to a ~260-m length of fence. We have not observed *P. hernandesi* in any other *L. ludovicianus* larders in or around GNP, even in areas where *P. hernandesi* is relatively common. It is not uncommon for *L. ludovicianus* to prey on lizards, including this genus (Clark 2011. Son. Herpetol. 24:20–21), but to our knowledge this is the first verified instance of *P. hernandesi* as prey for *L. ludovicianus* (E. R Pianka, pers. comm.; W. C. Sherbrooke, pers. comm.; G. L. Powell, pers. comm.).

Fig. 1. Two adult male *Phrynosoma hernandesi* impaled on a barbed wire fence by a shrike (*Lanius ludovicianus*). The lizard in the bottom photograph is mostly consumed. Note the different way in which each lizard is impaled.

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PHRYNOSOMA PLATYRHINOS **(Desert Horned-lizard). SCAVENGED BY TARANTULA.** Arachnids are known to prey on *Phrynosoma* lizards; for example, by *Latrodectus hesperus* (Western Black Widow Spider; Painter and Kamees 2010. Herpetol. Rev. 41:227) and *Hadrurus arizonensis* (Arizona Giant Hairy Scorpion; Turner and Rorabaugh 1998. Herpetol. Rev. 29:101). However, here we report an arachnid scavenging a dead *Phyrnosoma*.

At 2240 h on 13 September 2015, I found a large *Aphonopelma prenticei* (Desert Tarantula) feeding on an adult road-killed *Phrynosoma platyrhinos* on Nipton Road, in San Bernardino County, California, USA, in the eastern Mojave Desert (35.46648°N, 115.42955°W). I first spotted the animals from a moving vehicle, and as I approached them on foot for photographs, the spider continued to feed for at least an additional 6 min (2240–2246 h). This is the first recorded account of an arachnid scavenging a *Phrynosoma*.

Fig. 1. *Aphonopelma prenticei* (Desert Tarantula) feeding on a road-killed specimen of *Phrynosoma platyrhinos* (Desert Horned-lizard).

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PTYODACTYLUS PUISEUXI **(Israeli Fan-fingered Gecko). REPRODUCTION.** *Ptyodactylus puiseuxi* is known to occur in a variety of rocky habitats in Israel, Iraq, Jordan, Lebanon, and Syria (Bar and Haimovitch 2011. A Field Guide to Reptiles and Amphibians of Israel. Pazbar Ltd, Herzliya, Israel. 245 pp.). Several clutches of two eggs are deposited between May and August

(Bar and Haimovitch, *op. cit.*; Disi et al. 2001. Amphibians and Reptiles of the Hashemite Kingdom of Jordan, An Atlas and Field Guide. Edition Chimaira, Franfurt am Main. 408 pp.). In this note we add additional information on the reproductive biology of *P. puiseuxi*, including sizes at maturity from a histological examination of gonadal material from museum specimens.

A sample of 29 *P. puiseuxi* consisting of 14 adult males (mean SVL = 67.1 mm ± 8.8 SD, range = 53–83 mm) 10 adult females (mean SVL = 66.0 mm ± 4.6 SD, range = 60–75 mm), and five juveniles (mean SVL = 40.8 mm ± 1.9 SD, range = 39–44 mm) collected between 1953 and 2012 from Israel was examined from the Steinhardt Museum of Natural History (TAUM) University of Tel Aviv, Israel. The following *P. puiseuxi* were examined by District: HaGolan: 7526, 11660, 12964, 12965; Hermon Mountain: 7117, 9926, 9935, 9937, 12507, 12803, 16205; Jordan Valley: 1187, 1188, 1190, 16173, 16508; Lower Galil: 1181; Shomeron: 12683; Upper Galil: 494, 496, 497, 501, 1517, 4892, 7829, 13426, 13619–3621. For histological examination, the left gonad was removed to examine for yolk deposition or corpora lutea in females and to identify the stage of the testicular cycle in males. Counts were made of oviductal eggs. Tissues were embedded in paraffin, sectioned at 5 µm, and stained with hematoxylin followed by eosin counterstain. Histology slides were deposited at TAUM.

Three stages were noted in the testicular cycle (Table 1): 1) Late recrudescence, in which numerous spermatids of which a few were metamophosing, but no sperm were observed. In early recrudescence, there is a proliferation of spermatogonia and spermatocytes for the next period of spermiogenesis; 2) Spermiogenesis (sperm formation) in which lumina of the seminiferous tubules are lined by sperm or clusters of metanmorphosing spermatids; 3) Late spermiogenesis in which the germinal epithelium is reduced to a few layers of cells, sperm formation is coming to a close. The smallest mature male (TAUM 11660) measured 53 mm SVL, was undergoing spermiogenesis and was from April.

Table 1. Monthly stages in the testis cycle of 14 adult male *Ptyodactylus puiseuxi* from Israel. *Only the sperm-filled epididymis was present in TAUM 7829.

Month	N	Late recrudescence	Spermiogenesis	Late spermiogenesis
March	2	1	1	0
April	3	0	3	0
May	6	0	6*	0
June	1	0	1	0
July	2	0	0	2

Table 2. Monthly stages in the ovarian cycle of 10 adult female *Ptyodactylus puiseuxi* from Israel.

Month	N	Quiescent	Oviductal eggs
April	2	1	1
May	1	1	0
June	1	0	1
July	4	2	2
October	1	1	0
November	1	1	0

Two stages were present in the ovarian cycle (Table 2): 1) (quiescent), no yolk deposition; 2) oviductal eggs. Females contained oviductal eggs in spring and summer (Table 2). The mean clutch size (N = 4) was 1.8 ± 0.5 SD, (range = 1–2). The smallest mature female (TAUM 1188) measured 60 mm SVL, contained one oviductal egg and was from July.

The presence of two July males in late spermiogenesis likely reflects the breeding period is nearly over. In contrast, the congener *P. guttatus* from Israel (Goldberg 2011. Herpetol. Rev. 42:433) exhibited spermiogenesis in October and November and one clutch (two eggs) in October. Examination of *P. puiseuxi* gonads from autumn is warranted to ascertain whether *P. puiseuxi* also exhibits autumn reproduction.

We thank Shai Meiri (TAUM) for permission to examine *P. puiseuxi* and THE Steinhardt Museum of Natural History at Tel-Aviv University for providing the *P. puiseuxi* to study.

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***SCELOPORUS BULLERI* (Buller's Spiny Lizard). REPRODUCTION.** *Sceloporus bulleri* is a conspicuous diurnal species inhabiting boreal-tropical forests and tropical deciduous forests in the Sierra Madre Occidental of western Mexico, from southern Sinaloa and southwestern Durango to the highlands of Jalisco (Webb 1967. Copeia 1967:202–213). This species can be observed on large boulders, steep-sided rock walls, logs, and upright deciduous or pine trees (Webb 1967, *op. cit.*). Currently, the conservation status of *S. bulleri* is listed as Least Concern by the International Union for Conservation of Nature (Frost et al. 2007. The IUCN Red List of Threatened Species 2007:e.T64090A12736680). Although the distribution of *S. bulleri* is well known and it is an abundant species in mountainous habitats (Webb 1967, *op. cit.*; Frost et al. 2007, *op. cit.*), a number of aspects of its life history are unknown. Herein, we provide data on reproductive biology of females and males, clutch size, and egg attributes of *S. bulleri* in a tropical deciduous forest.

We conducted diurnal surveys during November 2015 to collect *S. bulleri* from San Sebastián del Oeste, in the state of Jalisco, Mexico (20.76167°N, 104.08667°W, WGS 84; 1480 m elev.). Vegetation adjacent to San Sebastián del Oeste is dominated by pines (*Pinus* sp.), oaks (*Quercus* sp.), and some patches of cloud forest. Climate of the area is temperate, with the rainy season between June and October (Dueñas et al. 2006. Ibugana: Bol. Inst. Bot. 14:51–91). In the town of San Sebastían, we collected three males and three females killed by local people. Lizards were transported to the laboratory. A cut was made in the abdominal cavity to observe enlarged follicles or oviductal eggs in females; for males, we assumed sexual maturity by the enlarged testes (Goldberg 1971. Herpetologica 27:123–131; Guillette and Casas-Andreu 1980. J. Herpetol. 14:143–147). We measured three standard morphological variables: snout–vent length (SVL), dorsal–cranial length (CL), and cranial width (CW). We measured length and width of left and right testes, and we also measured length of oviductal eggs. All measurements were taken with a digital caliper (scale 150 mm, precision 0.1 mm).

Morphological data of females and males are shown in Table 1. The number of oviductal eggs ranged from six to eight. The size of oviductal eggs was 6.8 ± 0.5 mm (SVL 90.2 mm; N = 6 eggs), 9.7 ± 0.5 mm (SVL 93.8 mm; N = 6 eggs), and 10.2 ± 0.3 mm (SVL 96.8, N = 8 eggs). The mean length and width of left testes was

TABLE 1. Morphological variables (mean ± SD mm; range), for male and female *Sceloporus bulleri*.

Variable	Females	Males
Snout–vent length	93.6 ± 3.3 (90.2–96.8)	80.4 ± 13.7 (76.9–95.5)
Head length	19.6 ± 1.4 (18.0–20.8)	19.2 ± 3.8 (15.7–18.7)
Head width	18.2 ± 0.4 (17.8–18.5)	17.6 ± 4.5 (13.1–22.1)

8.1 ± 2.2 mm and 5.7 ± 2.0 mm, respectively, whereas the mean length and width of right testes was 8.2 ± 2.7 mm and 6.2 ± 2.3 mm, respectively.

Our observations suggest that the reproductive activity of *S. bulleri* is similar to other species of the *torquatus* group, which occurs from autumn to spring (Ramírez-Bautista and Dávila-Ulloa 2009. Southwest. Nat. 54:400–408). However, our data are insufficient to determine whether there is asynchrony between the sexes, as occurs in other montane lizard species (Feria-Ortíz et al. 2001. J. Herpetol. 35:104–112; Gadsden et al. 2005. Acta Zool. Mex. [n.s.] 21:93–107). The number of oviductal eggs is within the range reported for other viviparous species of the *torquatus* group (see Ramírez-Bautista and Dávila-Ulloa 2009, *op. cit.*). Our observations, to our knowledge, are the first data on reproductive biology of *S. bulleri*. Further studies are needed of additional specimens to understand the reproductive cycles and characteristics in this lizard.

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***SCELOPORUS OLIVACEUS* (Texas Spiny Lizard). RECORD CLUTCH SIZE, NESTING, INCUBATION, AND HATCHLINGS.** At 1830 h on 6 May 2014, on a sunny day when the high temperature was 30.6°C and low was 17.8°C, while passing the Environmental Science Building at University of North Texas, Denton, Texas, USA (33.21376°N, 97.15123°W), I observed a *Sceloporus olivaceus* in a hole in a landscaped area to the south of the building. I slowly approached on foot to a distance of two meters, and captured a photograph of the wary lizard (Fig. 1A). I inadvertently disturbed the lizard, and she fled from the burrow into a nearby tree. I approached the burrow to find she had been nesting and had laid several eggs. I did not further disturb the nest site at this time.

I returned to the location at 1940 h to find that the lizard had not returned to the burrow, but had remained in the nearby tree, and continued to lay her eggs in a split in the tree, approximately 0.5 m above the ground. She was still laying eggs when I returned, but many of the eggs were falling to the ground. Although they did not break, they were soft, exposed, and some were showing signs of desiccation (i.e. dimpling). I retrieved vermiculite and a Gladware container with an interlocking lid (and small air holes in the lid to allow ventilation), and returned by 2010 h. The female had completed laying and watched from the tree as I collected the eggs from the surface of the ground, from the crevice, and from the burrow.

The nest site was alongside a stump with stones embedded at the base, in an area with loose soil and mulch. This nest cavity had been excavated to 8–9 cm in depth and 6–7 cm wide at the entrance. The location is exposed to the sun for several hours during late morning and early afternoon, with trees and planted bushes immediately surrounding it on its north side, shading it for part of the day.

The lizard remained in the area for several weeks, appearing gravid once more approximately a month after the observed reproductive episode. *Sceloporus olivaceus* are previously known to lay multiple clutches of eggs per year, with females two or more years of age producing an average of 3–4 clutches per year (Blair 1960. The Rusty Lizard. University of Texas Press, Austin, Texas. 185 pp.). The female was captured, measured with calipers, and released (SVL = 11.5 cm; total length = 27.1 cm); she was relatively large, but did not represent the record for *S. olivaceus*; Smith (1939. Field Mus. Nat. Hist., Zool. Ser. 26:1–397) reported a maximum SVL of 12.1 cm in *S. olivaceus*, and McCoid and Hensley (1996. Herpetol. Rev. 27:21) reported a maximum total length of 29.9 cm.

Although the female was not directly observed laying each egg, it is reasonable to assume that the eggs around the tree and those already in the nest cavity all belonged to this female and the same nesting event. *Sceloporus olivaceus* are not known to nest communally, and no additional females were observed in the vicinity, the eggs appeared freshly deposited at the time when they were found, and all of the eggs hatched nearly simultaneously. Eighteen eggs were recovered from the nest cavity, and an additional 16 were recovered from the ground beside the tree or from the split in the tree; hence, 34 eggs where recovered. The average number of eggs per clutch varies with age in *S. olivaceus*; one-year olds average 11.3 eggs per clutch, two-year olds average 18.4 eggs per clutch, and females three plus years of age average 24.5 eggs per clutch (Blair, *op. cit.*). Whereas fecundity may decrease with age, the largest clutches are known from females three or more years of age, in which the maximum clutch size reported by Blair (*op. cit.*) was 30 eggs.

I collected the eggs and buried them halfway in vermiculite mixed with water at a 2:3 ratio of water:vermiculite, by mass (Fig. 1B), with water replenished to the original mass every 4–5 days. The eggs were incubated at 28.0–30.0°C. The eggs measured approximately 8–11 mm at the time of collection, although some may have been partially desiccated. When I first set the eggs to incubate, I candled a few eggs; no blood vessels were visible. By day 10, one egg had discolored and collapsed, and it was removed and discarded. By day 15, another egg had done the same and it was removed, and by day 40, a third. The three eggs that did not survive to hatching were all among the first 18 laid that were recovered from the nest cavity, and they were likely exposed for the longest period of time before collection; these three eggs may have been negatively affected by exposure to the conditions at the time of laying, perhaps dying from desiccation during the first two hours post laying. In undisturbed (i.e., neither collected, nor predated) *S. olivaceus* nests, 2.4–13.4% of eggs, and primarily those eggs located higher in the nest cavity, fail to hatch, apparently due to desiccation (Blair, *op. cit.*). Further, nest failure, wherein all eggs in a clutch fail to survive to hatching occurs in 75–78% of *S. olivaceus* nests; predation plays a major role in this mortality, but desiccation is also a potential cause for mortality in disturbed nests (Blair, *op. cit.*).

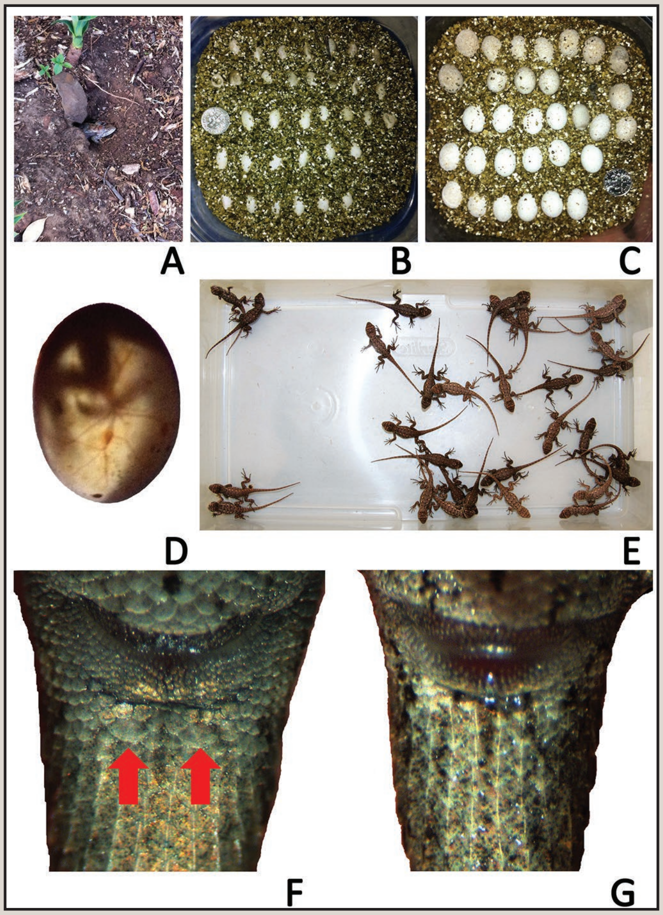

Fig. 1. A) Female *Sceloporus olivaceus* laying in nest cavity. B) Day 1 *S. olivaceus* eggs set to incubate. United States dime included for size reference. C) The same eggs at day 56 of incubation. D) One of the eggs being candled at day 56 of incubation. E) The 31 hatchling *S. olivaceus*. F) Post-cloacal scalation of a male *S. olivaceus* hatchling. Arrows indicate enlarged scales. G) Post-cloacal scalation of a female *S. olivaceus* hatchling.

By day 50, the eggs had swollen to range between 13–19 mm in length (Fig. 1C). A few eggs were candled at day 56, embryos with blood vessels around the corioallantois were observed, and each embryo appeared to fill approximately half of its egg (Fig. 1D). The eggs began hatching on day 58 (3 July 2014) during the morning hours (between 0330 h and 1000 h), during which time, the first 16 fully hatched, and several more pipped. During this time, a rainstorm was moving through the area, and sudden changes in pressure may have cued the hatching event. Between 1000 h and 1900 h, the rest of the clutch hatched, for a total of 31 hatchlings (Fig. 1E). This incubation period is within the range of 43–83 days observed by Blair (*op. cit.*) in naturally incubated nests, and incubation period in *S. olivaceus* likely varies with temperature, and potentially other variables (Blair, *op. cit.*).

Hatchling sex was visually determined by post-cloacal scalation, where males have two relatively flat enlarged scales easily distinguished from the smaller heavily keeled scales surrounding them (Fig. 1F), whereas females have more uniform scalation consisting entirely of small heavily keeled scales (Fig. 1G). The sex ratio in the clutch was 12:19 (males:females), which is not significantly different from an expected ratio of 1:1 (Chi-squared test of goodness of fit; $\chi^2 = 1.58$, df = 1, P = 0.21), a result that is not surprising in a species that is thought to possess genetic sex determination (Blair, *op. cit.*). *Sceloporus olivaceus* has a diploid set of 22 chromosomes, as do all members of the clade comprised of the *S. undulatus*, *S. formosus*, and *S. spinosus* species groups (Leaché et al. 2016. BMC Evol. Bio. 16:1–16). However, the sex chromosomes appear indistinct throughout this clade, whereas many *Sceloporus* species outside this group display heteromorphic X and Y sex chromosomes (Leaché et al., *op. cit.*).

There were no differences between male and female hatchlings in mean total length, mean SVL, mean tail length, and mean mass (Student's t-tests, P > 0.05 for all comparisons; mean total length = 64.23 ± 1.89 mm; mean SVL = 26.79 ±1.05 mm; mean tail length = 37.44 ± 1.29 mm; mean mass = 702.4 ± 28.9 mg). Whereas the observed lengths herein are consistent with those observed by Blair (*op. cit.*), the mass of these animals is greater than the range observed by Blair (*op. cit.*; 340–570 mg in ten hatchlings). This may reflect any or all of several variables: a genetic predisposition to large size in this biased sample of one clutch, or the conditions of incubation promoting growth and/or uptake of water, whereas the animals reported on by Blair (*op. cit.*) were incubated in the wild, where the wet masses of lizards were possibly limited by reduced water availability during embryonic development. Photos of the nesting female, eggs (day 1, day 15, and day 50), a day-56 candled egg, hatchlings, and post-cloacal scales viewed for sexing have been deposited at University of Texas at Arlington (UTA DC 8179–8189).

I thank Carl J. Franklin for cataloguing photos and offering thoughts on the observations. I thank Edward M. Dzialowski for thought-provoking discussion on the case.

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SQUAMATA — SNAKES

***BUNGARUS CAERULEUS* (Common Krait). DIET.** *Bungarus caeruleus* is a nocturnal elapid that is widely distributed throughout the Indian subcontinent (www.reptile-database.org; 30 Mar 2017). It feeds primarily on snakes, lizards, frogs,

Fig. 1. *Bungarus caeruleus* feeding on *Eryx whitakeri* in India.

and sometimes small mammals (Whitaker and Captain 2004. Snakes of India. Macmillan India Ltd., New Delhi. 354 pp.). Cannibalism and scavenging are also known in this species (Smith 1913. J. Bombay Nat. Hist. Soc. 23:373; Mohapatra 2011 Herpetol. Rev. 42:436–437; Deshmukh et al. 2016. ICRF Reptiles and Amphibians 23:169–170). On 30 November 2015, at ca. 0052 h, we observed a *B. caeruleus* (total length ca. 128 cm) preying on an *Eryx whitakeri* (Whitaker's Boa; total length ca. 45 cm) at Goa University Campus, Goa, India (15.2736°N, 73.5008°E, WGS 84; 57 m elev.). *Eryx whitakeri* is a medium-sized nocturnal constrictor in the family Boidae, endemic to Western Ghats of India (Whitaker and Captain, *op. cit.*). The *B. caeruleus* bit and held the prey mid body and the snakes struggled for ca. 43 min, until venom began to subdue the *E. whitakeri* (Fig. 1). The prey was then devoured headfirst in approx. 5 min. After ingesting its prey, the *B. caeruleus* moved into the nearby forest. We thank Amay Bhogte for his help.

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***BUNGARUS CAERULEUS* (Common Krait). DIET / SCAVENGING.** On 13 June 2013, at 2018 h, after a heavy rainfall, we encountered a *Bungarus caeruleus* on the road feeding on a dead gecko at Kuldiha Wildlife Sanctuary, Balasore, Odisha, India (21.4490°N, 86.6830°E, WGS 84; 149 m elev.). The head of the prey was inside the krait's mouth. The body of the prey was mutilated, exposing its intestine and abdominal parts (Fig. 1), apparently indicating a roadkill incident. After close observation, the dead prey was identified to be a *Hemidactylus* sp. (East Indian forest gecko). It took around 6 min for the krait to swallow the prey, after which the snake crossed the road and moved into the leaf litter.

Bungarus caeruleus is known to feed on frogs, lizards, and other snakes (Whitaker and Captain 2016. Snakes of India, the Field Guide. Westland/DracoBooks, Chennai. 400 pp.). Recently, scavenging behavior of this snake has been reported from India (e.g., Mohapatra 2011. Herpetol. Rev. 42:436–437; Deshmukh et al. 2016. IRCF Reptiles & Amphibians 23:169–170), which a common opportunistic foraging strategy in many snakes (DeVault and Krochmal 2002. Herpetologica 58:429–436). This is an additional report of *B. caeruleus* scavenging on lizard prey.

I thank Manuwar Khan and Nilakantha Jena for their help in the field.

Fig. 1. *Bungarus caeruleus* scavenging on a dead *Hemidactylus* sp.

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***CHILABOTHRUS CHRYSOGASTER CHRYSOGASTER* (Turks Island Boa). DIET.** *Chilabothrus chrysogaster chrysogaster* consumes a variety of small to medium-sized endothermic and ectothermic prey (Reynolds and Gerber 2012. J. Herpetol. 46:578–586). On small islands, adults and juveniles are largely saurophagous (Reynolds and Niemiller 2011. Herpetol. Rev. 42:290), or seasonally prey on native or migratory songbirds (Schwartz and Henderson 1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. University of Florida Press, Gainesville, Florida. 720 pp.; Tolson and Henderson 1993. The Natural History of West Indian Boas. R&A Publishing Ltd., Taunton, UK. 68 pp.). Although these snakes consume a variety of native prey species, no records exist of them consuming introduced prey species.

At 2103 h on 15 March 2017, we found an adult female *C. c. chrysogaster* (SVL = 757 mm) in the process of consuming an adult *Hemidactylus mabouia* (Woodslave). The snake was positioned at the base of a grass tussock, with 1/3 of the anterior body length extended and coiled around the lizard (Fig. 1). The observation occurred in heavily modified habitat near a series of large buildings on Big Ambergris Cay, located on the Caicos Bank, Turks and Caicos Islands. This island is privately owned and undergoing development. Hence there are serious risks for the introduction of invasive species. The Big Ambergris Cay population of *H. mabouia*, first documented in 2011 (Reynolds 2011. Caribbean Herpetol. 28:1), remains restricted to buildings on the island, and is not yet found in native vegetation. It is possible that the population is being kept in check by predation, as the boa population on this island is exceptionally dense (Reynolds and Gerber 2012. J. Herpetol. 46:578–586).

PHOTO BY JOSEPH BURGESS

Fig. 1. Adult female *Chilabothrus chrysogaster chrysogaster* consuming an adult *Hemidactlyus maboiua*, an introduced species, on Big Ambergris Cay, Turks and Caicos Islands.

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***COLUBER LATERALIS* (= *MASTICOPHIS LATERALIS*) (Striped Racer). DIET.** *Coluber lateralis* is an active-foraging diurnal colubrid endemic to California and the northern Baja California peninsula. *Coluber lateralis* is a generalist that preys upon a wide variety of taxa, but lizards are the most common prey (Ernst and Ernst 2003. Snakes of the United States and Canada, Smithsonian Books, Washington, DC. 668 pp.). On 14 September 2008 and again on 5 September 2009, RD observed as individual *C. lateralis* successfully captured and consumed hovering *Calypte anna* (Anna's Hummingbirds) as they fed at a residential hummingbird feeder in Westlake Village on the south side of the Simi Hills, Ventura County, California, USA (34.19221°N, 118.77354°W; WGS 84). On the first occasion the snake rapidly swallowed a bird, and was photographed laying on the feeder with a distended abdomen. On the second occasion RD obtained photographs of the snake swallowing a bird (Fig. 1). Photographs of both observations were deposited as digital photo vouchers into the Los Angeles County Museum of Natural History (LACM PC 2135–2136).

Published avian prey of *C. lateralis* includes goldfinches (*Carduelis psaltria*), orioles (*Icterus glabula*), and wrens (Shafer and Hein 2005. Herpetol. Rev. 36:195; Ernst and Ernst, *op. cit.*). However, to our knowledge this is the first report of any hummingbird species in the diet of *C. lateralis*.

Fig. 1. *Coluber lateralis* swallowing a male *Calypte anna* (Anna's Hummingbird) that it seized in-flight.

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***CROTALUS HORRIDUS* (Timber Rattlesnake). REPRODUCTION.** *Crotalus horridus* is a large, heavy bodied, crotaline snake that ranges across 30 states from Wisconsin south to Texas, east to Florida and north to New Hampshire, USA (Brown 1993. SSAR Hepetol. Circular 22:1–78). It has been extirpated from portions of its range and is of conservation concern in many states due to habitat modification and loss and persecution (Brown, *op. cit.*). Conservation actions to protect and conserve *C. horridus* populations in parts of its range include translocation (Sealy 1997. Son. Herpetol. 10:94–99) and construction of artificial rookeries and hibernacula (Brown, *op. cit.*), but the efficacy of such measures is unclear (Griffith et al. 1989. Science 245:477–480; Wolf et al. 1999. Conserv. Biol. 10:1142–1154). Here we report on the reproductive characteristics of *C. horridus* from two sites in north central Missouri, Crowder State Park (CSP) and Premium Standard Farm (PSF). Crowder State Park, in Grundy County, is a natural site that offers protection due to park regulations. Premium Standard Farm Grundy and Daviess County, is a secure commercial hog breeding facility with a patch of natural woodland habitat surrounding a man-made reservoir with a rip rap dam. *Crotalus horridus* utilize the artificial rip rap dam as a rookery and for hibernation.

From March 2008 to September 2010 we captured six pregnant *C. horridus* from the two sites (two from CSP; four from PSF). Gravid females were held in the lab until parturition. All snakes were returned to the site of capture within one week of parturition. One additional litter was discovered without the mother at PSF.

The six females averaged 86.98 cm (+/- 7.13 cm 1 SD) snout–vent length (SVL) and 656.31 (+/- 89.39) g body mass. The smallest female was 76.7 cm. Reproductive female size was similar to other populations across the range (Fitch 1985. Occ. Pap. Mus. Nat. Hist. Univ. Kansas 118:1–11; Martin 1988. Catesbeiana 8:9–12; Martin 1993. J. Herpetol. 27:133–143). Females from CSP were longer than at PSF (t-test; $p < 0.001$) and were heavier at a given length (ANCOVA; $p < 0.001$). There were 49 offspring produced with an average litter size of 7 (+/- 1.41). The sex ratio of 33M:16F was significantly male biased (χ^2; $p = 0.0152$). There was no significant effect of maternal SVL on clutch size (ANOVA; $p = 0.358$). Litter size at both sites was similar to those reported throughout the range (Galligan and Dunson 1979. Biol. Conserv. 15:13–56; Fitch, *op. cit.*; Martin, *op. cit.*).

Average neonate size was 30.25 (+/- 2.27) cm SVL and 25.23 (+/- 5.85) g mass. There was no significant difference between female and male neonates in SVL (t-test; $p = 0.287$) or mass (t-test; $p = 0.198$). Neonate size was within the range reported across all populations (Galligan and Dunson, *op. cit.*; Martin, *op. cit.*), but smaller than those from the closest population in Kansas (Fitch, *op. cit.*). Neonates from the natural site (CSP) were longer at a given female body size (ANCOVA; $p = 0.004$) than those from artificial rookeries and den sites at PSF. Our results indicate that *C. horridus* are able to survive and reproduce utilizing artificial rookeries and hibernacula (i.e., rip rap). However, *C. horridus* at the more natural site (CSP) are larger and produce larger offspring. The difference between two sites, all other things being equal, indicates that artificial rookeries and hibernacula can support *C. horridus* populations, although they may not be optimal.

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***DRYOCALAMUS NYMPHA* (Indian Bridal Snake). REPRODUCTION.** Few published observations exist on the reproductive ecology of *Dryocalamus nympha*, a rare colubrid snake found in India and Sri Lanka (Whitaker and Captain 2004. Snakes of India: The Field Guide. Draco Books, Chennai. 479 pp.). Here I present three records of neonate *D. nympha* from Tamilnadu, South India.

The first specimen (SVL = 16.2 cm, tail length [TL] = 6.4 cm; 223 ventrals, 82 subcaudals) was captured in a residence in Akkarai, Chennai district on 17 March 2016. The second specimen (SVL = 18.0 cm, TL = 7.2 cm; 209 ventrals, 71 subcaudals) was found in the garden of a residence in Mahabalipuram, Kanchipuram district on 11 October 2016, 35 km S of the first location. Another neonate (SVL = 16.9 cm, tail length = 6.8 cm; 214 ventrals, 79 subcaudals) was observed at Manimutharu, Tirunelveli district on 16 August 2015 by Surya Narayanan. The only published observation of copulation in free-ranging *D. nympha* was by Krishnakumar (2014. Herpetol. Notes 7:337–338) who observed a copulating pair during August 2013. The same author reported a female with eggs found during August 2015 (Krishnakumar et al. 2016. Entomol. Ornithol. Herpetol. 5: e120). Based on the above observations, it is likely that *D. nympha* has an extended reproductive season in this part of its range.

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***ERYTHROLAMPRUS MILIARIS* (Military Ground Snake). DIET.** *Erythrolamprus miliaris* is a small to medium-sized snake that often preys on fishes and anurans (Dixon 1979. *In* Duellman [ed.], Origin and Distribution of the Reptiles in Lowland Tropical Rainforests of South America, pp. 217–240. Monogr. Mus. Nat. Hist. Univ. Kansas). The species occurs across South America (Uetz [ed.], The Reptile Database, http://www.reptile-database.org, accessed June 10, 2017), usually in moist or aquatic habitats. During fieldwork in Monte Alegre municipality, State of Pará, Brazil (1.17869ºS, 54.18683ºW; WGS 84), on 5 July 2014 at 2000 h, we found a young male *E. miliaris* (Fig. 1A; LZATM 930) foraging in a pond formed by a small spring. There were several *Phyllomedusa bicolor* tadpoles in the pond, including some metamorphs (Fig. 1B–D). We found two whole *P. bicolor* tadpoles (length = 20 and 19 mm) in the snake's stomach, as well as the mostly digested tail of a third tadpole. Predation of *E. miliaris* on adult *Phyllomedusa* frogs (Sazima 1994. J. Herpetol. 8:376–377) and eggs inside nests (Figueiredo-de-Andrade and Kindlovits 2012. Herpetol. Notes 5:229–230) has been reported, but we are unaware of previous reports of *E. miliaris* feeding on *Phyllomedusa* tadpoles.

Fig. 1. A) Young male *Erythrolamprus miliaris*; B) *Phyllomedusa bicolor* swimming in the puddle; C) side view of one of the tadpoles taken from the snake's stomach; D) tadpoles found in the snake's stomach.

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***ERYTHROLAMPRUS VIRIDIS* (Green-snake). DEFENSIVE BEHAVIOR.** Hooding behavior is an anti-predation mechanism known in some elapid snakes of the Old World, characterized by extending the anterior ribs and stretching the neck skin laterally (Greene 1997. Snakes: The Evolution of Mystery in Nature. University of California Press, Berkeley. 337 pp.). However, this behavior also has been described in some genera of New World snakes including *Thamnodynastes* (Franco et al. 2013. Zootaxa. 334:1–7), *Hydrodynastes* (Young and Kardong 2010. J. Exp. Biol. 213:1521–1528), *Xenodon* (Kahn 2011. Herpetotropicos 6:25–26), *Heterodon* (Edgren 1955. Herpetologica 11:105–117), and *Erythrolamprus* (Menezes et al. 2015. Herpetol. Notes 8:291–293). On 27 February 2016 we recorded the first occurrence this behavior in *Erythrolamprus viridis* (Fig. 1), a Neotropical dipsadid snake with terrestrial and diurnal activity (Vanzolini et al. 1980. Répteis das Caatingas. Academia Brasileira de Ciências, Rio de Janeiro. 161 pp.). The specimen was observed in a tree along a roadside near the River Vaza-Barriz (10.6211°S, 37.7316°W; WGS 84), Municipality of Pedra Mole, Sergipe, Brazil. When observed, it raised the anterior part of its body and displayed a flattened nuchal region, stretching the neck skin laterally. We suggest this behavior is a synapomorphy for the genus *Erythrolamprus* and serves a defensive function in the presence of potential predators (Menezes et al., *op. cit.*).

Fig. 1. *Erythrolamprus viridis* displaying hooding defensive behavior.

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***LAMPROPELTIS TRIANGULUM* (Milksnake). PREDATION.** *Lampropeltis triangulum* is a medium-sized terrestrial colubrid snake found in North American grasslands and forests (Ruane et al. 2014. Syst. Biol. 63:231–250). It is thought to be a Batesian mimic of venomous coralsnakes (genus *Micrurus*), although the

Fig. 1. *Neovison vison* (Mink) carrying a dead *Lampropeltis triangulum* (Milksnake) along a trail in Ohio, USA.

extent to which this is protective in allopatry is debated (Pfennig and Mullen 2010. Proc. Roy. Soc. Lond. B Biol. 277:2577–2585). Known predators of this species include conspecifics, *Lithobates catesbeianus* (Bullfrog), *Toxostoma rufum* (Brown Thrasher), hawks (*Buteo jamaicensis*, *B. nitidus*), and an apparent attack by a *Mutsela nigripes* (Black-footed Ferret; Ernst and Ernst 2002. Snakes of the United States and Canada. Smithsonian Institution Press, Washington D.C. 661 pp.). Here, we report a new predator on *L. triangulum*—the opportunistically carnivorous mustelid *Neovison vison* (Mink, formerly *Mustela vison*).

On 13 June 2013, at ca. 1400 h, one of us (TS) was hiking the Ohio & Erie Canal Towpath along the Cuyahoga River (41.48964°N, 81.69442°W; WGS 84) in Cleveland, Ohio, USA, when he observed an *N. vison* running towards him along the path carrying a snake in its mouth (Fig. 1). Once it was about 20 m away, it dropped the snake onto the path, abruptly turned, and ran off into the underbrush. This allowed TS to photograph and identify the deceased snake. After continuing on, TS was able to observe the *N. vison* retrieving the snake from where it had been dropped in the path.

Most studies of *N. vison* diet have either taken place in winter, when snakes are inactive, or were conducted in parts of its range uninhabited by snakes (Larivière 1999. Mammalian Species Archive 608:1–9). Reptiles made up a minor component (0–5%) of *N. vison* diet in the few warm-season studies in temperate North America (Hamilton 1940. J. Wildl. Manage. 4:80–84; Wilson 1954. J. Wildl. Manage. 18:199–207; Arnold and Fritzell 1987. Can. J. Zool. 65:2322–2324). Snakes in the genera *Nerodia*, *Pantherophis*, and *Thamnophis* are known to be consumed.

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***LEPTOPHIS AHAETULLA* (Parrot Snake). DIET.** On November 2002, in the Amolar region, Mato Grosso, Brazil (17.81666°S, 57.55000°W; WGS 84), we recorded two events of predation on birds, *Passer domesticus* (House Sparrow) and *Tangara palmarum* (Palm Tanager), by *Leptophis ahaetulla*. In the first event, we recorded an adult *L. ahaetulla* in the top (ca. 4 m) of a tree preying on a nest of *P. domesticus* with two nestlings (71.46 and 83.07 mm length). After the observation, the snake was captured and deposited in the Collection Zoological of Reference of the Campus of Corumbá (CEUCH 2091). In the second event, an adult *L. ahaetulla* (SVL = 703 mm; Tail length = 403 mm; 83.5 g) was found preying on a *T. palmarum*. After a few minutes of observing the predation event, the snake was collected, and was subsequently marked and released. The diet of *L. ahaetulla* is composed primarily of amphibians and lizards (Vitt 1996. Herpetol. Nat. Hist. 4:69–76; Martins and Oliveira 1999. Herpetol. Nat. Hist. 6:78–150; Albuquerque et al. 2007. J. Nat. Hist. 41:1237–1243). This is the first record of *L. ahaetulla* preying on *P. domesticus* and on *T. palmarum*.

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***LIODYTES ALLENI* (Striped Crayfish Snake). PREDATION.** *Liodytes alleni* (formerly *Regina alleni*) is a small semi-aquatic natricine snake found in peninsular Florida and southeastern Georgia, USA (Ernst and Ernst 2002. Snakes of the United States and Canada. Smithsonian Institution Press, Washington D.C. 661 pp.). Predators of *L. alleni* include crayfish, large fishes, sirens, alligators, other snakes (*Coluber constrictor*, *Lampropeltis getula*, *Agkistrodon piscivorus*), river otters, raccoons, Red-shouldered Hawks, Great Blue Herons, Great Egrets, and Sandhill Cranes (Gibbons and Dorcas 2004. North American Watersnakes: A Natural History. Univ. Oklahoma Press, Norman. 438 pp.; Ernst and

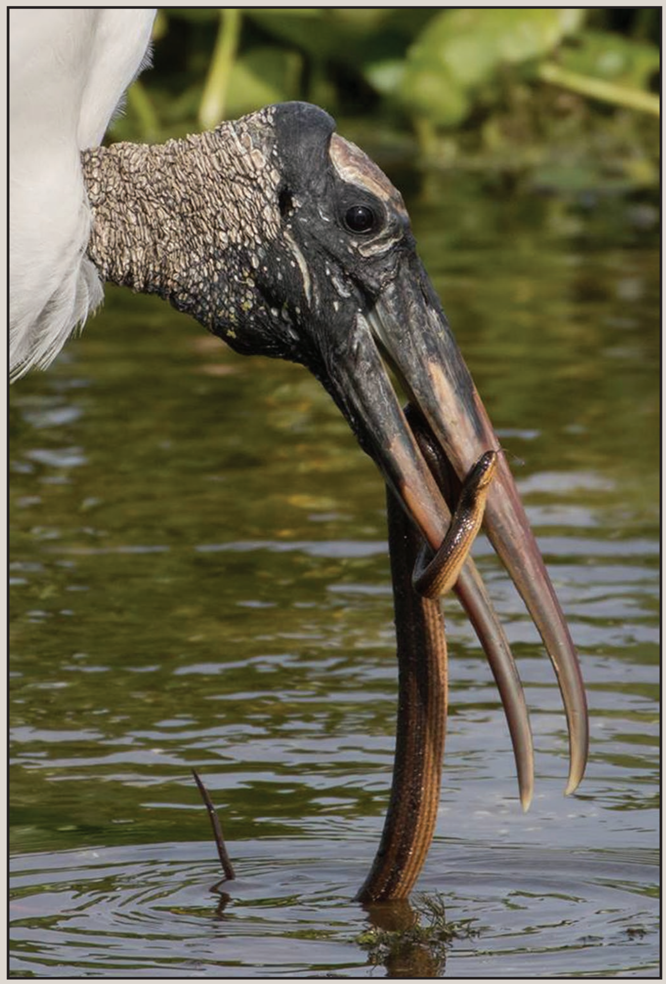

Fig. 1. *Liodytes alleni* being eaten by *Mycteria americana*.

PHOTO BY JOHN A. MIDDLETON JR [TOP]; PHOTO BY ROY HERRERA [BOTTOM]

Fig. 2A–B. *Liodytes alleni* being eaten by *Eudocimus albus*.

Ernst, *op. cit.*). Here we report three records of predation and one record of attempted predation on *L. alleni* by three novel avian predators.

At 1645 h on 5 March 2017, one of us (DM) saw and photographed an adult *L. alleni* in the bill of a *Mycteria americana* (Wood Stork) at Orlando Wetlands Park, Orange County, Florida (28.580758°N, 80.9989167°W; WGS 84; Fig. 1). The *M. americana* was standing in ca. 10 cm of water. The *M. americana* attempted to swallow the *L. alleni* but the smooth scales of the snake prevented the bill of the *M. americana* from gaining purchase. The outcome of the interaction is unknown. *Mycteria americana* eat mostly fishes, as well as crabs, insects, and anurans (Coulter et al. 1999. *In* P. G. Rodewald [ed.], The Birds of North America Online. Cornell Lab of Ornithology, Ithaca, New York. DOI: 10.2173/bna.409), although there are records of *M. americana* eating *Nerodia erythrogaster* (Plain-bellied Watersnake; Depkin et al. 1992. Colon. Waterbirds 15:219–225), *Nerodia floridana* (Florida Green Watersnake; Durso et al. 2017a. Herpetol. Rev., *in press*), and an unspecified “thick-bodied snake some twelve inches long” (Rand 1956. Am. Midl. Nat. 55:96–100).

Fig. 3. *Liodytes alleni* being eaten by *Podilymbus podiceps*.

We present two records of predation on *L. alleni* by *Eudocimus albus* (White Ibis). At ca. 1300 h on 3 February 2017, one of us (JM) observed and photographed an *L. alleni* being eaten by an *E. albus* on the La Chua Trail at Paynes Prairie Preserve State Park, Alachua County, Florida, USA (29.605978°N, 82.302639°W; WGS 84; Fig. 2A). The *E. albus* repeatedly shook the *L. alleni* and slapped it against the ground, to which the *L. alleni* responded by attempting to wrap its body around the bill of the *E. albus*. After ca. 2 min the *E. albus* dropped *L. alleni* on the ground, pecked its head aggressively, and then swallowed it. At 0930 h on 10 February 2017, one of us (RH) observed and photographed an *L. alleni* being eaten by an *E. albus* on the La Chua Trail at Paynes Prairie Preserve State Park, Alachua County, Florida, USA (29.605978°N, 82.302639°W; WGS 84; Fig. 2B). The *E. albus* was foraging in the only remaining water in a drying wetland, alongside numerous other birds. It captured and consumed an *L. alleni*. At the same site within 15 min, a second *E. albus* caught and consumed a *Seminatrix pygaea* (Black Swampsnake) under similar circumstances. The diet of *E. albus* is comprised mostly of fishes, crustaceans, and aquatic insects, although they also, rarely, eat other vertebrates, including frogs, salamanders, lizards (Moore et al. 2005. Herpetol. Rev. 36:182), and at least three species of snakes (“moccasins,” presumably *A. piscivorus*; Baynard 1912. Wilson Bull. 24:167–169; *Thamnophis sirtalis*; Eastern Gartersnake; Dorn et al. 2011. Ibis 153:323–335; *Seminatrix pygaea*; Durso et al., *in press*. Herpetol. Rev.).

At ca. 1545 h on 11 November 2016, one of us (JM) saw and photographed an *L. alleni* being captured by a *Podilymbus podiceps* (Pied-billed Grebe) at Watertown Lake, Columbia County, Florida (30.193795°N, 82.602697°W; WGS 84; Fig. 3). The capture occurred out of sight among emergent vegetation (mostly *Pontedaria* and Cyperaceae) along the shore. The *P. podiceps* emerged onto the open water carrying the *L. alleni* in its bill, hotly pursued by another *P. podiceps*. Both birds moved away from the observer too quickly to determine the ultimate outcome. *Podilymbus podiceps* are dietary opportunists that mostly feed on crustaceans (especially crayfish), aquatic insects, and fishes, as well as occasionally on leeches, snails, frogs and tadpoles, and salamanders, including *Ambystoma tigrinum* (Tiger Salamander) and *Taricha granulosa* (Rough-skinned Newt), which proved lethal to three young *P. podiceps* (Storer 2000. Misc. Publ. Mus. Zoo. Univ. Michigan 188:1–100). This is the second record of *P. podiceps* feeding on a snake; the other is of an unidentified *Liophis* sp. in Brazil (Sick 1993. Birds in Brazil. Princeton University Press, New Jersey. 703 pp.).

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FIG. 1. *Micrurus corallinus* in copulation (arrow). The female is stretched out, and the male is positioned above the female with his tail wrapped around hers.

MICRURUS CORALLINUS **(Coralsnake). REPRODUCTION.** Coral snakes have a characteristic aposematic color pattern, but their semifossorial habits (Campbell and Lamar 2004. The Venomous Reptiles of the Western Hemisphere. Cornell University Press, Ithaca, New York. 870 pp.) makes it difficult to sight specimens in the field. *Micrurus corallinus* has a wide distribution in the Atlantic Forest biome of South America, preferentially in areas with high humidity, such as the Serra do Mar (Marques et al. 2006. South Amer. J. Herpetol. 1:114–120). This species displays seasonal reproduction, concentrating its activities mainly during the spring (Marques 1996. Amphibia-Reptilia 17:277–285), and shows female-biased sexual size dimorphism in length, which may be related to the absence of combat (Marques et al. 2013. Herpetologica 69:58–66). Moreover, there is possibly a sexual aggregation behavior where many males may compete for a female (Almeida Santos et al. 2006. Herpetol. J. 16:371–376). Here we report an observation, made by an amateur photographer, of the first copulation report of *M. corallinus* in nature during summer and the first photographic record of such behavior.

The snakes were found on 8 January 2016 at 1123 h, on a pathway of Saco do Céu - Freguesia de Santana, near Japariz beach in the municipality of Angra dos Reis – RJ, Brazil, 10 m from a small pool of water. The female was identified by greater SVL and had its body fully stretched along the path. The male's tail curved over the female's tail in copula (Fig. 1). The snakes tried to flee when touched with a stick, but could not because they were linked by the tails. The copulation was observed during the day, which reinforces the diurnal activity of this species (Marques 1996, *op. cit.*). The coral snakes were on the surface of the ground between shrubs and rocks, partially hidden in the leaf litter. The copulation period described for this species is restricted to spring, from October to November (Marques et al. 2013, *op. cit.*), so the observation of summer mating implies that other reproductive events also may occur later. On the coast, due to the hot weather, breeding season may be extended further, which was observed for other females of this species (E. Bassi, pers. obs.). Thus, oviposition may occur in late summer and hatching in early autumn, increasing the hatching period of offspring during the dry season.

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MICRURUS IBIBOBOCA **(Caatinga Coralsnake). DEFENSIVE BEHAVIOR.** Hooding behavior is an anti-predator mechanism characterized by extending the anterior ribs to stretch the neck skin laterally. It is best known in elapid snakes of the Old World (Young and Kardong 2010. J. Exp. Biol. 213:1521–1528), however it is phylogenetically and geographically widespread among snakes (Carpenter and Ferguson 1977. *In* Gans and Tinkle [eds]. Biology of the Reptilia. Ecology and Behaviour A, pp. 335–555. Academic Press, London; Myers 1986. Amer. Mus. Novit. 2853:1–12). In particular, this behavior has been described in some genera of New World xenodontine and dipsadine snakes, such as *Erythrolamprus* (Myers, *op. cit.*; Menezes et al. 2015. Herpetol. Notes. 8:291–293), *Thamnodynastes* (Franco et al. 2013. Zootaxa 334:1–7), *Philodryas* (Jara and Pincheira-Donoso 2015. Anim. Biol. 65:73–79), *Hydrodynastes* (Young and Kardong, *op. cit.*), *Xenodon* (Kahn 2011. Herpetotropicos 6:25–26), and *Ninia* (Greene 1975. Amer. Midl. Nat. 93:478–484; Henderson and Hoevers 1977. J. Herpetol. 11:106–108).

On 7 March 2013 we observed this behavior in *Micrurus ibiboboca*, a terrestrial and nocturnal elapid of the Neotropics (Vanzolini et al. 1980. Répteis das Caatingas. Academia Brasileira de Ciências, Rio de Janeiro. 161 pp.). The *M. ibiboboca* was seen in a fragment of Atlantic Forest in National Park Serra de Itabaiana (10.7488°S, 37.3419°W; WGS 84), Municipality of Itabaiana, Sergipe, Brazil. It raised the anterior portion its body when we approached, flattening the nuchal area, and stretching the neck skin laterally (Fig. 1). Although neck-flattening displays have been described from coralsnake mimics such as *Ninia sebae* (Red Coffee Snake; Greene, *op. cit.*; Henderson and Hoevers, *op. cit.*), this is the first observation of hooding behavior in the diverse genus *Micrurus*, a group that is more well-known for relying on aposematic coloration for defense (Smith 1975. Science 187:759–760; Smith 1977. Nature 265:535–536). We suggest that this behavior could be a synapomorphy for elapid snakes and another way for coralsnakes and their mimics to enhance aposematic signals.

FIG. 1. *Micrurus ibiboboca* displaying defensive hooding behavior.

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NERODIA FLORIDANA **(Florida Green Watersnake). PREDATION.** *Nerodia floridana* is a medium-sized semi-aquatic natricine snake found in the southeastern USA (Ernst and Ernst 2002. Snakes of the United States and Canada. Smithsonian Institution Press, Washington D.C. 661 pp.). Relatively few records of predation on *N. floridana* have been reported in the literature, including that by American Alligators (*Alligator mississippiensis*), Cottonmouths (*Agkistrodon piscivorus*) and conspecifics (in captivity; Van Hyning 1931. Copeia 1931:59–60), river otters (*Lontra canadensis*), as well as "large fish" and "predatory birds" (Ernst and Ernst, *op. cit.*). Krysko (2002. Am. Midl. Nat. 148:102–114) found the skeleton of a *N. floridana* under a *Buteo lineatus* (Red-shouldered Hawk) roost. The most comprehensive recent review does not list any specific predators (Gibbons and Dorcas 2004. North American Watersnakes: A Natural History. University of Oklahoma Press, Norman. 438 pp.), although it is generally presumed that wading birds are among the potential predators of most semi-aquatic snake species. Here we report three records of predation on *N. floridana* by wading birds.

At 1040 h on 25 February 2017, one of us (LS) saw and photographed an adult *N. floridana* (HerpMapper173068) being eaten by a *Mycteria americana* (Wood Stork) at Sweetwater Wetlands Park, Alachua County, Florida, USA (29.61841°N, 82.32692°W; WGS 84). The *M. americana* was standing in ca. 15 cm of water near the bank of a permanent wetland with moderate emergent vegetation, mostly reeds (Fig. 1). It consumed the snake, which appeared to have had its head crushed and was still moving but not actively trying to escape, within 5 min. *Mycteria americana* eat mostly fishes, as well as crabs, insects, and anurans (Coulter et al. 1999. *In* P. G. Rodewald [ed.], The Birds of North America Online. Cornell Lab of Ornithology, Ithaca, New York. DOI: 10.2173/bna.409), although there is at least one record of one eating a *Nerodia erythrogaster* (Plain-bellied Watersnake; Depkin et al. 1992. Colon. Waterbirds 15:219–225) and another of one capturing an unspecified "thick-bodied snake some twelve inches long" (Rand 1956. Am. Midl. Nat. 55:96–100).

Fig. 1. *Nerodia floridana* being eaten by *Mycteria americana*.

Fig. 2. *Nerodia floridana* being eaten by *Botaurus lentiginosus*.

Fig. 3. *Nerodia floridana* being eaten by *Ardea herodias*.

At 1148 h on 17 December 2016, one of us (SL) saw and photographed an adult *N. floridana* being eaten by a *Botaurus lentiginosus* (American Bittern) at Lake Apopka, Orange County, Florida, USA (28.68300°N, 81.60063°W; WGS 84). The *B. lentiginosus* was standing on the edge of thick vegetation next to a canal (Fig. 2). It consumed the snake, which was alive and struggling, within 4 min, dipping it in the water a few times. The diet of *B. lentiginosus* consists mainly insects, amphibians, crayfish, and small fishes and mammals; it has also been reported to eat gartersnakes (*Thamnophis* sp.; Gabrielson 1914. Wilson Bull. 87:51–68; Ingram 1941. Auk 58:253), watersnakes (*Nerodia* sp.; Lowther et al. 2009. *In* P. G. Rodewald [ed.], The Birds of North America Online. Cornell Lab of Ornithology, Ithaca, New York. DOI: 10.2173/bna.18), and *Seminatrix pygaea* (Black Swampsnake; Durso et al. 2017. Herpetol. Rev. *in press*).

At 0833 h on 6 June 2015, one of us (RL) saw and photographed an adult *N. floridana* being eaten by an *Ardea herodias* (Great Blue Heron) at the Circle B Bar Reserve, Polk County, Florida, USA (27.99009°N, 81.870679°W; WGS 84; Fig. 3). The predation event occurred in ca. 15 cm deep water with significant aquatic vegetation. *Ardea herodias* are dietary generalists that feed mostly on fishes, but also eat invertebrates, amphibians, reptiles, mammals, and birds (Vennesland and Butler 2011. *In* P. G. Rodewald [ed.], The Birds of North America. Cornell Lab of Ornithology, Ithaca, New York. DOI: 10.2173/bna.25). Although few quantitative data are available, mostly from outside the range of semi-aquatic snakes, *A. herodias* are undoubtedly frequent predators of semi-aquatic snakes.

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OLIGODON TAENIATUS **(Striped Kukri Snake). ENDOPARASITE.** *Oligodon taeniatus* is known to occur from parts of Thailand, Paksé, Champasak Provinces, Laos, Cambodia, and Vietnam (Das 2010. A Field Guide to the Reptiles of South-east Asia, Myanmar Thailand Laos Cambodia, Vietnam. Peninsular Malaysia, Singapore, Sumatra, Borneo, Java, Bali. New Holland Publishers, London, UK. 376 pp.). We know of no reports of endoparasites from *O. taeniatus*. In this note we establish the initial helminth list for *O. taeniatus*.

One *O. taeniatus* from Don Khong Island (14.11739°N, 105.85548°E; WGS 84), Champasak Province, southern Laos was collected on 3 December 2016. On external examination, two dozen bumps with coiled helminths were noted under the integument. Small incisions were made through which helminths were removed (Fig. 1). The helminths were preserved in 70% ethanol and shipped to CRB for identification. The *O. taeniatus* was subsequently released. On the basis of morphology (white, wrinkled, ribbon-shaped unsegmented strobila approximately 25 mm in length; anterior end rounded with suggestions of sucking grooves that are present in the scolex of *Spirometra*), the helminths were identified as sparagnum (Smyth 1976. Introduction to Animal Parasitology, 3rd ed. Cambridge Univ. Press, UK. 549 pp.). The sparagnum was sent to the Harold W. Manter Parasitology Laboratory, University of Nebraska, Lincoln, Nebraska, USA, as HWML 99820.

A sparagnum is a larval form (plerocercoid) of a *Spirometra* tapeworm (Smyth, *op. cit.*). The *O. taeniatus* likely became infected with the sparagnum by eating infected prey; frogs or lizards are known parts of their diet (Das, *op. cit.*). No further development will occur in the *O. taeniatus,* which would have served as a transport (paratenic) host until it was eaten by a carnivore in which development to the adult *Spirometra* would have occurred. The sparagnum in *O. taeniatus* represents a new host record.

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FIG. 1. *Oligodon taeniatus* from southern Laos infected by *Spirometra* sp.

OPHEODRYS VERNALIS **(=*LIOCHLOROPHIS VERNALIS*) (Smooth Greensnake). FIRE MORTALITY AND PHENOLOGY.** On 11 April 2017, we discovered two *Opheodrys vernalis* (total lengths = 31 and 39 cm; Fig. 1) deceased among ashes, along with one deceased *Thamnophis sirtalis* (Common Gartersnake; total length = 63 cm), following a prescribed burn to control woody encroachment in the flood plain of the Platte River on Shoemaker Island, Hall County, Nebraska, USA (40.79660°N, 98.46978°W, WGS 84; 597 m elev.). The long rectangular burn consisted of 0.26 ha (40 × 650 m) of shrub-encroached, lowland tallgrass prairie bordered on the north by the Platte River. A pre-burn assessment of vegetation noted extensive encroachment by Eastern Red Cedar (*Juniperus virginiana*) and American Plum (*Prunus americana*). The burn unit was largely dominated by senesced Big Bluestem (*Andropogon gerardii*) with emerging green vegetation that included Western Marbleseed (*Onosmodium molle*) and Kentucky Bluegrass (*Poa pratensis*). The area had predominantly sandy soils and also contained a significant amount of Brittle Prickly Pear Cactus (*Opuntia fragilis*). The controlled burn was a backing and flanking fire that covered the unit in about 35 min beginning at 1404 h. The burn was relatively hot, leaving little remaining vegetation; relative humidity at time of ignition was 39% and ambient temperature was 16°C. Our observations represent the first recorded mortality for *O. vernalis* as a result of a prairie fire (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Books, Washington, D.C. 680 pp.) and an in-depth description of habitat for this species in Nebraska (Ballinger et al. 2010. Amphibians and Reptiles of Nebraska. Rusty Lizard Press, Oro Valley, Arizona. 400 pp.). Our observations also represent the earliest reported records of activity in Nebraska, as little is known about the phenology of *O. vernalis* in the state (Ballinger et al. 2010, *op. cit.*; Fogell 2010. A Field Guide to the Amphibians and

FIG. 1. One of two *Opheodrys vernalis* collected following a controlled burn on 11 April 2017 at Shoemaker Island, Hall County, Nebraska. Left: Ventral side of snake placed next to cm ruler. Right: Dorsal side of individual upon collection in situ.

Reptiles of Nebraska. University of Nebraska Press, Lincoln. vi + 158 pp.). Research from Wisconsin and throughout most of its range indicates an active period from mid-April to October (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Public Museum. 205 pp.; Ernst and Ernst 2003, *op. cit.*). The earliest prior state record was collected on 4 June 1983 in Merrick County, 0.8 km S, 13.7 km E of Palmer, Nebraska (University of Nebraska State Museum ZM#8580). The latest specimen collection date for *O. vernalis* in Nebraska was 15 October 2011 from Phelps County (Geluso 2012. Collinsorum 1:3–6).

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***PANTHEROPHIS ALLEGHANIENSIS* (Eastern Ratsnake). FORAGING.** *Pantherophis alleghaniensis* are well-known predators of birds and their eggs (DeGregorio et al 2014. J. Avian Biol. 45:325–333). Some birds incorporate snake sheds into the construction of their nests, the function of which is not entirely clear (Medlin and Risch 2006. Condor 108:963–965; Trnka and Prokop 2011. Ibis 153:627–630).

We documented predation of a *Thryothorus ludovicianus* (Carolina Wren) nest containing a shed of a *Coluber constrictor* (Racer) by a *P. alleghaniensis*. The nest was located inside the carport of a private residence in Alachua County, Florida, USA (29.658926°N, 82.379202°W; WGS 84), in a folded lawn chair (Fig. 1A). The nest was discovered on 16 March 2016, the first egg laid on 26 March, and the 4th and final egg laid on 29 March. The snake shed was added between 19 March and 14 April, when the eggs hatched (Fig. 1B; *T. ludovicianus* often adds nest material, including shed snake skins, after incubation has begun; Haggerty and Morton 2014. *In* P. G. Rodewald [ed.], The Birds of North America. Cornell Lab of Ornithology, Ithaca, New York. DOI: 10.2173/bna.188). The predation event occurred on 16 April at ca. 2030 h, consistent with the idea that *P. alleghaniensis* often depredate bird nests after dark (DeGregorio et al. 2015. Ethology 121:1225–1234).

Most sheds incorporated into bird nests and identified were from widespread, generalist species such as *P. alleghaniensis*, *C. constrictor*, *C. flagellum* (Coachwhip), and *Thamnophis* sp. (gartersnakes); Miller and Lanyon 2014. *In* P. G. Rodewald [ed.], The Birds of North America. Cornell Lab of Ornithology, Ithaca, New York. DOI: 10.2173/bna.300), not to snake-eating specialists like *Lampropeltis*; thus, there is no obvious mechanism by which this adaptation might deter snake predators. Instead, because snake sheds contain skin-derived semiochemicals used as pheromones for communication (Mason and Parker 2010. J. Comp. Physiol. A 196:729–749) and snake sheds in active bird nests deteriorate much more slowly than those in artificial nests (Medlin and Risch, *op. cit.*), it is possible that *P. alleghaniensis* and other nest-depredating snakes could use olfactory as well as visual cues to locate nests that contact snake sheds (Mullin and Cooper 1998. Am. Midl. Nat. 140:397–401). The possible risk of providing chemical cues to snake predators suggests that the benefits to birds of incorporating snake sheds into their nests must be substantial.

Fig. 1. A) Nest of *Thryothorus ludovicianus* (Carolina Wren) shortly after depredation by *Pantherophis alleghaniensis* (Eastern Ratsnake). B) Nest of *Thryothorus ludovicianus* (Carolina Wren) constructed with shed skin of *Coluber constrictor* (Racer). Identification of the shed was based on geography, size, and the presence of unkeeled dorsal scales.

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***PHILODRYAS CHAMISSONIS* (Chilean Green Racer). DIET.** *Philodryas chamissonis* is a medium-sized, oviparous, diurnal and predominantly terrestrial colubrid. It is endemic to Chile and is usually found in dry and warm environments such as grasslands and rocky slopes (Demangel 2016. Reptiles en Chile. Fauna Nativa Ediciones. 619 pp.). *Philodryas chamissonis* has a generalist diet, including different taxa of small vertebrates, but particularly lizards (Sepulveda et al. 2006. Herpetol. Rev. 37:224–225; Machado-Filho 2015. Master's Thesis, Paulista State University, São José do Rio Preto, São Paulo State, Brazil. 99 pp.). Here, we report predation by *P. chamissonis* upon *Liolaemus tenuis* (Thin Tree Lizard), a small, diurnal, and predominantly arboreal lizard (Demangel, *op. cit.*).

Fig. 1. *Philodryas chamissonis* preying on *Liolaemus tenuis* at a human settlement in the locality of Río Blanco, Los Andes, Valparaiso's Province, Chile. The red arrow indicates the partial automization of the lizard's tail.

Around noon on 31 December 2012, ES-L found an adult *P. chamissonis* ingesting an adult male *L. tenuis* on leaf litter under the creeper plant *Dioscorea brachybotrya* (Fig. 1). The observation was made in a garden of a house located in Río Blanco, Los Andes, Valparaiso Province, Chile (32.9106°S, 70.3059°W, WGS 84; 1429 m elev.). The lizard was being ingested by the head, with its limbs and body still exposed, and its tail was partially autotomized. A few minutes after being spotted, the snake released the lizard and escaped. To our knowledge this is the first record of *P. chamissonis* preying on *L. tenuis*, despite these two species being sympatric along most of their geographical distributions in Chile (Demangel, *op. cit.*). *Philodryas chamissonis* and *L. tenuis* are mostly terrestrial and arboreal, respectively, and the observed predatory event may reflect the flexibility in the microhabitat use by both species.

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***PYTHON MOLURUS* (Indian Rock Python). PREDATION.** *Python molurus* is a very large pythonid snake found in southern Asia (Wallach et al. 2014. Snakes of the World: A Catalogue of Living and Extinct Species. CRC Press, Boca Raton, Florida. 1227 pp.), ranging in size from ca. 60 cm at hatching to > 6 m as adults (Dorcas and Willson 2011. Invasive Pythons in the United States: Ecology of an Introduced Predator. University of Georgia Press, Athens. 156 pp.). Its close relative, *P. bivittatus* (Burmese Python; Jacobs et al. 2009. Sauria 31:5–11) has been introduced to southern Florida, USA (Dorcas and Willson, *op. cit.*) where they are occasionally eaten by *Alligator mississippiensis* (American Alligator). Documentation of predators of *P. molurus* in its native range is almost non-existent (Dorcas and Willson, *op. cit.*). Krishna (2002. Herpetol. Rev. 33:141) reported two instances of predation by *Ophiophagus hannah* (King Cobra). Other known sources of mortality in the wild are trampling by ungulates and attempting to consume *Hystrix indica* (Indian Porcupine), as well as possibly predation by *Canis aureus* (Golden Jackal), *Hyena hyena* (Striped Hyena), large eagles (*Aquila* spp.), and predation of the eggs by *Varanus bengalensis* (Bengal Monitor Lizard; Bhupathy and Vijayan 1989. J. Bombay Nat. Hist. Soc. 86:381–387). Here we report two records of predation on *P. molurus* by *Spilornis cheela* (Crested Serpent Eagle), a medium-sized bird of prey found in forests across tropical Asia.

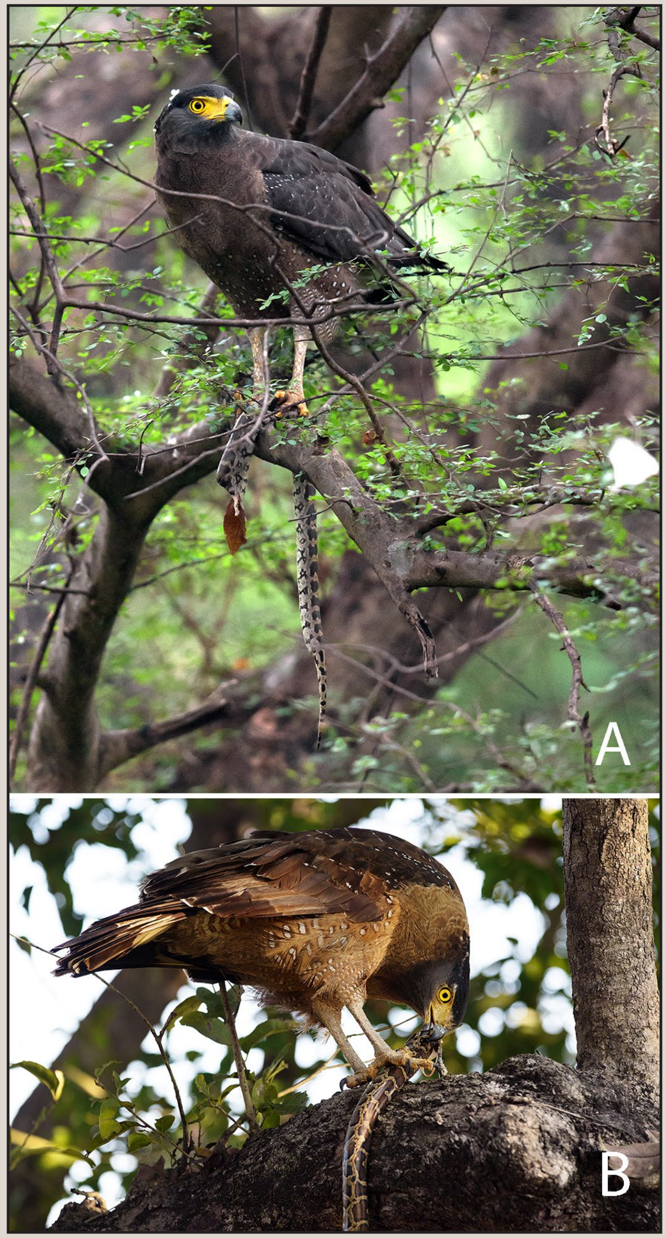

Fig. 1. *Python molurus* predation by Crested Serpent Eagles (*Spilornis cheela*) in India: A) Dudhwa National Park, Uttar Pradesh; and B) Ranthambore Tiger Reserve, Rajasthan.

At 0808 h on 27 December 2011, two of us (VKG and BG) saw and photographed a ca. 1.5-m *P. molurus* being eaten by an *S. cheela* at Dudhwa National Park, Lakhimpur Kheri, Uttar Pradesh, India (28.49948°N, 80.79961°W; WGS 84), ca. 2.5 km S of the border with Nepal. The *S. cheela* was perched on a tree branch ca. 4–5 m above the ground at a distance of ca. 45 m (Fig. 1A). The mahout driving our elephant maneuvered us within 6 m of the *S. cheela*, which continued to feed calmly on the *P. molurus* for 22 min. The mahout reported never having seen this kind of predation in >17 years of working for the park.

At 0722 h on 12 October 2013, one of us (BG) saw and photographed a juvenile *P. molurus* being eaten by an *S. cheela* at Ranthambore Tiger Reserve, Sawai Madhopur, Rajasthan, India (26.02944°N, 76.44339°W; WGS 84). The *S. cheela* was perched in a tree clutching a dead *P. molurus* in its talons (Fig. 1B). The head had already been consumed, and without the head the *P. molurus* was ca. 1.2 m in length. This *S. cheela* was disturbed and flew away with the kill within 8 min. Forest officials and local wildlife enthusiasts also reported never having observed this kind of predation before.

Spilornis cheela eat mostly snakes, including *Oligodon arnensis*, *Dendrelaphis tristis*, *Xenochrophis piscator*, *Ahaetulla nasuta*, *Naja naja*, *Daboia russellii* (Gokula 2012. Taprobanica 4:77–82), *Cyclophiops major*, *Ptyas mucosa*, *Trimeresurus stejnegeri*, and *Naja atra* (Chou et al. 2004. *In* Chancellor and Meyburg [eds.], Raptors Worldwide, pp. 557–568. World Working Group on Birds of Prey/MME-BirdLife, Hungary, Berlin.). This is the first report of an *S. cheela* feeding on a pythonid snake.

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SIBYNOMORPHUS NEUWIEDI **(Neuwiedi's Snail-eating Snake). CHROMATIC ANOMALY.** Chromatic anomalies in snakes are divided into two main groups: I) aberrant coloration and II) aberrant dorsal pattern (Bérnils et al. 1991. Rev. Biotemas 3:129–132). Reports of such anomalies have been published sporadically since the beginning of the 20th century (e.g., Amaral 1925. Contrib. Harvard Inst. Trop. Biol. Med. 2:44–46). The rarity of such anomalies is attributed to stabilizing selection against them (Amaral 1932. Mem. Inst. Butantan. 7:81–87). However, despite their rarity, reports of chromatic anomalies are important to better understand the development and evolution of color pattern variation in snakes (Lema 1960. Iheringia [Zool.] 13:20–27).

The South American genus *Sibynomorphus* (Dipsadidae) comprises eleven species of medium-sized, gastropod-eating, nocturnal snakes found west of the Andes in northern Peru and southwestern Ecuador, and east of the Andes south of the Amazon basin in South America (Cadle 2007. Bull. Mus. Comp. Zool. 158:183–283; Costa and Bérnils 2015. Herpetol. Bras. 4:75–93). Several cases of type I anomalies are reported in the literature, including both xanthism and albinism in *S. mikanii* (originally misidentified as *S. turgidus*; Amaral 1934. Mem. Inst. Butantan. 8:151–153; Sazima and Di-Bernardo 1991. Mem. Inst. Butantan 53:167–173), and albinism in *S. neuwiedi* (Sazima and Di-Bernardo, *op. cit.*) and *S. ventrimaculatus* (Abegg et al. 2014. Herpetol. Notes 7:475–476).

Here we report an adult female *S. neuwiedi* (Museu de Zoologia João Moojen [MZUFV] 1682; total length = 367 mm) from Mata do Paraíso (municipality of Viçosa, Minas Gerais, Brazil: 20.8023°S, 42.8585°W, WGS 84; 750 m elev.) with a type II chromatic anomaly (Bérnils et al., *op. cit.*; Fig. 1). Non-anomalous individuals have a dorsal pattern of dark transverse blotches that decrease in thickness and regularity from head to tail, usually separated by lighter, wider interspaces and alternating with subtle longitudinal blotches. The ventral pattern is typically homogeneously scattered lateral dark pigments against a light background (Franco 1994. Dissertação de Mestrado, Instituto de Biociências, PUCRS. 148 pp.). Instead, MZUFV 1682 has two rows

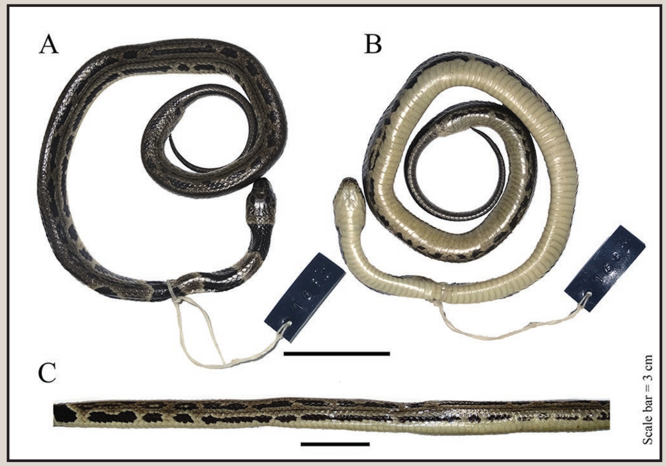

Fig. 1. *Sibynomorphus neuwiedi* (MZUFV 1682) with a type II chromatic anomaly. A) Dorsal view; B) ventral view; and C) lateral view.

of fused blotches that are much longer than they are wide, with reduced interspaces, one above and the other below a continuous thin dark lateral line. The ventral region is almost completely depigmented.

Some studies suggest that type I chromatic anomalies might play a role in the ecology of the carrying animal, especially on the ecology of fossorial or nocturnal foraging behavior snakes (e.g., Sazima and Di-Bernardo 1991, *op. cit.*; Silva et al. 2010, *op. cit.*; Sueiro et al. 2010, *op. cit.*; Abegg et al. 2014, *op. cit.*; Abegg et al. 2015, *op. cit.*). However, little is known about the influence of type II chromatic anomalies, if any, on snake ecology. We thank Henrique C. Costa for a critical reading and helpful comments and Katie Lempke for the English review.

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SIPHLOPHIS LEUCOCEPHALUS **(Common Spotted Night Snake). DEFENSIVE BEHAVIOR.** Defense strategies are quite diverse among snakes (Greene 1988. *In* Gans and Huey [eds.], Biology of the Reptilia, Volume 16, Ecology B: Defense and Life History, pp. 1–152. Alan R. Liss Inc., New York). Most tactics are used against visually oriented predators and are related to habitat. Terrestrial species display defensive behaviors against

Fig. 1. *Siphlophis leucocephalus* forming a ball and hiding its head.

predators that normally come from above, whereas arboreal species must protect themselves from threats that come from several directions (Greene 1979. Experientia 35:747–748).

Snakes as diverse as boids, colubrids, and elapids form their bodies into a ball and hide their head when threatened (Lewis and Lewis 2010. Herpetozoa 23:79–81). This behavior is widespread within dipsadine colubrids (Cadle and Myers 2003. Am. Mus. Novit. 3409:1–47). Within the genus *Siphlophis,* this behavior is known from two species: *S. cervinus* (Martins 1996. Anais de Etologia 14:185–199) and *S. compressus* (Sena et al. 2016. Herpetol. Rev. 47:315–316), and may represent evidence of phylogenetic conservatism in the defense strategies of this group (Martins 1996, *op. cit.*). *Siphlophis leucocephalus* is a semiarboreal species with nocturnal habits (Argôlo 2004. As Serpentes Dos Cacauais do Sudeste da Bahia. Editus, Ilhéus, Bahia. 260 pp.) and endemic to the Brazilian states of Bahia, Tocantins, and Minas Gerais (Thomassen et al. 2015. Check List 11:1637). Here we report ball-forming and head-hiding defensive behavior from an individual *S. leucocephalus* found in a cocoa plantation shaded by Atlantic rainforest on the Universidade Estadual de Santa Cruz campus (14.79547°S, 39.17251°W; WGS 84), municipality of Ilhéus, Bahia, Brazil. The *S. leucocephalus* hid its head amid the body when it was not given an opportunity to escape, holding that position when it was touched with a stick (Fig. 1). When there was the possibility of escape, the *S. leucocephalus* hid beneath the foliage or moved around actively.

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***TROPIDOCLONION LINEATUM* (Lined Snake), *THAMNOPHIS SIRTALIS* (Common Gartersnake). REFUGIA AND MORTALITY.** On 22 January 2017, six *Tropidoclonion lineatum* and three *Thamnophis sirtalis* where found deceased and frozen near and within a partially overturned cow patty (Fig. 1) in a grazed pasture on Mormon Island, Hall County, Nebraska, USA (40.79591°N, 98.42111°W, WGS 84; 595 m elev.). The island is approximately 1100 ha of sub-irrigated wet meadow and tallgrass prairie habitat bordered on the north and south by channels of the Platte River. A potential hibernaculum was located 3 m west of the cow patty in a burrow (about 12 cm in diameter) where another deceased *T. lineatum* was found in frozen mud near the opening (Fig. 2). Abutting the patty was a small mammal midden that was composed of senesced grass blades and held the shed skin of a *T. lineatum*. All *T. sirtalis* (total lengths 38–58 cm) were found relatively intact, whereas all *T. lineatum* (total lengths 18–24 cm) carcasses demonstrated some tearing and damage. Within the cow patty, hundreds of frozen isopods (Armadillidiidae) were also found. The ground below the patty was thawed, whereas the ground surrounding the patty was frozen. Ten additional cow patties were flipped within 5 m of the suspected burrow hibernaculum, but all lacked any sign of snakes. Temperatures were highly variable during January 2017 (min. = -23°C, max = 15°C, mean = -3°C), with periods of sustained warmth well above average temperatures, which may have prompted early emergence from brumation.

Fig. 1. Disturbed cow patty where three *Thamnophis sirtalis* and six *Tropidoclonion lineatum* were found dead on 22 January 2017 within grazed wet meadow habitat on Morman Island, Hall County, Nebraska, USA.

Fig. 2. *Tropidoclonion lineatum* partially frozen in mud near suspected hibernaculum entrance located 3 m west of the cow patty in Fig. 1.

We suspect that the cow patty was used as an emergency refugium offering physical protection from quickly falling temperatures following premature emergence from hibernation. Environmental insulation has been demonstrated to promote survival in *T. sirtalis* by slowing the rate of ice formation within the snake's body, preventing damage from rapid expansion (Costanzo et al. 1988. Cryo-Letters 9:380–385). Microbial thermogenesis would have sustained a higher-than-ambient temperature within the manure, possibly attracting the snakes to the cow patty (James 1928. J. Bacteriol. 15:117). As a food source, the isopods may have initially drawn *T. lineatum* and *T. sirtalis* to the manure microsite (Hamilton Jr. 1951. Am. Midl. Nat. 46:385–390; Oldfield and Moriarty 1994. Amphibians and Reptiles Native to Minnesota. University of Minnesota Press, Minneapolis, Minnesota. 237 pp.). The snakes may have also simply have been sharing the thermal refugium with the isopods (Carpenter 1953. Ecology 34:74–80). We believe this to be the first account of either *T. sirtalis* or *T. lineatum* utilizing ungulate manure as refugia from cold. In Europe, oviparous *Natrix natrix* (Grass Snakes) have evolved nesting behaviors closely associated with manure and compost heaps, which provide more stable thermal conditions, higher mean temperatures, and much higher egg survival than "natural" nest sites, likely allowing the species to extend its distributional range into cooler climates (Löwenborg et al. 2010. Funct. Ecol. 24:1095–1102; Löwenborg et al. 2012. Biodivers. Conserv. 21:2477). We suspect that emergent snakes are opportunistic in cow manure microsite selection for survivorship during cold conditions, although Bison (*Bison bison*) manure would have been available to them historically.

Winter-kill within hibernacula is a well-documented source of *T. sirtalis* mortality (Shine and Mason 2004. Biol. Conserv. 120:201–210). *Thamnophis sirtalis* are regularly active beginning in late February in Kansas (Fitch 1965. Univ. Kansas Publ. Mus. Nat. Hist. 15:493–564) and *T. lineatum* are known to be active from "late April to October" in Nebraska (Ballinger et al. 2010. Amphibians and Reptiles of Nebraska. Rusty Lizard Press, Oro Valley, Arizona. 400 pp.). Early emergence and patrolling within 3 m of den entrances by male *T. sirtalis* has been noted as early as mid-February in Missouri (Sexton and Bramble 1994. Amphibia-Reptilia 15:9–20). Activity outside of hibernacula earlier than 22 January 2017 is unseasonable, especially in the case of *T. lineatum*. Mortality within and adjacent to the cow patty and den indicates risk of snake mortality associated with early hibernaculum emergence (Wiese et al. 2016. Collinsorum 5:3–5), which may become more common as seasonal temperature variability and the frequency of temperature anomalies increase (Singh et al. 2016. J. Geophys. Res. Atmos. 121:9911–9928).

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TROPIDODIPSAS SARTORII **(Terrestrial Snail Sucker). REPRODUCTION.** *Tropidodipsas sartorii* ranges from central Nuevo Léon, Mexico to northeastern Honduras on the Atlantic versant and from eastern Oaxaca, Mexico to western El Salvador, western Nicaragua and northwestern Costa Rica (McCranie. 2011. The Snakes of Honduras Systematics, Distribution, and Conservation. Society for the Study of Amphibians and Reptiles. Ithaca, New York. 714 pp.). Information on reproduction of *T. sartorii* is limited and consists of a report of 3–5 eggs produced during late in the dry season or early in the rainy season (Campbell 1998. Amphibians and Reptiles of Northern Guatemala, the Yucatán and Belize. University of Oklahoma Press, Norman. 380 pp.). In this note I present a new maximum clutch size for *T. sartorii.*

One female *T. sartorii* (SVL = 508 mm) collected February 1983 at Cuautlapan (18.871256°N, 97.022963°W; WGS 84), Veracruz, Mexico, and deposited in the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA as LACM 154846 was examined. A mid-ventral cut was made in the lower part of the abdomen and six eggs (mean length = 27.0 mm ± 3.1 SD, range = 22–30 mm) were counted in the oviducts. All possessed leathery shells and were presumably close to being deposited. Six is a new maximum clutch size for *T. sartorii.*

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XENOCHROPHIS PISCATOR **(Checkered Keelback). DIET and MORTALITY.** *Xenochrophis piscator* is a common species of non-venomous snake found throughout South Asia, except Andaman and Nicobar islands (Whitaker and Captain 2004. Snakes of India, The Field Guide. Draco Books, Chennai, India. 495 pp.). It is primarily found in and around fresh water bodies and paddy fields. Young snakes prey on frog eggs, tadpoles, and water insects; while adults feeds on fishes, frogs, and occasionally rodents and birds (Whitaker and Captain 2004, *op. cit.*). Herein we report an observation of death of an *X. piscator* after attempted predation on a fish.

At ca. 2130 h on 20 August 2015, during a night survey near the Ambika River in Bilimora, Gujarat, India (20.7868°N, 72.9723°E; WGS 84), we encountered a dead sub-adult *X. piscator* (total length = 34.5 cm) with a dead fish, *Anabas tertudineus*, in its mouth (Fig. 1). *Anabas tertudineus* has a long dorsal fin with sharp spines; which are used in defense (Storey et al. 2002. Int. J. Ecol. Environ Sci. 28:103–114). It is likely that the sharp spines of the fish stuck in the snake's mouth, ruptured soft inner tissues, and might have caused the snake to die by suffocation. Snakes typically feed on large prey relative to their body size. However, many times young snakes mis-evaluate prey size, resulting in their death (Sazima and Martins 1990. Mem. Inst. Butantan 52:73–79).

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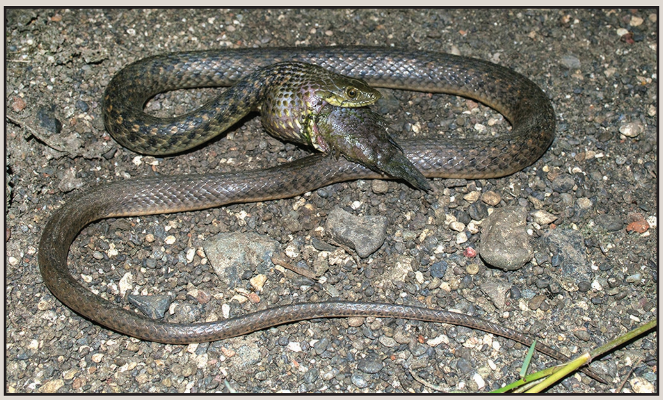

Fig. 1. A dead sub-adult *Xenochrophis piscator*, with an *Anabas tertudineus* in its mouth.

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